Real Estate Analysis in Pandemic Period

1. Introduction

With the rapid growth of the real estate market, purchasing real estate become the most popular way for people to realize capital appreciation. However, the investors need to face several problems before the investment. For instance, which regions are suitable to do the investment according to their budget? Investing in which regions' property can assure their profit? And the most concerned question during the current epidemic period is how the epidemic affecting the real estate market.

In this project, we focused on the real estate data for 500 regions in Victoria to analyse the changes in apartment's price from 2020 to 2021. In the following report, we will first present how we narrow down 500 regions step by step according to investor requirements. Then, we will show our analysis among the filtered regions' data and how it can be used to help the investor to make a wise investment.

2. Data information

> Disclaimer: The scraping is for once-off data analytics only, we would not use it as a recurring script to get domain data.

In this particular project, we retrieved our origin data from Domain. Domain is a platform that people can rent, buy and view sold properties in Australia. We extracted following twelve features for our further analysis.

1. Id: a unique id for properties in Domain.
2. Address: the properties' address
3. suburb: the name of the regions that properties located in
4. Type: the type of the properties. Since house and apartment are the mainstream in real estate, we will focus on house and apartment/unit/flat in analyse.
5. Sold By: in which way the property has been sold.
6. Sold date: date of the property has been sold in the format year-month-date
7. Price: property sold price
8. Beds: Number of beds in the properties
9. Baths: Number of baths in the properties
10. Parking: Number of parking place in the properties.
11. Size: the size of the properties.
12. Distance: the distance between the suburb and the Melbourne center. (Calculated with the geographic location data from: https://github.com/michalsn/australian-suburbs (https://github.com/michalsn/australian-suburbs))

The following figure shows the apartment sold count among 500 suburbs in Vicotria. The sales volume in the region is represented by the shade of colour. The deeper the colour is, the higher the sales volume is.
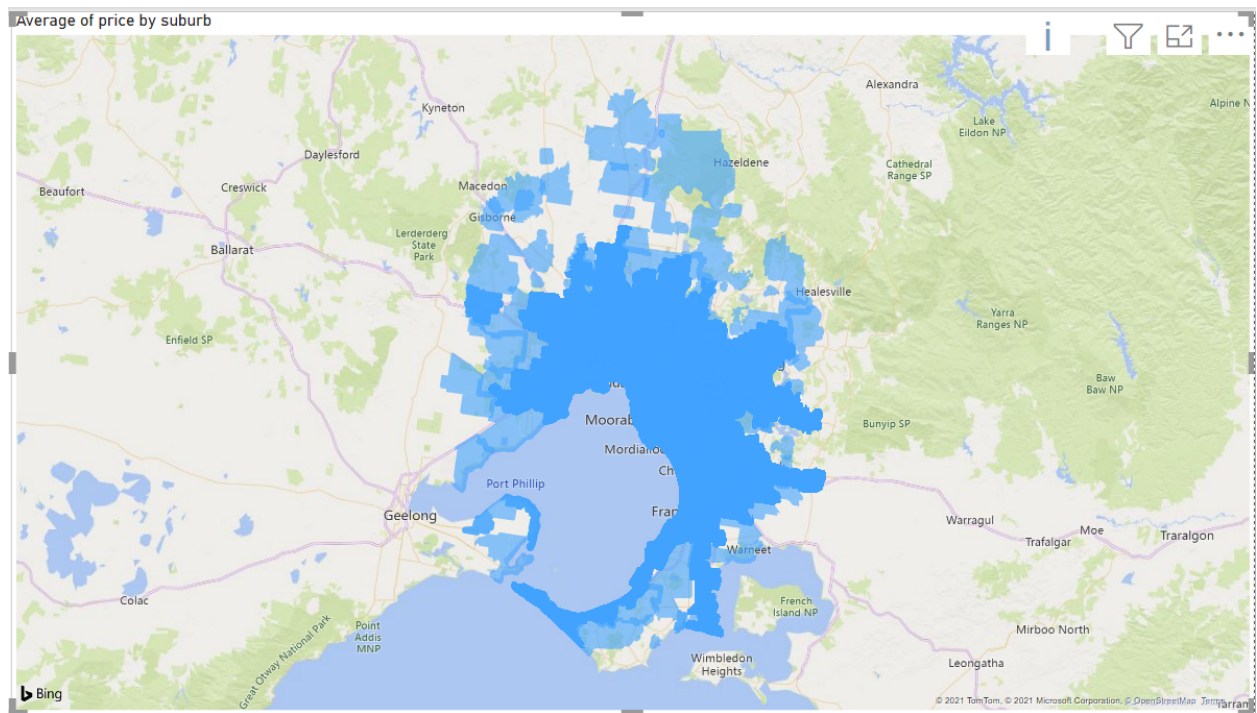
Figure 1: apartment sold count

