

Behaviour of residential construction and real estate markets in W.A. during Covid-19 Crisis - slides

Team: 'Kalbarri Sun'

Team members

- Lauren Prins
- Daniel Sobral
- Warren Villarosa
- Sylvia Broadbent

+Behaviour of residential construction and real estate markets in W.A. during Covid-19 Crisis - report
Github link: <https://github.com/Supasyl/Data-Analytics-Project-1.git>

Summary

Hypothesis

Considering the information we keep receiving from the government and media, it seems that the whole world has been affected by COVID-19. We are looking at various factors of the residential real estate and construction market in WA to see if it has really been affected.

Questions

We asked ourselves what areas we can look into to get a diversified look at the residential real estate market as that is an area of shared interest in our team. We have narrowed it down to property sales, building permits issued and their value and the first home owner grant in relation to dwellings, townhouses and apartments.

We then looked further into the behaviour of the stock value of the 10 largest property groups in WA.

Available timeframe

We based our timeframe for the research on the dataset with the most limited data. This turned out to be the real estate information as most of that information requires payment. We started from the last quarter of the year in 2018 to the second quarter this year.

Covid-19 period

In WA the regional travel ban started on 31 March so we have used the second quarter of 2020 as the 'COVID-19' quarter to compare against.

Stock market - Daniel Sobral

Question: How was the Share Market impacted from Q4 2018 to Q2 2020?

To do so we will look at the top 10 companies with highest market capitalisation in the property sector.

Data: Extracted Share prices and traded volume data from the last 5 years using Bloomberg API available on RapidAPI.

Cleanup & exploration:

Dump Bloomberg extracted data into json format.

Pandas tables manipulation to create separate tables to analyse volume traded and share price change.

Convert information into Quarters and Months for future analysis.

Analyse the mean of those data sets.

Table 1 - Share Price % change

	GMG	SCG	DXS	SGP	MGR	LLC	GPT	VXS	CHC	GOZ	Avg (%) Change
Quarter											
2018Q4	2.33%	-6.94%	3.16%	-4.64%	-4.88%	-11.34%	3.93%	-0.72%	5.30%	-2.59%	-1.64%
2019Q1	22.06%	-1.20%	14.88%	-5.60%	17.52%	-24.08%	11.89%	-3.99%	36.03%	9.21%	7.67%
2019Q2	12.62%	-3.65%	7.06%	15.72%	16.73%	0.92%	0.97%	1.13%	12.17%	4.82%	6.85%
2019Q3	6.56%	4.29%	1.91%	4.68%	3.74%	24.79%	3.51%	0.37%	9.81%	2.76%	6.24%
2019Q4	-7.78%	-3.63%	-12.01%	7.45%	1.20%	9.57%	-2.62%	0.00%	-6.40%	-1.57%	-1.58%
2020Q1	10.93%	1.26%	8.18%	5.35%	3.26%	-1.53%	-1.27%	-4.83%	17.15%	0.91%	3.94%
2020Q2	-6.51%	-37.72%	-24.04%	-25.56%	-28.45%	-32.31%	-28.37%	-32.03%	-27.18%	-22.97%	-26.51%
2020Q3	19.78%	-9.56%	-5.87%	-1.52%	-8.03%	-2.68%	-1.34%	-16.67%	23.86%	0.58%	-0.14%
2020Q4	3.80%	1.32%	-2.33%	5.13%	-1.31%	-0.63%	-4.99%	-1.38%	7.35%	1.16%	0.81%

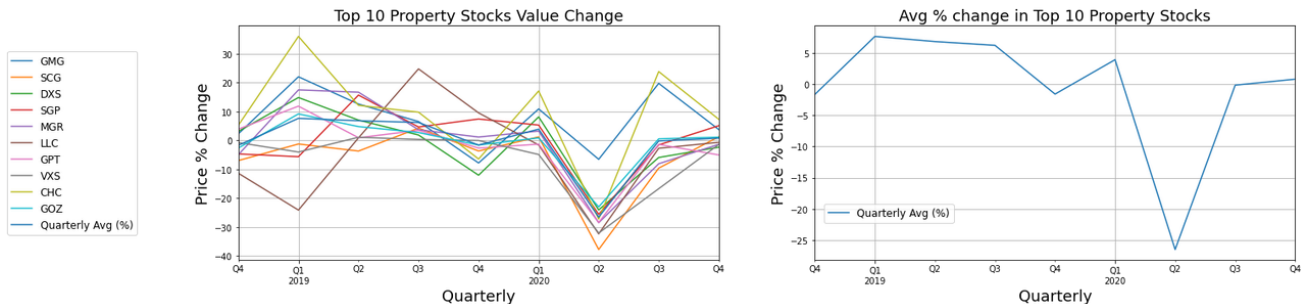
Table 2 - Trade Volume % Change

	GMG Vol	SCG Vol	DXS Vol	SGP Vol	MGR Vol	LLC Vol	GPT Vol	VXS Vol	CHC Vol	GOZ Vol	Avg Vol (%) Change
Quarter											
2018Q4	12.94%	15.40%	30.89%	32.31%	40.78%	405.66%	18.34%	25.13%	65.31%	-9.43%	63.73%
2019Q1	74.95%	2.50%	13.50%	12.77%	-20.03%	-43.93%	-20.04%	37.30%	-13.79%	28.82%	7.21%
2019Q2	-54.91%	45.26%	20.81%	52.15%	49.15%	-36.48%	85.35%	-9.20%	18.19%	-2.08%	16.82%
2019Q3	379.43%	-11.37%	-34.90%	-28.95%	-34.03%	66.04%	-28.70%	-34.84%	43.78%	33.84%	35.03%
2019Q4	-74.88%	133.76%	4.35%	-23.63%	-4.92%	-47.50%	-14.90%	-9.85%	-36.93%	12.91%	-6.16%
2020Q1	125.26%	9.23%	123.99%	173.58%	153.32%	40.26%	101.78%	201.02%	127.95%	79.87%	113.63%
2020Q2	-46.30%	-28.57%	-16.06%	-24.25%	-29.95%	37.62%	-5.50%	52.47%	-38.81%	-27.11%	-12.64%
2020Q3	-15.24%	-13.10%	-40.55%	-37.36%	-23.71%	-54.17%	-45.22%	-49.28%	-40.67%	-31.30%	-35.06%
2020Q4	-37.56%	-50.23%	-33.40%	-24.22%	-24.56%	-25.70%	-24.27%	-33.12%	-32.08%	-48.46%	-33.36%

