PUBLIC HOUSING RESALE MARKET ANALYSIS

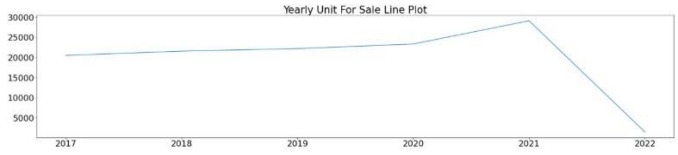
Abdullah Sayyid Ayyash B. Engineering

INTRODUCTION

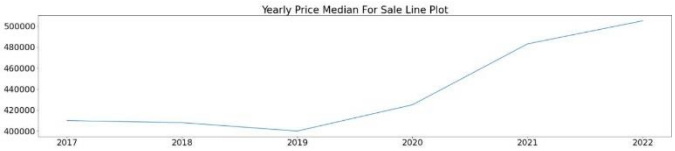
Public housing/flats in Singapore along with growing population in Singapore. Hence, this becomes potential market in properties sector and need further analysis. This report used the Resale Flat Prices in Singapore from 2017 until 2022 Government Data.

EXPLANATORY DATA ANALYSIS

1. GROWTH



Picture 1. Flat Unit for Sale in every Year



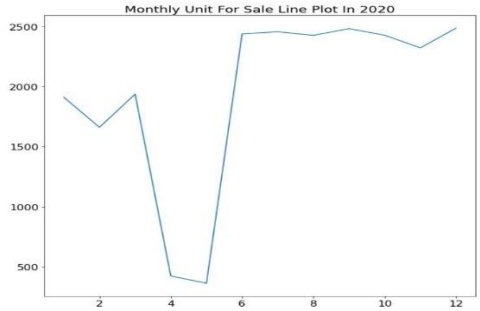
Picture 2. Median of Flat's Price in every Year

Based on **Picture 1**, Since 2017 until early 2022, The number of unit flats for sale is always increasing from 20509 units to 29106 units in the year of 2021 (in 2022 only record in January so it seems like a drop value in 2022). There was a big increase from 2020 (around 23333 units) to 2021 (around 29106 units). It possibly indicates that the market / demand is always growing every year.

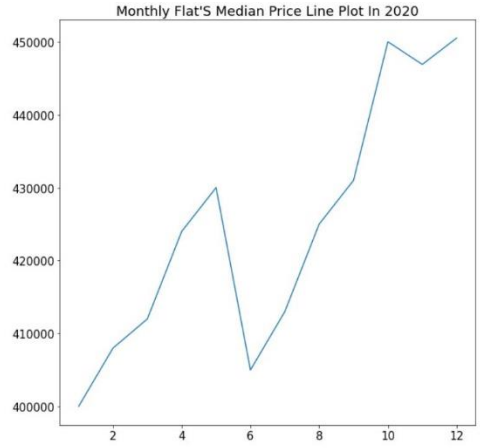
The median of flat prices also growing year by year (**Picture 2**). In 2017 the price is around 443,888 SGD per unit, while in 2022 (this year) the price reach 529,391 SGD per unit. It could indicate that the market of resale flat is getting bigger and more competitive.

2. Market Condition in 2020

There was a big increase in 2020 to 2021 int Number of flats unit for sale, so that it would be interesting to get a deep understanding of market condition in 2020.

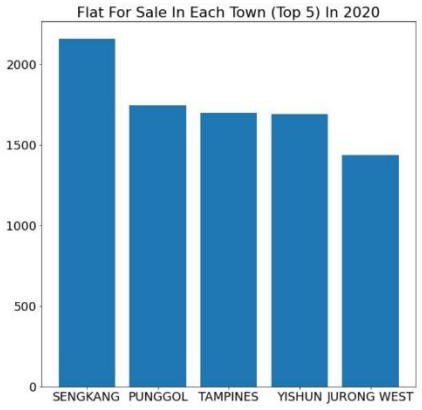


Picture 3. Flat Unit for Sale in 2020 each month

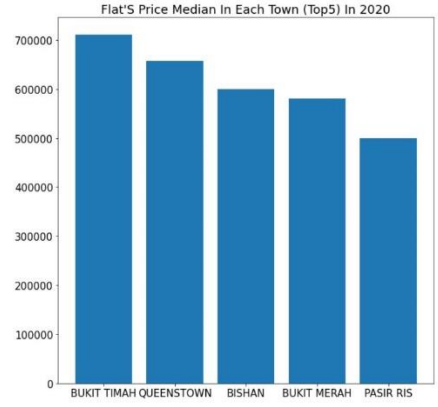


Pictures 4. Median of Flat's Price in 2020 each month

Based on **Picture 3** there were a big drop of number of flats for sale in 2020 at April and Mei. In March 2020, there were 1937 flats that had been sold but in April and Mei 2020 there were only 424 and 363 units sold. It was possibly be affected by low demand of flats. Therefore, in June 2020 the price went down significantly (**Picture 4**) to attract market in the interest of buying flats. It was success and able to elevate number of flats for sale significantly. In June 2020, there were 2438 units of flats that had been sold – bigger than the previous months.