In [1]:

```python
''' Set up environment '''
import pandas as pd
import warnings
warnings.filterwarnings('ignore')
```

Following table presents 10 sampled data that discribed above.

```
pd.read_csv('../data/sold_vic_500_regions.csv')
```

Out[8]:

	id	address	suburb	type	sold_By	sold_Date	price
0	2016970888	384 Johnston StreetABBOTSFORD VIC 3067	abbotsford-vic-3067	House	Sold at auction	2021-05-22	1010000
1	2016970804	9/18 Nicholson StreetABBOTSFORD VIC 3067	abbotsford-vic-3067	Apartment / Unit / Flat	Sold prior to auction	2021-05-19	535000
2	2016950168	1/30 Abbotsford StreetABBOTSFORD VIC 3067	abbotsford-vic-3067	Apartment / Unit / Flat	Sold at auction	2021-05-15	476000
3	2016941525	610/88 Trenerry CrescentABBOTSFORD VIC 3067	abbotsford-vic-3067	Apartment / Unit / Flat	Sold prior to auction	2021-05-13	750000
4	2016765516	E601/11 Flockhart StreetABBOTSFORD VIC 3067	abbotsford-vic-3067	Apartment / Unit / Flat	Sold by private treaty	2021-05-13	458000
...	...	...	...	...	...	...	...
350316	2016303260	3 Tamarack StreetKALKALLO VIC 3064	yuroke-vic-3063	House	Sold by private treaty	2020-12-29	700000
350317	2016483713	30 Greaves CrescentKALKALLO VIC 3064	yuroke-vic-3063	Vacant land	Sold by private treaty	2020-12-29	351000
350318	2016713582	19 Cardamon AvenueMICKLEHAM VIC 3064	yuroke-vic-3063	House	Sold by private treaty	2020-12-29	615000
350319	2016435569	6 Oresund StreetCRAIGIEBURN VIC 3064	yuroke-vic-3063	Vacant land	Sold by private treaty	2020-12-28	493000
350320	2016605366	43 Serendip CrescentGREENVALE VIC 3059	yuroke-vic-3063	House	Sold by private treaty	2020-12-28	790000

350321 rows × 12 columns

3. Tools used in project

1. Docker: set up the jupyter and postgres environment
2. Jupyter: used to create readable analysis with code, images, and comments.
3. GitHub: a version control and collaboration tool that we can share our documents and work with others.
4. Data Grip: A database management environment for developers.

4. Target Audience

An individual investor who wants to buy an apartment with 2 bed rooms for capital growth with A$800,000 budget. The main obejctive of this analytics project is to provide as much information as we can to support his decision making on where to invest.

5. Data Analysis - Apartments in Victoria

5.1 Apartments affordability in Victoria

According to the apartments' price as of May 2021 in each suburb, with the budget of our target audience(800,000), there are 108 regions out of 500 where he can afford at least 20% of apartments on the market. We also filtered out regions with too few options for the investor (less than 3 properties).

In [7]:

```
pd.read_csv("../data/affordability_suburbs.csv").head(5)
```

Out[7]:

	in_apartment	sold_apartment	percentage	suburb
0	8	8	100	brunswick-west-vic-3055
1	3	3	100	hadfield-vic-3046
2	3	3	100	seabrook-vic-3028
3	4	4	100	bundoora-vic-3083
4	5	5	100	footscray-vic-3011

5.2 Risk Management 1

In the risk analysis, we find out the month that apartments' price most affected by the Covid-19 in 2020. Then, we compare the average price of apartments in that month with the latest month (May 2021) involved in the dataset to see how the price changed.