Analysis:

To visualise our data we decided to plot line charts as they express strong changes during the Covid-19 Out Break

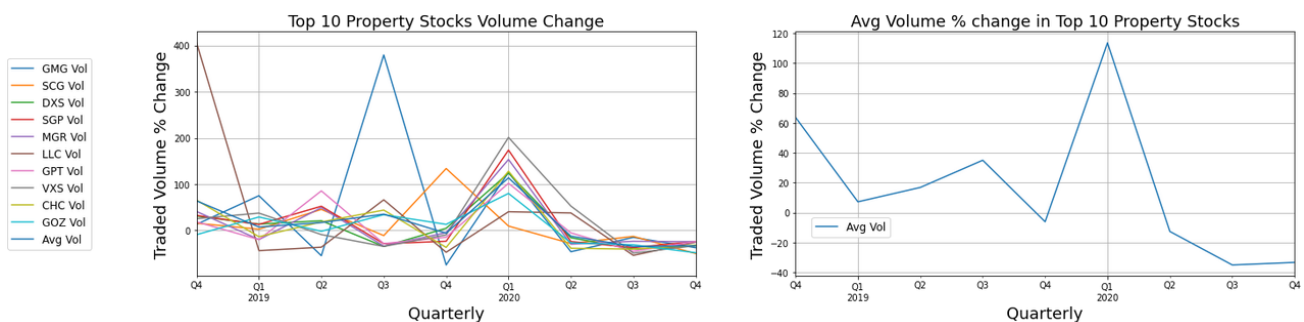
Figure 1 - % Change in Share Value



Share Price Analysis

- From start of 2020 the Top 10 Property stocks display closer price movements,
- Leading to end of Q2 2020 (covid outbreak and subsequent lockdown) measures all shares dropped.
- Followed by a V-shape recovery until end of Q3 of 2020.
- GMG stands has the biggest realestate company with 3 times the market cap of the second largest.
- The Average Price Movement will allow us to compare the stock market behaviour with other macroeconomic variables.

Figure 2 - % change in Traded Value



Volume as a Liquidity indicator:

- GMG displays a more independent behaviour with an individual spike of liquidity leading to 2020 Q3.
- Spike in volume traded in the beginning of 2020(pre-covid) - Followed of a massive drop heading to end of Q2 2020(post-covid).

Overall Conclusion:

- Shares Value and Volume traded dropped after March.
- Although prices saw a recovery the % change in traded volume kept negative.

- Despite the recovery in the value these stocks, they now offer significantly less liquidity than they did pre-covid.

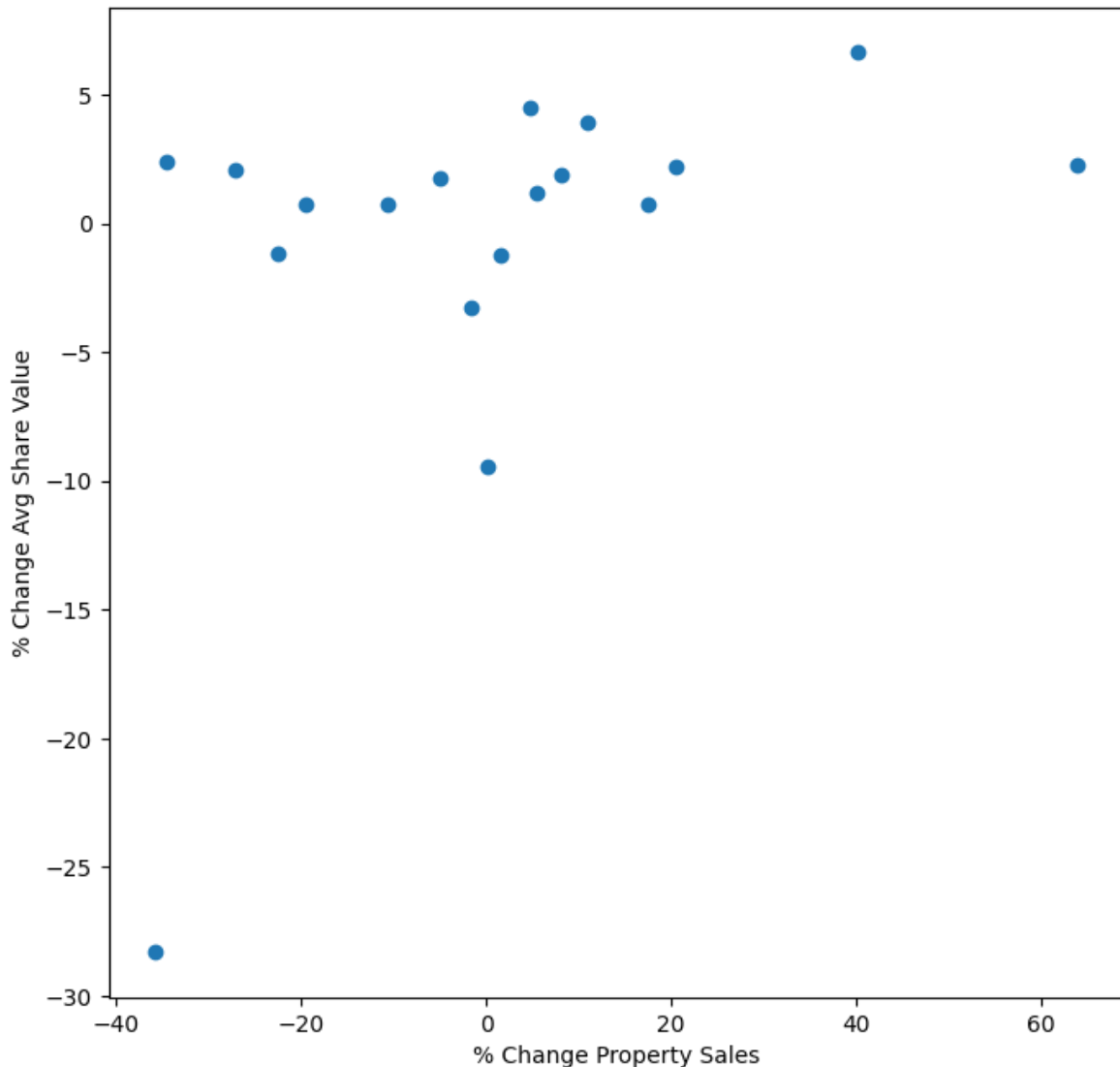
Correlation:

How does the Share Market Relates to National Real Estate Sales
Analysing behaviour and correlation

Table 3 - Change in Property Sales Vs Share Value Change

	Year	Month	Sales	Monthly Avg (%)
1	2018	11	1.58%	-1.23%
2	2018	12	-19.42%	0.72%
3	2019	1	-27.19%	2.06%
4	2019	2	40.16%	6.66%
5	2019	3	20.53%	2.20%
6	2019	4	-10.62%	0.73%
7	2019	5	11.05%	3.92%
8	2019	6	-4.94%	1.74%
9	2019	7	4.80%	4.50%
10	2019	8	5.47%	1.19%
11	2019	9	-1.53%	-3.24%
12	2019	10	17.47%	0.73%
13	2019	11	8.06%	1.92%
14	2019	12	-22.54%	-1.19%
15	2020	1	-34.51%	2.40%
16	2020	2	63.99%	2.28%
17	2020	3	0.17%	-9.46%
18	2020	4	-35.84%	-28.31%

Figure 3 - Scatter Plot - Change in Property Sales vs Share Value Change



Our Scatter Plot Shows that Share price value variation presented some stability when compared with the variation in Property Sales.

We can notice a clear exception when both variables revealed a record drop.

As we've seen previously this drop relates to the beginning of Q2 2020.

Both Variables exceeded the necessary p-value to be considered normal distribution so we cannot run a linear regression and evaluate a degree of correlation.

Real estate - Warren Villarosa

Question:

What was the effect of Covid 19 and the resulting lockdown as well as market sentiment on Real Estate Sale Volume and House Prices.

Data:

The dataset used was a CSV file from Kaggle that included sales information from late 2018 till mid 2020. Each row was a sales entry that included date, price, suburb, property type and the coordinates for the suburb.

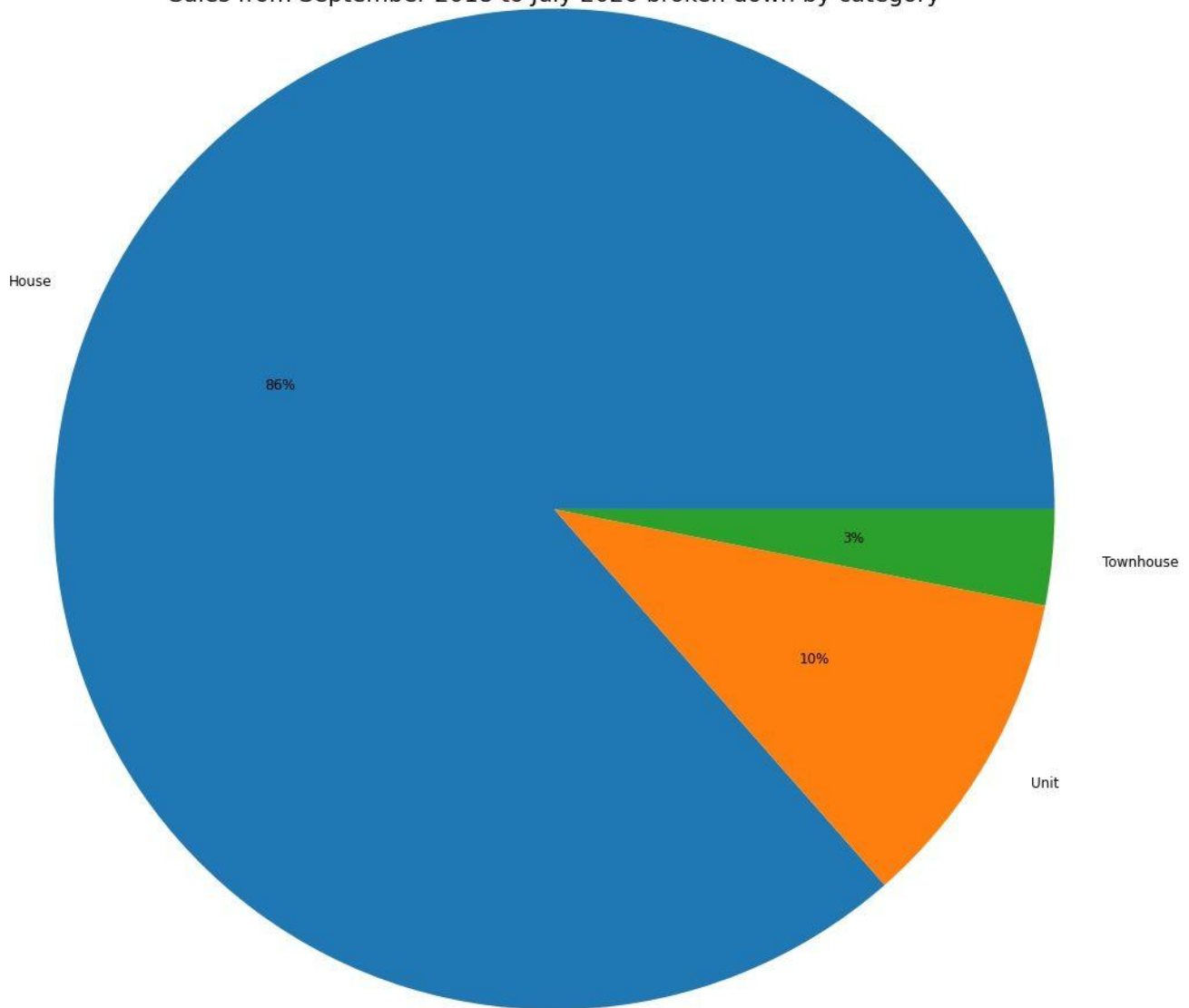
Cleanup & exploration:

- Imported into CSV Jupyter as a Dataframe using Pandas
- The null values were predominantly in the sales price column
- Date information was in string format so that was converted to datetime
- Created columns for year, quarter and month to allow for easier sorting with groupby.
- Summarised national sales and packaged into a CSV for Daniel
- Limited dataset to Western Australia
- Created identical sets of data grouping by quarter and month - Settled on month for the extra data points

Analysis & Observations

Figure 1 - The Share of total real estate sales over the time frame examined.