Picture 5. Flat Unit for Sale in 2020 per Town (Top 5)

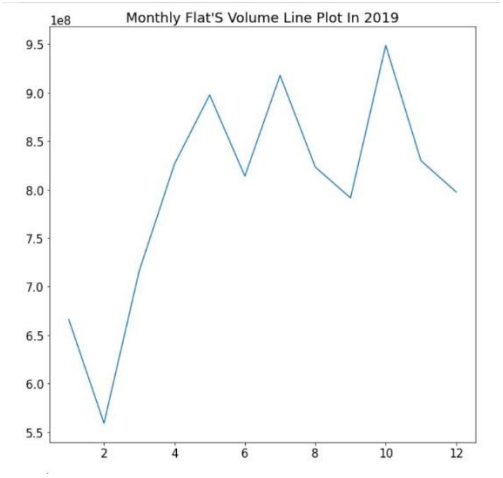


Picture 6. Flat Price (Median) in 2020 per Town (Top 5)

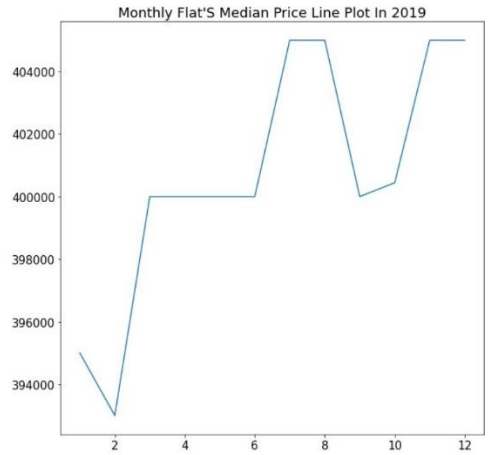
In 2020, there were 5 Towns that had the biggest number of units had been sold (**Picture 5**). The following were Sengkang (2159), Punggol (1748), Tampines (1700), Yishun (1692) and Jurong West (1439). Moreover, there were also 5 towns that sell the highest price in 2020 (**Picture 6**) : Bukit Timah (710,888 SGD), Queenstown (657,000 SGD), Bishan (600,000 SGD), Bukit Merah (580,000 SGD) and Pasir Ris (500,000 SGD).

3. Market condition in 2019

The big leap of flat's price starting in 2019 (**Picture 2**), therefor it would be captivating if we breakdown the market condition in 2019.



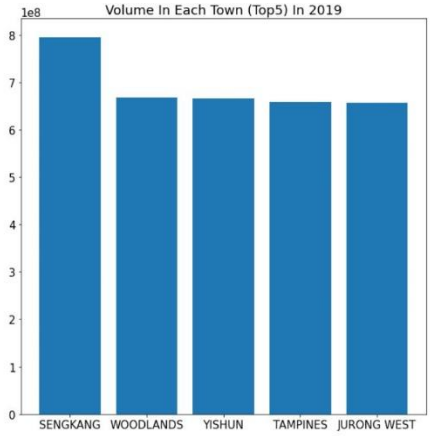
Picture 7. Resale Transaction Volume in 2019 each month



Picture 8. Median of Flat's Price in 2019 each month

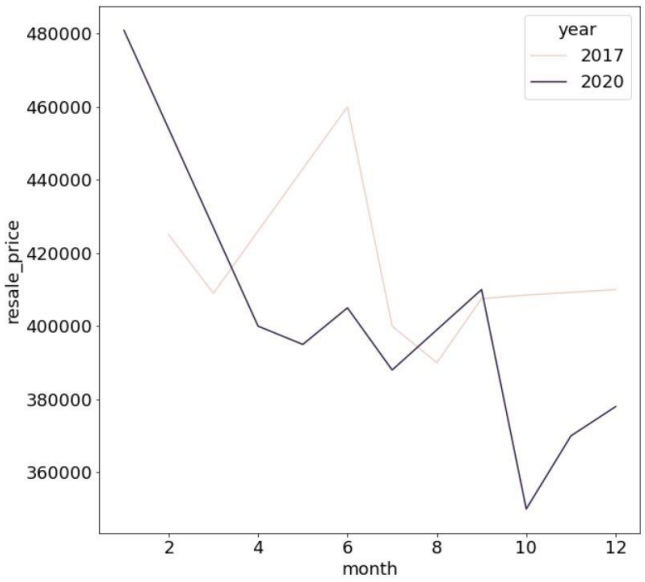
In the 2019, the resale transaction volume fluctuated every month (**Picture 7**). The lowest point in February 2019 with value 559,277,900 SGD and the highest volume in October 2019 with 948,587,200 SGD. Between Mei 2019 until December 2019 the value is always up and down. This is tend to be affected by the price is also up and down in 2019 (**Picture 8**).