5.2.1 Find the most affected month by Covid-19

The picture below shows average prices of apartments from January 2020 to December 2020 in all regions. It can be seen from the graph that the apartments' price dropped rapidly in January and May 2020 and reached the bottom in September 2020. Based on the graph, we can conclude that in September 2020, the negative effect of the epidemic on the apartments' price is the most significant.
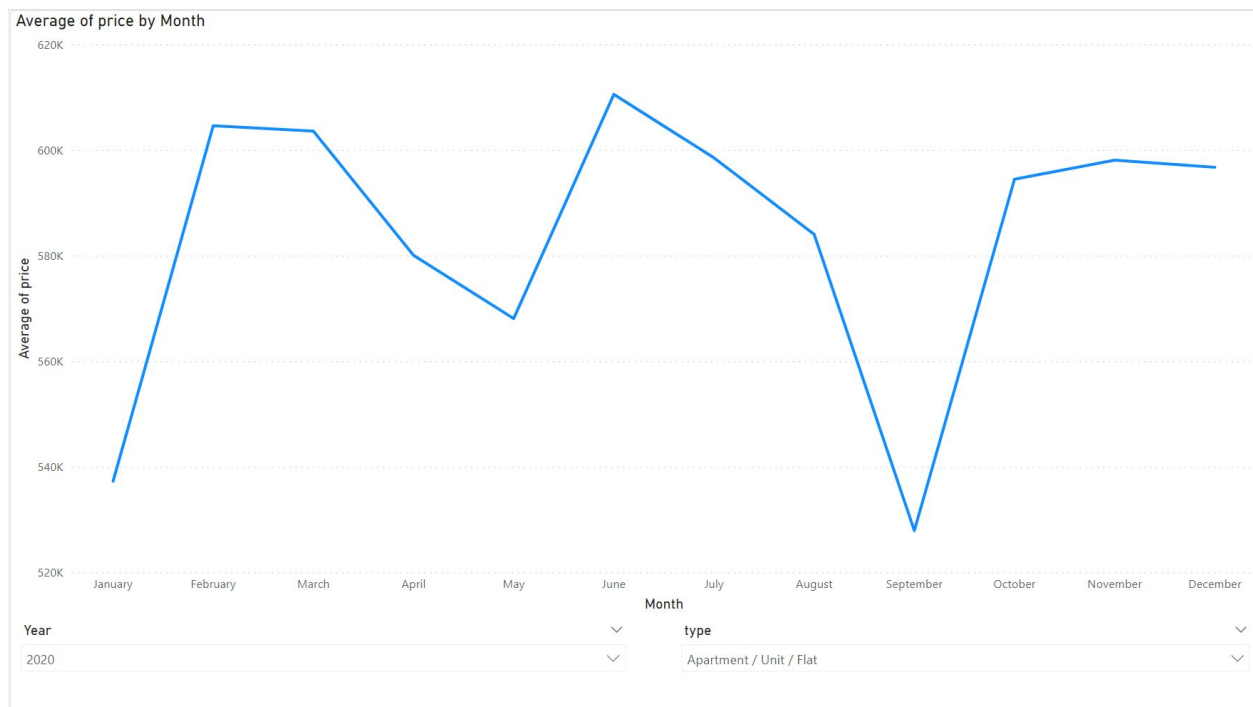
Figure 2: Average price of apartments in 2020