Sales from September 2018 to July 2020 broken down by category



Share of total volume by Property Type.

Question:

How is the total volume of sales distributed across property types?

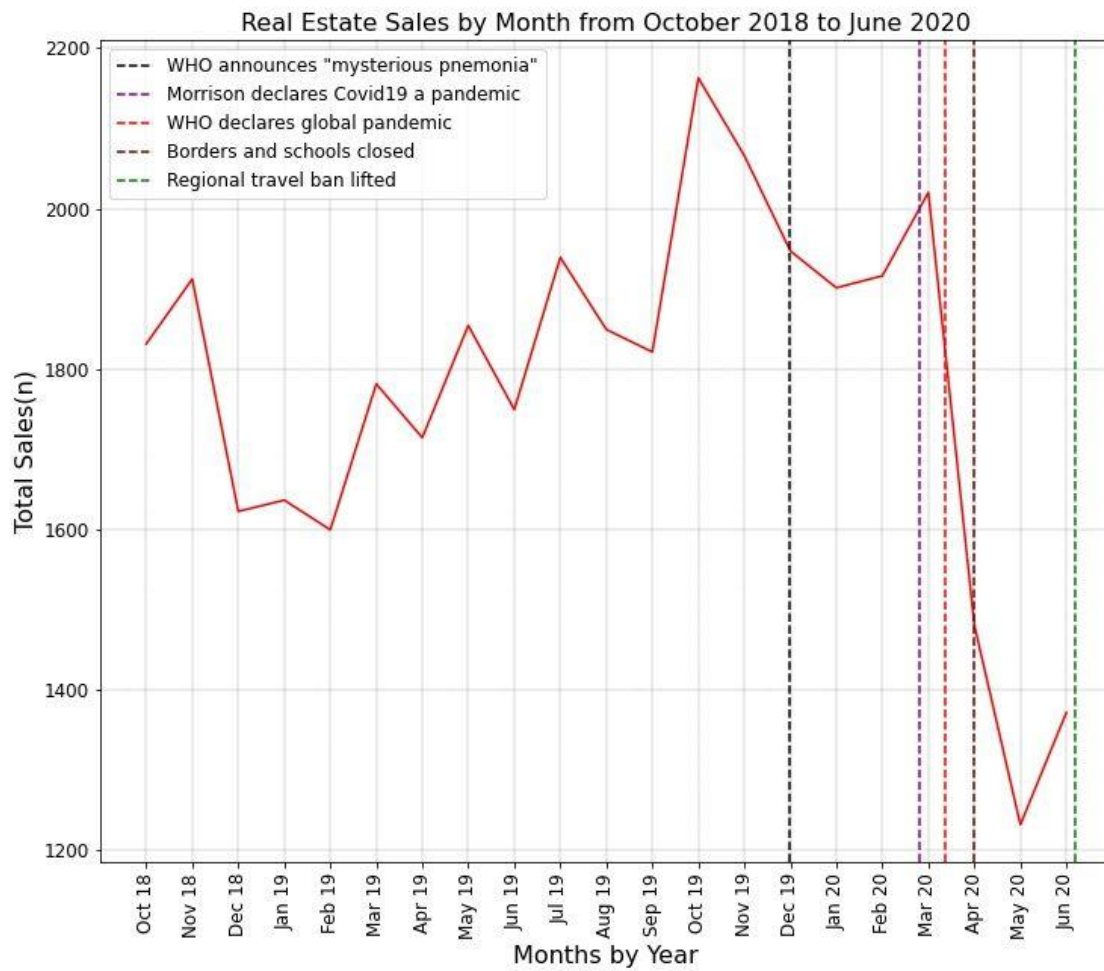
Method:

- Counted the total number of sales by property type and plotted the values in the above pie chart.

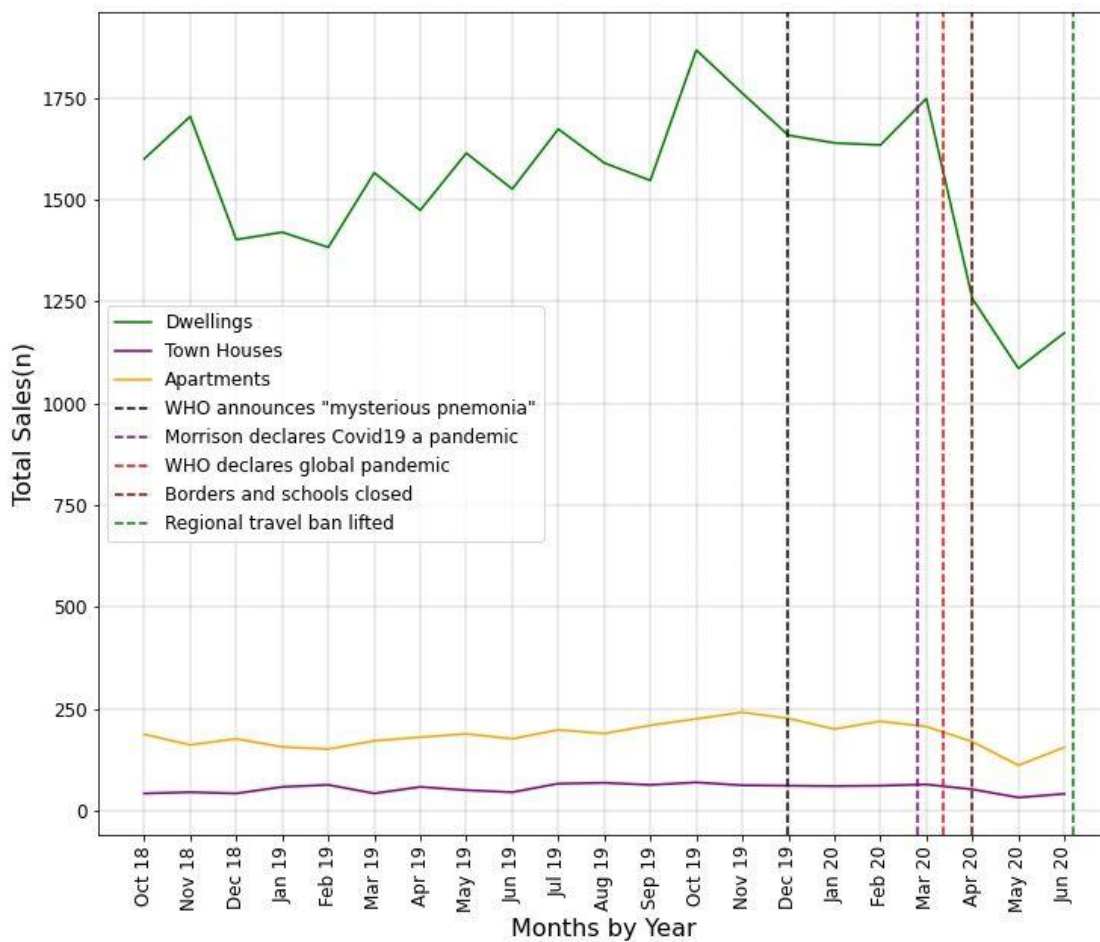
Observations:

- The W.A. market is overrepresented by Dwellings (houses)
- Units and Townhouses combined, only account for roughly 13% of the volume of sales so their effect on the trends observed will be subdued

Figure 2 & 3 - Total volume of real estate sales from Oct 2018 to June 2020 then by Property Type



Total volume of real estate sales over the period examined



Total volume of realestate sales by category Oct 2018 to Jun 2020

Question:

What effect did the various announcements and events surrounding Covid have on the overall sales volume and were the effects of the announcements and events surrounding covid uniform across the three property types??

Method:

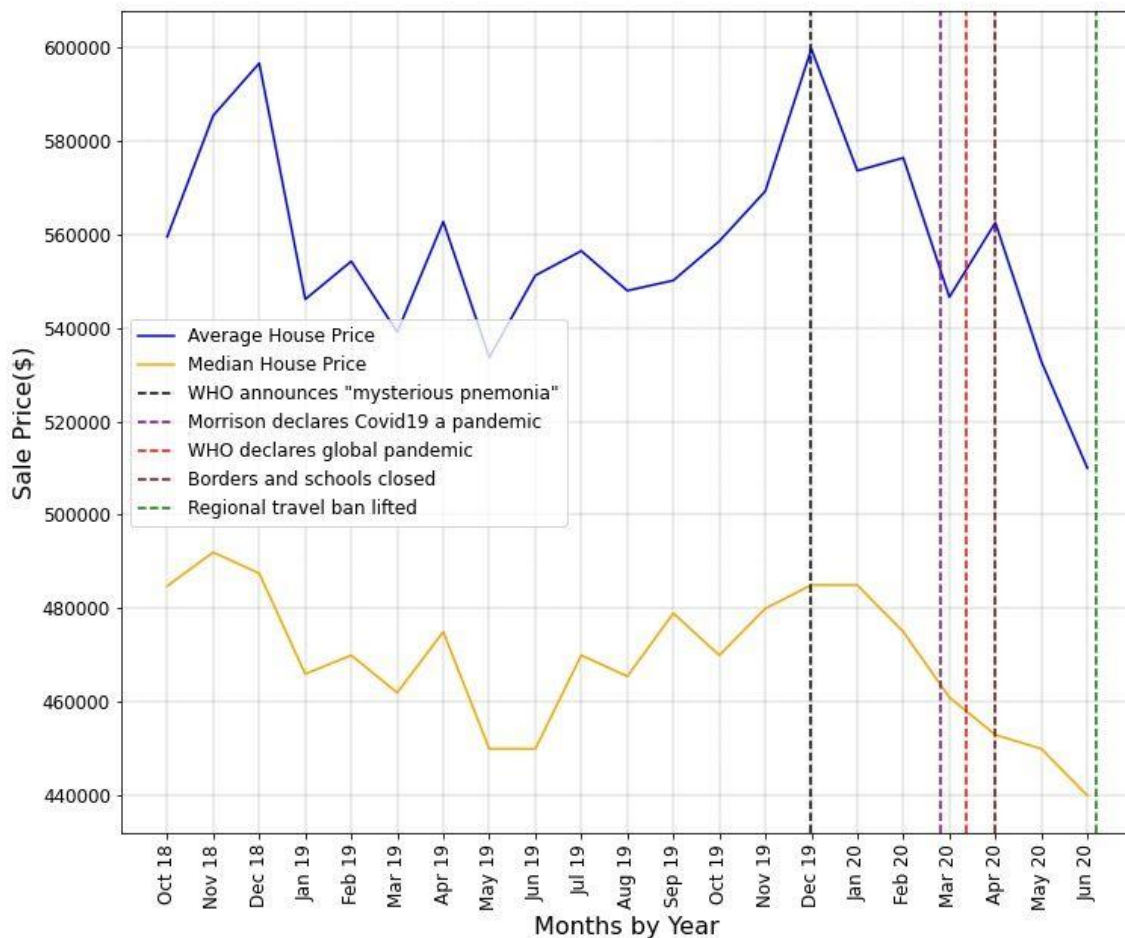
- Grouped data by year and month and added a count of entries.
- Also Separately grouped the dataset by year, month and property type. Isolated each property type in its own list and plotted those against the months to produce the above chart.
- The months and the counts were plotted in the above line plot
- Added key dates (represented by the vertical lines) , sourced from news articles to see if they matched up with any market trends.
 - **Dec 31st 2019** - WHO announces a "mysterious pneumonia"
 - **Late February (Around the 23rd) 2020** - Scott Morrison Declares Covid 19 a pandemic
 - **March 11 2020** - WHO Declares Covid19 a global pandemic
 - **March 31 2020** - Regional borders and schools closed within Western Australia

■ **June 6 2020** - Regional travel ban lifted

Observations:

- Sharpest drop in total volume appears to follow shortly after Scott Morrison declared Covid 19 a pandemic (Purple Intermittent Line)
- Whilst the data is extremely limited, it could be suggested that the market had a strong, albeit slightly delayed negative reaction to the announcement which was then further exacerbated by the border closures and announcements following.
- The effect on dwellings is almost identical meaning the initial trend is almost completely determined by their overwhelming percentage in total volume.
- Similar but less noticeable trends can be seen in the volume of apartment sales at this scale.
- The volume of townhouse sales is so low that trends can barely be observed at the same scale as dwellings.