There were top 5 towns observed had the highest volume in 2019. The following were Sengkang (794,518,800 SGD), Woodlands (666,748,400 SGD), Yishun (665,075,200 SGD), Tampines (657,998,800 SGD) and Jurong West (656,798,300 SGD). It is presented in **Picture 9**.



Picture 9. Resale Transaction Volume in 2019 per Town (Top 5)

4. Monthly Resale Price Trend for *3 ROOM* Flat Type in Bukit Timah Town in 2017 and 2020.



Pictures 10. Median of Flat's Price in 2017 and 2020 monthly for 3 ROOM flat type in Bukit Timah Town

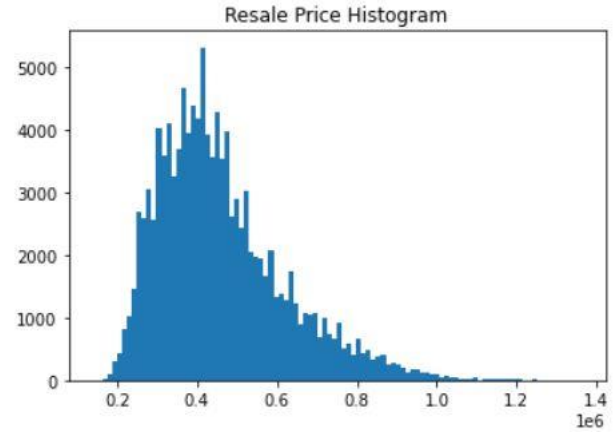
In the year of 2017 the price fluctuated every month, the highest point in June 2017 (460,000 SGD) and the lowest point in August 2017 (390,000 SGD). Overall, in 2017 the price is stagnant (not tend to decrease or increase).

On the other hand, in the year of 2020 the monthly price's trend tend to be decreasing over time. The price was getting more inexpensive. The lowest point in October 2020 with median price around (350,000 SGD) – lower than the lowest price in 2017. It was possibly influenced by the big drop of demand in April 2020 and Mei 2020 (**Picture 2**) therefor the price decrease in the interest of escalating the demand.

CLASSIFICATION PROBLEM

1. Categorize the *very affordable*, *affordable* and *not affordable*

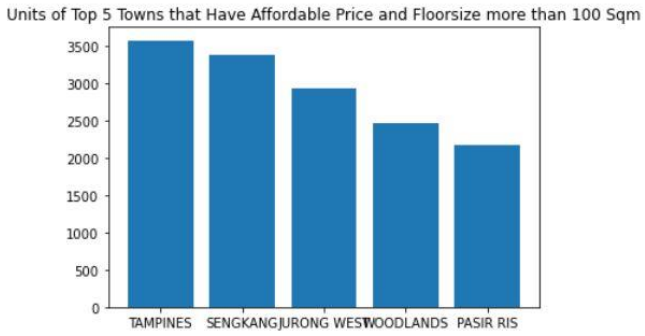
Based on **Picture 11**, The resale price histogram, the distribution is left skewed. The *cheaper* the price, the more demand.



Picture 11 Resale Price Histogram

In conclusion, we can classify the affordability in 3 classes: 1) Very Affordable (< 400,000 SGD); 2) Affordable (400,000 – 600,000 SGD) and 3) Not Affordable (>600,000 SGD)

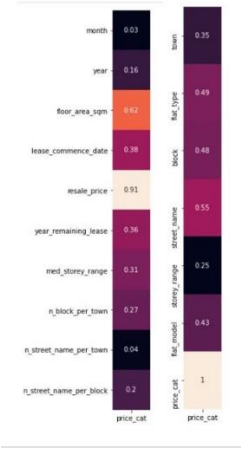
2. *Affordable* flats with floor size more than 100 sqm



Picture 12 Towns that have Affordable flat's price and floorsize > 100 sqm

After classify the price affordability, we able to see that the number one town that have the most affordable flats and have floorsize more than 100 sqm is **Tampines**.