5.2.2 Compare the average price in September 2020 and May 2021

Except for the areas with no transactions in September 2020, the figure below shows the change of the apartments' average price in 26 areas in May 2021 compared with September 2020. It can be seen from the histogram that 15.4% (4 out of 26)of the regions have a growth rate of more than 40%, 34.6% (9 out of 26) of the regions have more than 50%, and only 11.5% (3 out of 26) of the regions have a decline rate. Overall, the real estate market in most suburbs is recovered from the epidemic while some suburbs are still recovering.
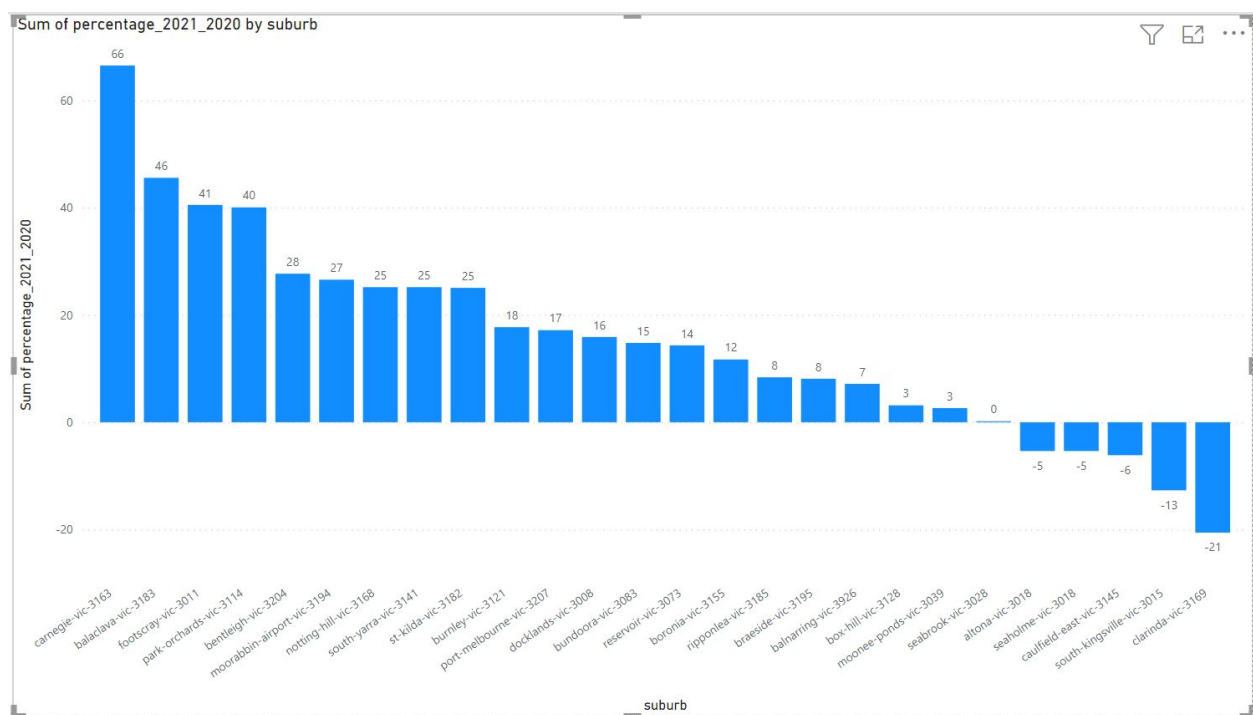

Figure 3: Average Price Change Rate

According to the current analysis, the investor can focus on regions with the highest growth rates where these regions can quickly recover from the impact of the epidemic. However, investors can also choose regions with

the lowest growth rate if they believe the price of these regions has the potential to increase in the future. In the next section, we will go further in risk analysis based on two situations.

5.3 - Risk Management 2

In this section, we will see growth rate of the apartments' average price month on month from September 2020 to May 2021.

In [4]:

```
pd.read_csv('../data/risk_management_results2.csv').head()
```

Out[4]:

	suburb	former_year_month	former_year_month.1	latter_year_month	latter_avg_price	month
0	altona-vic-3018	2020-09	640000.00	2020-10	601714.29	2
1	altona-vic-3018	2020-10	601714.29	2020-11	581428.57	2
2	altona-vic-3018	2020-11	581428.57	2020-12	546875.00	2
3	altona-vic-3018	2020-12	546875.00	2021-01	535000.00	2
4	altona-vic-3018	2021-01	535000.00	2021-02	650250.00	2