Figure 4 - mean and median house price by month



Monthly key housing price indicators from Oct 2018 to Jun 2020

Question:

What effect did Covid 19, the resulting announcements and precautionary measures have on house prices?

Method:

- Had initially wanted to do box plots but the line graphs relayed similar information but much clearer.
- Grouped by Year and month and used .agg (aka the best Pandas function) to calculate mean and median values for each month.
- Plotted mean and median values against the months to create the above plots.
- Added in key dates as per previous two plots

Observations:

- Sharp decline begins in December after WHO acknowledged "mysterious pneumonia"
- Interestingly the mean house price trends upwards after Scott Morrison's announcement while the median keeps trending downwards.
- One could speculate that at this point investors and owners with higher value assets started to liquidate in preparation for what was to come.
- After the borders closed, mean house prices fell sharply, following the trend of median house prices.

Table 1 - Top Ten Suburbs by Sales Volume across quarters during the period examined

Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020
Baldivis	Baldivis	Baldivis	Baldivis	Baldivis	Baldivis	Baldivis
Canning Vale	Morley	Thornlie	Canning Vale	Canning Vale	Scarborough	Ellenbrook
Morley	Scarborough	Canning Vale	Scarborough	Scarborough	Canning Vale	Canning Vale
Dianella	Canning Vale	Ellenbrook	Dianella	Thornlie	Dianella	Dianella
East Perth	Dianella	Scarborough	East Perth	Ellenbrook	Morley	Butler
Gosnells	Como	Dianella	Ellenbrook	Rockingham	Rockingham	Scarborough
Perth	Gosnells	Maylands	Morley	Perth	Como	Duncraig
Thornlie	Maylands	East Perth	Como	South Perth	Maylands	Thornlie
Clarkson	Bayswater	Morley	Byford	Dianella	Duncraig	Wanneroo
Scarborough	South Perth	Secret Harbour	South Perth	Morley	Ellenbrook	Claremont

Question:

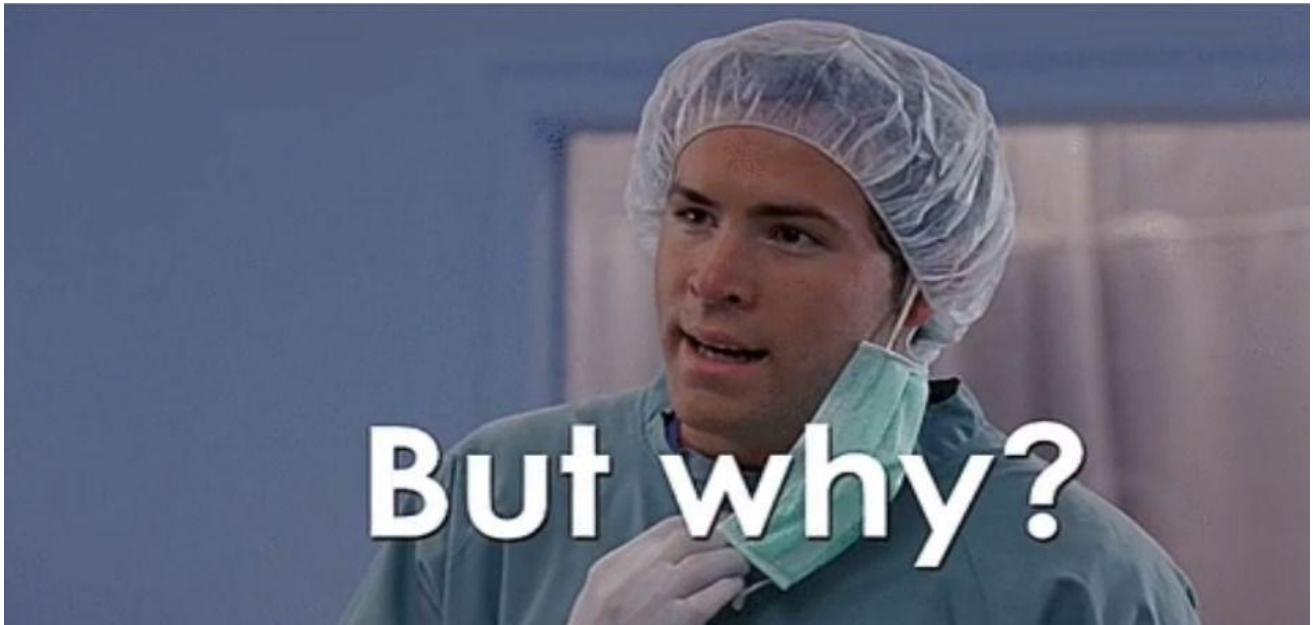
Did any of the above trends have a noticeable effect on the top ten suburbs by volume?

Method:

- Struggled to get a neat result from grouping and listing the highest values without breaking each quarter into its own dataframe.
- Had planned to add to a heatmap however the data was clearer and better illustrated in a summarised tabular format.

Observations:

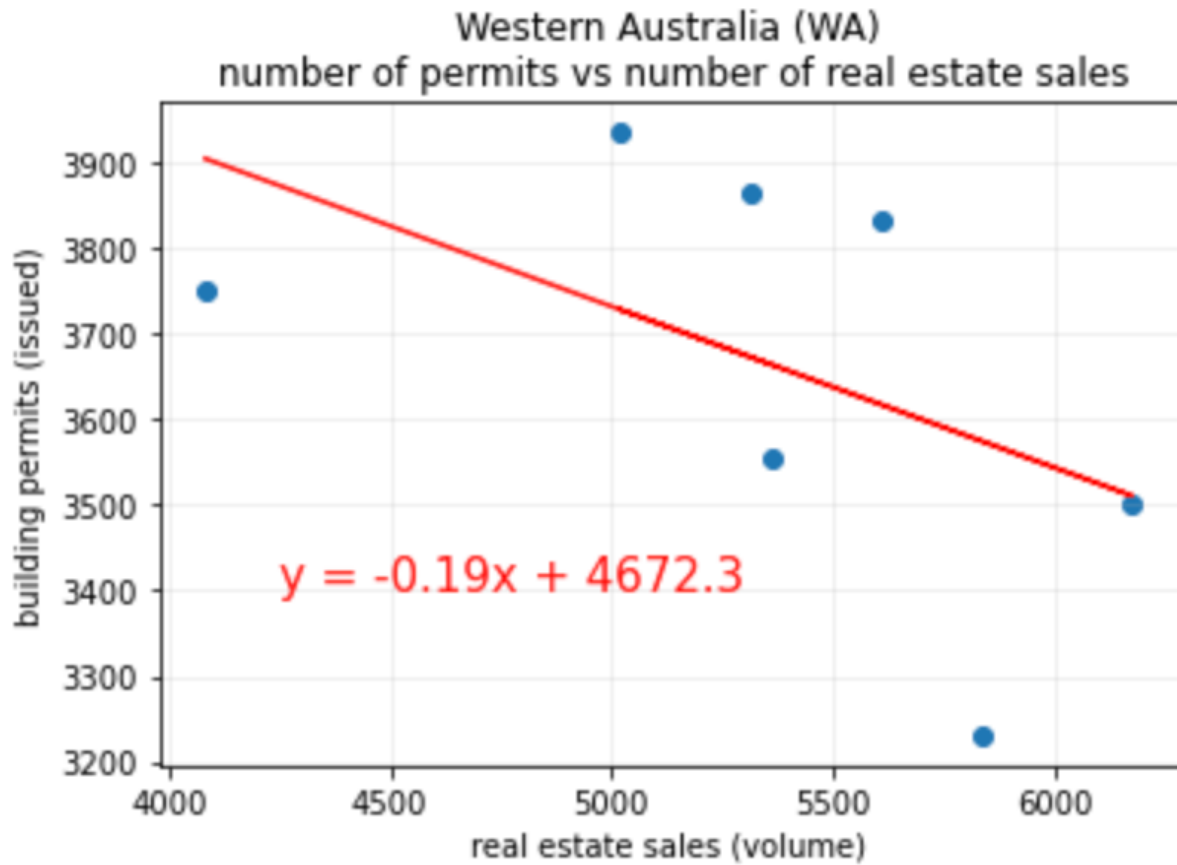
- Baldivis... Never falling from the top spot.



- Canning Vale, Scarborough and Dianella rarely fell out of the top 10 if ever.
- No observable trends correlating with the previous trends.

Figure 5 - Scatter Plot Showing Correlation between number of permits issued and number of real estate sales for W.A.

The r-squared is: 0.2547026417198125

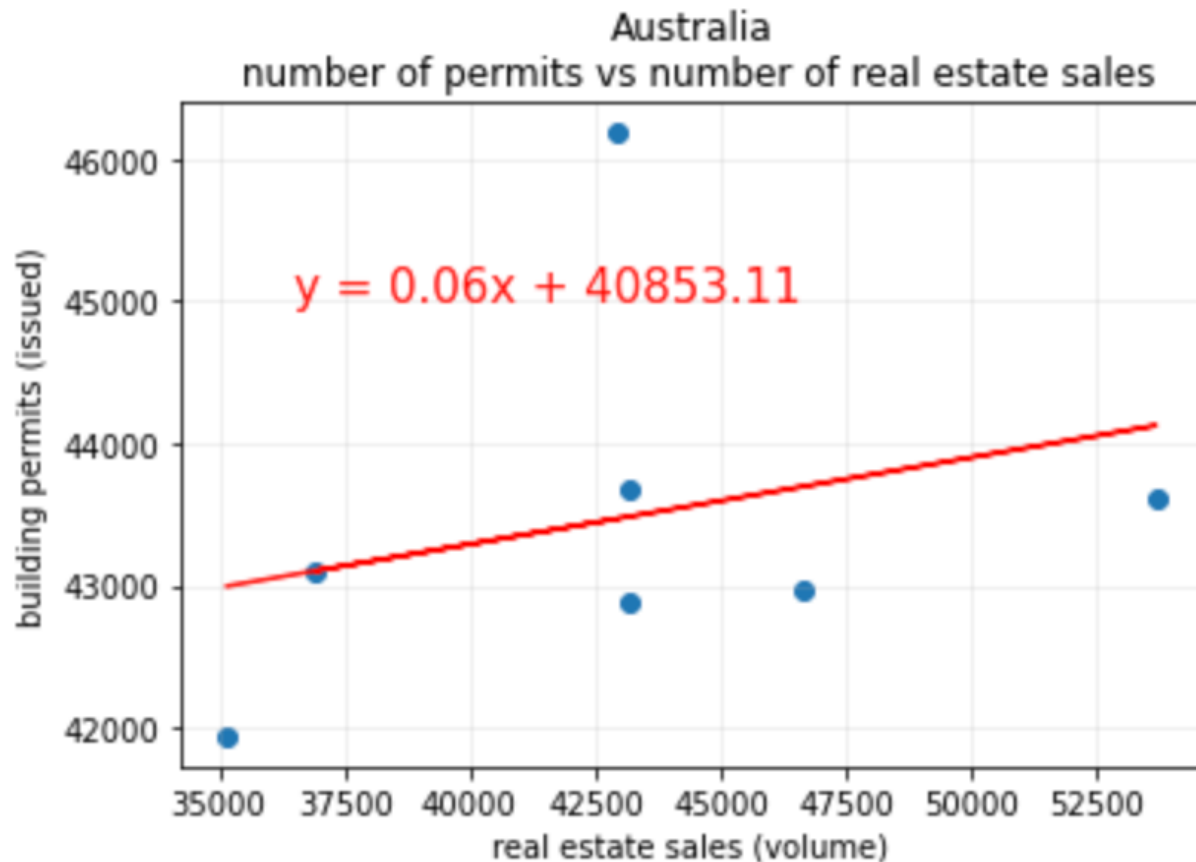


Attempted to observe correlation between the number of permits vs the number of real estate sales. However, confidence in such correlation is extremely low due to the limited data points from the time period. It is also suspected that the real estate sales dataset did not include new builds.