3. Variable that associated to price affordability



Picture 13 Correlation Ratio and Association Cramers to Price affordability

Determine the association to price affordability (categorical values) can devided by two : 1) Categorical – categorical (Association cramers V) and 2) Categorical – numerical (Correlation Ratio). Between Categorical fields that have bigger Association cramers V value to price affordability field are Street name (0.55), flat type (0.49) and block (0.48). Between numerical fields that have bigger correlation ratio value to price affordability field are floor area sqm (0.62) and resale price (0.91).

4. a) Is it affordable for flat at Blk 12 TOH YI IDR, 5 ROOM type, floorsize 120 sqm and remaining lease at least 60 years ?

The simple answer is "**Not Affordable**". Based on the model that I have been created in Jupyter Notebook File (2_classification_modelling.ipynb) with Decision Tree Model, the input criteria generate a "**Not Affordable**" classification. (with assumption that the conversation at this month January 2022)

```
[130]: # make def function for translating the model result

def translate (list_input):
    y_pred = pipe_DT.predict(pd.DataFrame(data=[list_input], co
    if y_pred == 2 :
        return "Not Affordable"
    elif y_pred == 1:
        return "Affordable"
    else :
        return "Very Affordable"
```

```
[133]: print("For the condition in number 4.a the answer is "+translat

For the condition in number 4.a the answer is Not Affordable
```

5. Do you think you should go to view the flat? How confident are you with the assessment ?

In terms of the confidence, I am 90% confidence because of the recall, precission and accuracy of my model. Based on my model, it is not a requirement for me to view the flat

```
[51]: # evaluation matrix of Decision Tree base model

conf_mat(pipe_DT, X_sm, X_test, y_sm, y_test, 'DT Base')

Classification report data TEST DT Base

              precision    recall  f1-score   support

           0       0.91      0.92      0.92      9487
           1       0.88      0.88      0.88     10054
           2       0.90      0.90      0.90      4092

    accuracy                           0.90     23633
   macro avg       0.90      0.90      0.90     23633
weighted avg       0.90      0.90      0.90     23633


Confusion matrix data test DT Base


      Pred2  Pred1  Pred0
Akt2   3693    399      0
Akt1    433   8809    812
Akt0      0    792   8695
============================================================
```

REGRESSION PROBLEM

1. The same case like in Classification (Blk 12 TOH YI DR. It's a 5-room flat so the size is approximately 120 sqm), but the price is 700,000 SGD. is the price reasonable ?

month	year	town	flat_type	block	street_name	storey_range	floor_area_sqm	flat_model	lease_commence_date	resale_price
1	2019	BUKIT TIMAH	5 ROOM	12	TOH YI DR	04 TO 06	122.0	Improved	1989	750000.0
5	2019	BUKIT TIMAH	5 ROOM	12	TOH YI DR	07 TO 09	122.0	Improved	1989	768000.0
6	2021	BUKIT TIMAH	5 ROOM	12	TOH YI DR	07 TO 09	122.0	Improved	1989	889000.0

Picture 14 Price for Specific Flat

Based on the historical data, the minumum price of flats in 12 TOH YI DR with 5 ROOM type is 750,000 SGD. That price was 3 years ago. The newest data (2021) is around 889,000 SGD and every year it the price should be increase (based on trend in **Picture 2**). In conclusion, it is **unreasonable** if the price is 700,000 SGD. you should check the flat if it's necessary.

2. The Reasonable price at second half of 2021 ?

If we look to the historical data (**Picture 14**) at June, 2021, The 5 ROOM Flat's price in Blk 12 TOH YI DR is **889,000 SGD**.

Moreover, based on my model (Decision Tree) the reasonable price is a little higher around **914213.08** SGD and **965786.92** SGD

```
MAE_model_DT = comparison_EVA[[i for i in comparison_EVA.columns if "DT" in i][0]
print("The reasonable price should within the range "
      + '\033[1m'
      + str(round(translate (input_data_1)-MAE_model_DT, 2))
      + '\033[0m'
      + " SGD and "
      + '\033[1m'
      + str(round(translate (input_data_1)+MAE_model_DT, 2))
      + '\033[0m'
      + " SGD")
```

```
The reasonable price should within the range 914213.08 SGD and 965786.92 SGD
```

3. How confidence with the model ?

I am around 90% confidence with the model based on my R^2 value. The R^2 give a value 94%.

	DT Base Training	DT Base Testing
R2	9.997542e-01	9.481461e-01
MAE	3.835600e+02	2.578692e+04
MSE	6.214411e+06	1.337079e+09
RMSE	2.492872e+03	3.656610e+04

It means that my model can explained the resale price of flat 94% confidence based on the other variable. Also the minimum value that come from my model (**914213.08** SGD) to the true values (**889,000** SGD) differ **25,213.08** SGD or around **2.8%** differ from the true values.