Except for the month that no sales volume, the table above presents the change of the apartments' average price in regions month on month over the period from September 2020 to May 2021.
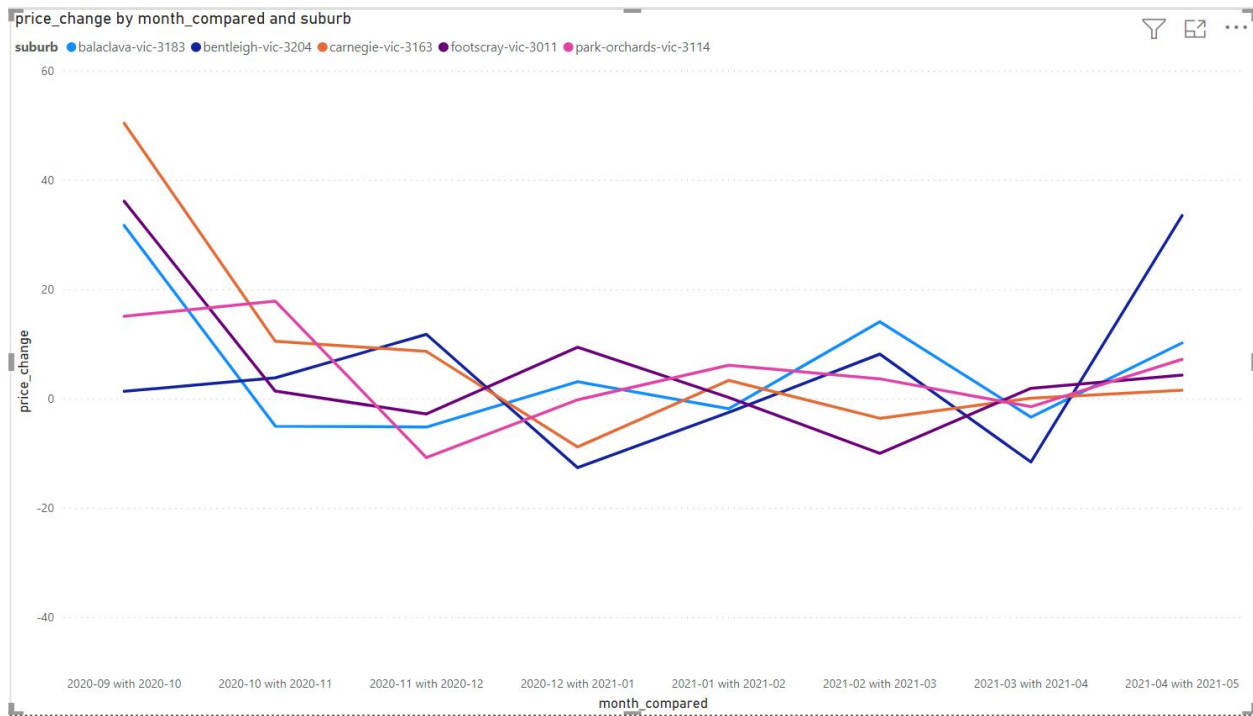
Figure 4: Price Change Rate for top 5 regions

In figure 4, the x-axis indicates months while the y-axis presents the price change month on month. As seen from the line chart, in Carnegie VIC, Footscray VIC, and Balaclava VIC, the change rate decreases in the period 09/2020 to 11/2020. Especially in Balaclava VIC, the change rate drops from 31.67% to -5.03%. As for other regions, the growth rate less than 10%. From 11/2020 to 03/2021, the change rate becomes stable. Although it increases in some regions and decrease in other regions, the change rate keeps in the range of 20% to -20%. From 03/2021 t0 05/2021, the change rate keep increases especially in Bentleigh VIC, the price increased 33.49% in 05/2021 compare with 04/2021. From the graph, we can tell that the real estate market in 5 regions is recovered from the epidemic.

In general, for the investor who looking for a growth rate at apartments' price, these regions can be their priority. However, investors should think twice if they choose to buy an apartment in Bentleigh VIC. Considering the price decreased 11.61% and then increased to 33.49% from 03/2021 to 05/2021, the same situation may happen after May.
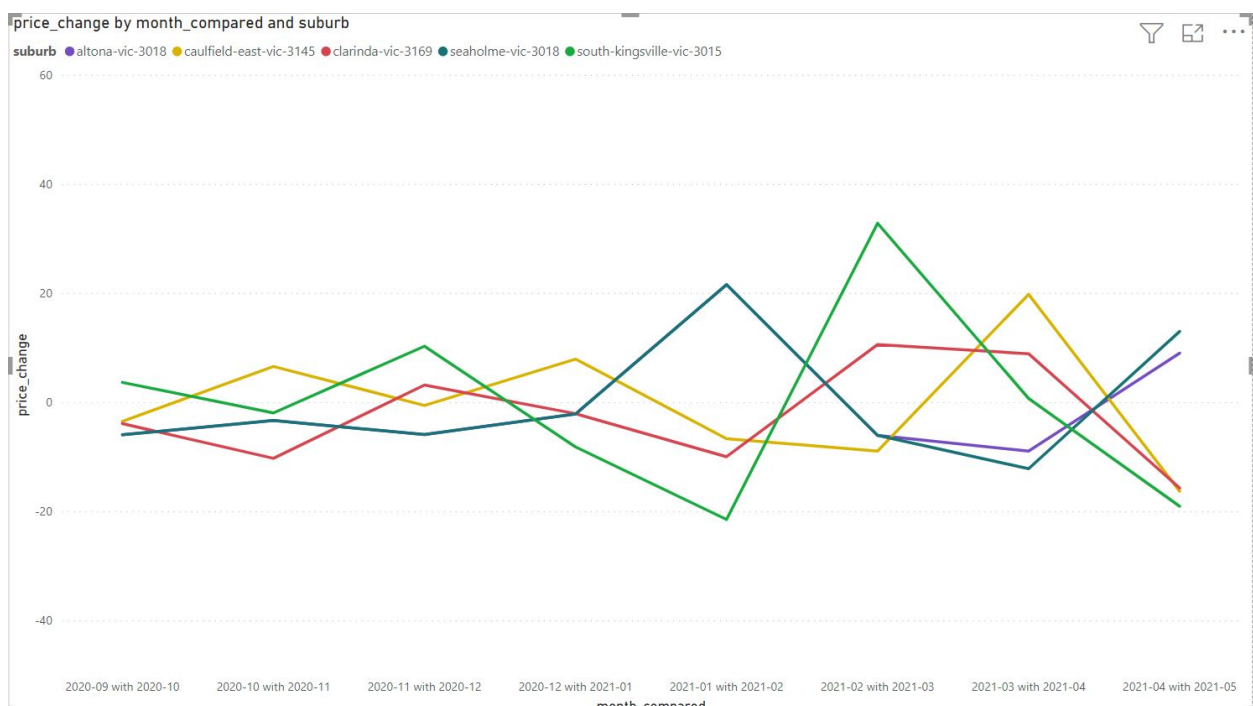
Figure 5: Price Change Rate for bottom 5 regions

Similar to figure 4, figure 5 shows the average price change rate in the bottom 5 regions in figure 3. Over the period from 09/2020 to 12/2020, the average price change rate remained level in the range from 10% to -10%. Then, the change rate becomes unstable. As can be seen from the graph, the largest growth rate up to 32.79% and the lowest decline rate up to -21.50. The line chart depicts that the real estate market in these regions still in the recovery period.

For the investor, Altona and South Kingsville could be their first choice because the average price increased in 05/2021 compared with 04/2021. However, investors can also choose to buy an apartment in the other three regions, if they believe the apartments' price has the potential to increase in the future.

5.4 - More information about each regions

In this section, we show more information about each region, such as the average price of apartments in regions in 2020, the distance to the city. We hope those information helps the investor in decision making on where to invest.

5.4.1 - Average price in each regions in 2020

In the following figure, we use a heat matrix to represent the average price of apartments in that region from 09/2020 to 12/2020.In the matrix, the deeper the colour, the higher the price.

The upper matrix represents the top 5 regions in figure 3. From the table, we can tell that the apartment price of balaclava, Bentleigh and Carnegie are higher than others. The investor could choose these regions.

As for the lower matrix, it represents the bottom 5 regions in figure 3. As we can see that the price of the apartment is higher in the period from September to December than the price in January to May. If the investor wants to buy an apartment in these regions, it would be better to buy it in the period of January to May because the price is lower than in other months.

suburb	September	October	November	December
balaclava-vic-3183	520625.00	685490.38	651020.80	617122.75
bentleigh-vic-3204	580000.00	587666.67	610000.00	681666.67
carnegie-vic-3163	393750.00	592125.00	654230.77	710637.50
footscray-vic-3011	350000.00	476333.33	482807.27	469222.22
park-orchards-vic-3114	442500.00	509100.00	599857.14	535000.00

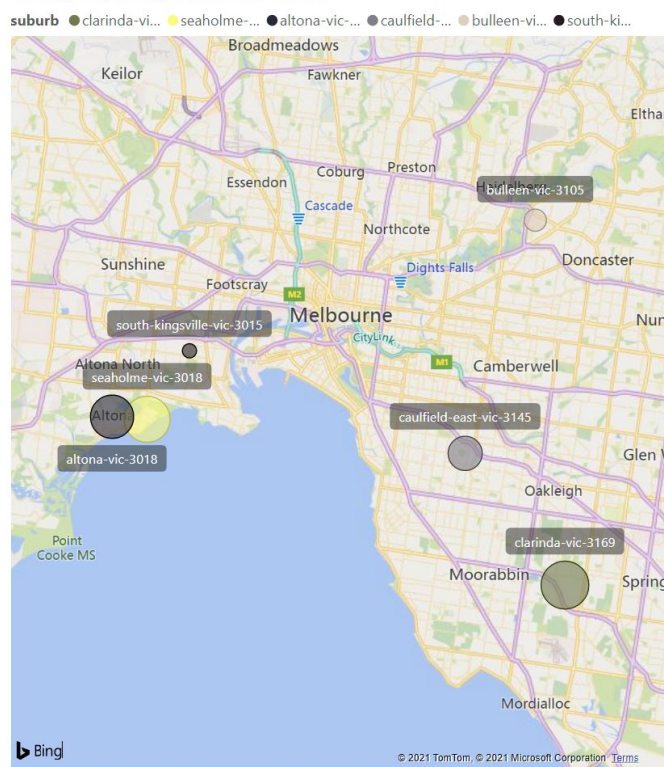| suburb	January	February	March	April	May
balaclava-vic-3183	636178.57	624319.98	712044.08	687907.41	757833.33
bentleigh-vic-3204	595500.00	580375.00	627638.89	554800.00	740583.33
carnegie-vic-3163	647750.00	669333.33	645181.82	645666.67	655571.43
footscray-vic-3011	513333.33	514333.33	462785.71	471500.00	491800.00
park-orchards-vic-3114	533788.89	566375.00	586900.10	578230.77	619727.27

suburb	September	October	November	December
altona-vic-3018	640000.00	601714.29	581428.57	546875.00
caulfield-east-vic-3145	640000.00	617500.00	657876.06	653916.36
clarinda-vic-3169	543000.00	521666.67	467954.55	482666.67
seaholme-vic-3018	640000.00	601714.29	581428.57	546875.00
south-kingsville-vic-3015	570000.00	590640.00	579000.00	638333.33

| suburb	January	February	March	April	May
altona-vic-3018	535000.00	650250.00	610666.67	555800.00	605714.29
caulfield-east-vic-3145	705590.91	658357.14	599399.93	717815.79	600678.57
clarinda-vic-3169	472500.00	425249.75	470137.50	511875.00	431300.00
seaholme-vic-3018	535000.00	650250.00	610666.67	536166.67	605714.29
south-kingsville-vic-3015	586000.00	460000.00	610833.33	615000.00	497666.67

5.4.2 - Location and max growth rate in each regions

The following maps show the location of the top 5 and bottom 5 regions and their relative distance to the city. It also indicates the relative average price in 5/May through the size of the circle. The larger the circle is, the higher the average price. The left figure shows the bottom 5 regions, we can see clearly that region- South Kingsville, Seaholme and Altona are closer to the city compare with others. On the right, except for Park Orchards far from the city, other regions are good choices if the investor would like to buy an apartment near the city.

Average of price by suburb and suburb
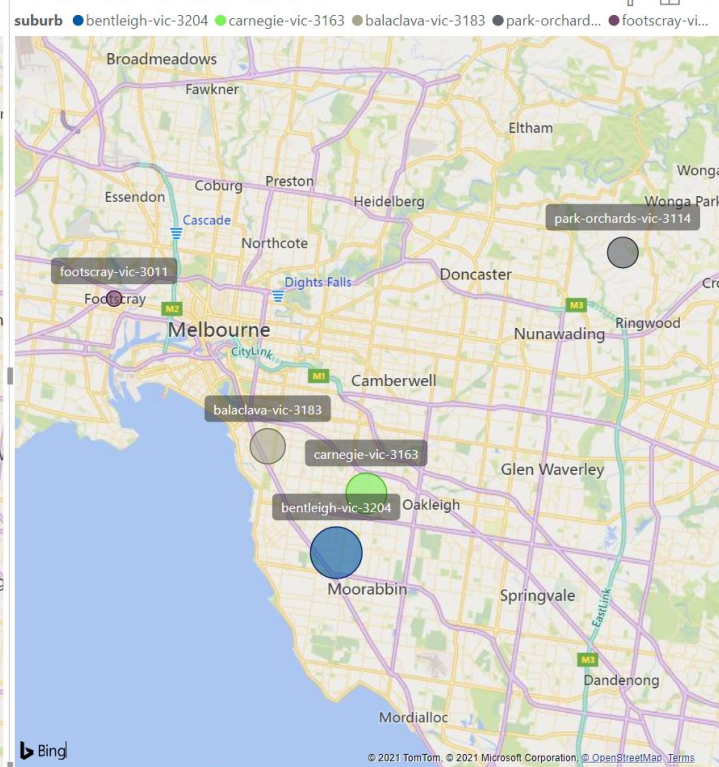
6. Summary

The table below represents a summary of all the information we analysed above. Following are the details of features in the table:

1. suburb: name of each suburbs
2. distance: distance between suburbs to Melbourne. The table order by ascending distance.
3. affordability: Based on the apartments' price as of May 2021 in each region, this column shows the number of apartments that the investor can afford (around 800,000)versus the total number of apartments in the regions. The results represents in percentage.
4. avg_price: It shows the average price of the apartments in May 2021 in each region.
5. percentage_2021_2020: It represents the change rate (percentage) of apartments' average price in May 2021 compared with the month(September 2020) that the price of apartments is the most significant by the epidemic.
6. min_price_change_rate: The minimum price change rate month on month over the period from September 2020 to May 2021.
7. max_price_change_rate: The maximum price change rate month on month over the period from September 2020 to May 2021.

In [5]:
```python
pd.read_csv('../data/Result_conclusion.csv')
```

Out[5]:

	suburb	distance	affordability	avg_price	price_change_rate_may	max_price_change_rate
0	south-yarra-vic-3141	2.4269	29	827604.17	25.18	28.5
1	st-kilda-vic-3182	3.5319	44	597260.00	25.05	22.3
2	docklands-vic-3008	3.8201	58	698000.00	15.89	9.8
3	balaclava-vic-3183	4.7223	39	686426.83	45.56	31.6
4	burnley-vic-3121	5.1016	44	735990.38	17.72	15.6
5	ripponlea-vic-3185	5.3513	36	782806.82	8.38	15.1
6	port-melbourne-vic-3207	5.3790	20	862433.33	17.16	216.8
7	moonee-ponds-vic-3039	8.0620	100	572200.00	2.64	16.7
8	footscray-vic-3011	8.5273	100	491800.00	40.51	36.1
9	caulfield-east-vic-3145	9.2616	57	597500.00	-6.14	19.7
10	reservoir-vic-3073	11.1448	59	614956.41	14.33	29.9
11	carnegie-vic-3163	11.1858	38	742230.77	66.49	50.3
12	south-kingsville-vic-3015	11.3157	75	486625.00	-12.69	32.7
13	bentleigh-vic-3204	11.3525	50	848250.00	27.69	33.4
14	seaholme-vic-3018	14.5179	70	663250.00	-5.36	21.5
15	bundoora-vic-3083	15.3624	100	444250.00	14.79	38.5
16	altona-vic-3018	16.8866	77	648055.56	-5.36	21.5
17	box-hill-vic-3128	17.2170	77	479944.44	3.15	43.4
18	clarinda-vic-3169	18.3095	45	673318.18	-20.57	10.5
19	moorabbin-airport-vic-3194	19.7251	62	735046.88	26.57	14.4

	suburb	distance	affordability	avg_price	price_change_rate_may	max_price_change_rate
20	notting-hill-vic-3168	20.1047	25	865199.00	25.18	407.64
21	braeside-vic-3195	23.2256	58	737041.67	8.11	23.54
22	seabrook-vic-3028	24.1082	100	440333.33	0.08	12.59
23	park-orchards-vic-3114	27.3047	84	641307.69	40.05	17.83
24	boronia-vic-3155	34.8594	21	669785.71	11.70	11.92
25	balnarring-vic-3926	51.4638	55	494644.44	7.16	29.22

In summary, we analyze the price of apartments in each region to help the investor decide where to buy an apartment for capital growth with an 800 thousand budget. We successfully narrow 500 regions down to 10 regions based on the analysis result. The investor can choose regions according to their preference in 10 regions. Considering, regions population, distance to school, renter/owner percentage or other aspects, if the investor is not satisfied with those 10 regions, he/she can choose regions from 32 regions according to the summary table above.

7. Conclusion

In this project, we first filter out regions that the investor cannot afford and regions with too few options. From it, the investor can decide where to buy the apartment from 108 instead of 500 regions. Then, we consider the recovery ability of the real estate market in that region in the effect of the epidemic. We first find out the negative effect of the epidemic on the apartments' price is the most significant in 09/2020. Then, we consider the growth and decline rate of the apartments' price in 5/2021 compare with 9/2020. Except for regions with no sales volumes, we successfully narrow 108 regions into 26 regions. Next, by considering the price change month on month in regions that have the largest growth and decline rate in 26 regions, we show investor which regions are more suitable for investment compare with others.

In conclusion, by considering questions - which regions the investor can afford, which regions' property price is increasing and which regions have a minimum impact by the epidemic, we successfully narrow 500 regions into 10 regions. And we also provide properties information in other regions, which gives investor more option when they consider regions population, distance to school, renter/owner percentage or other aspects