The Western Australian numbers show a strong negative correlation with a high variance.

Figure 6 - Scatter Plot Showing Correlation between number of permits issued and number of real estate sales.

The r-squared is: 0.07987105331653124



Number of Permits in Australia vs Total Real Estate Sales

The national numbers show a weak positive correlation with even more variance.

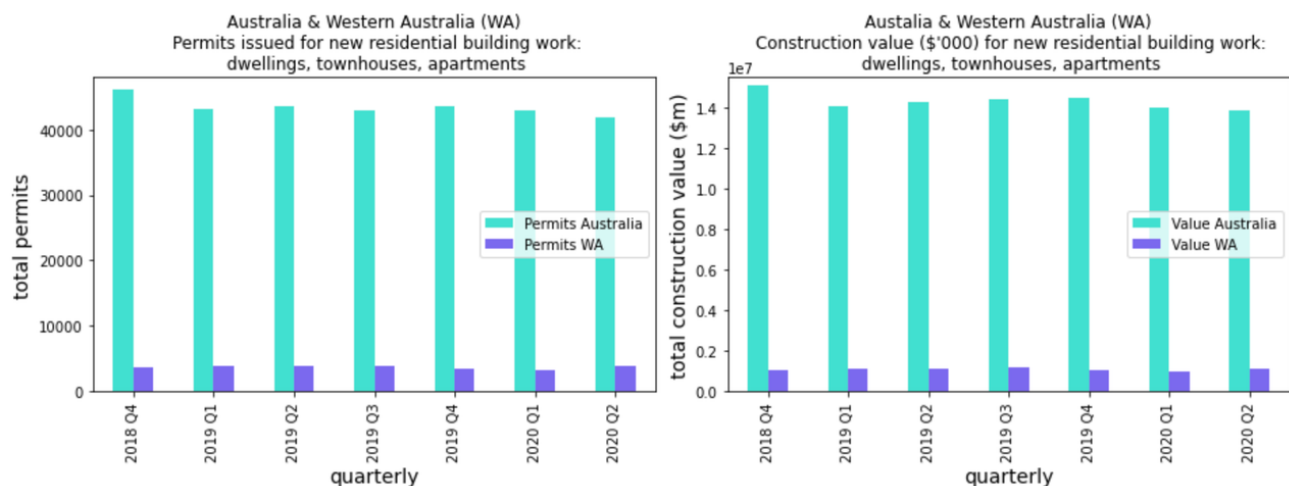
Permits & construction value - Sylvia Broadbent

- Question: Are the number of permits issued for residential construction impacted by the COVID-19 crisis?
- Data: Statistics about construction is publicly available via the ABS (Australian Bureau of Statistics). In WA the Data is collected by the Building Commission.
- Cleanup & exploration:
 - Data for WA starts in 1970!
 - Export excel files and turn them into csv files.
 - Creating Pandas Dataframe in Jupyter.
 - Manipulating them to create the final Dataframes with required information.
 - No mean or median values as there is not enough information to make an accurate representation.

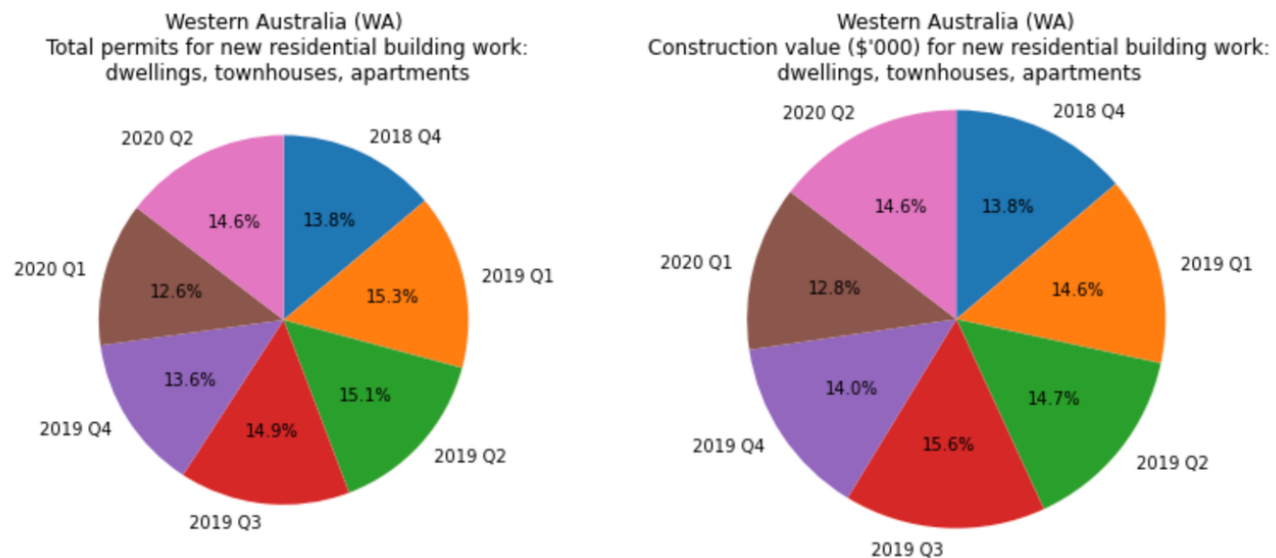
	dwellings	townhouses	apartments	dwellings_\$'000	townhouses_\$'000	apartments_\$'000	total_permits	total_value		permits_au	value_au
2018Q4	3068	240	247	910726	56850	84852	3555	1052428	2018Q4	46181	15107274
2019Q1	2821	299	815	824553	69611	218410	3935	1112574	2019Q1	43091	14062628
2019Q2	2996	343	526	878667	74793	171036	3865	1124496	2019Q2	43681	14315655
2019Q3	2770	265	799	826658	66966	294430	3834	1188054	2019Q3	42972	14390276
2019Q4	2897	268	336	877361	67937	119569	3501	1064867	2019Q4	43616	14496008
2020Q1	2718	220	293	830906	53003	89497	3231	973406	2020Q1	42878	13992118
2020Q2	2878	196	676	851247	52387	208546	3750	1112180	2020Q2	41943	13845277

All information I am presenting shows the number of permits on the left and the value of permits in \$'000 on the right.

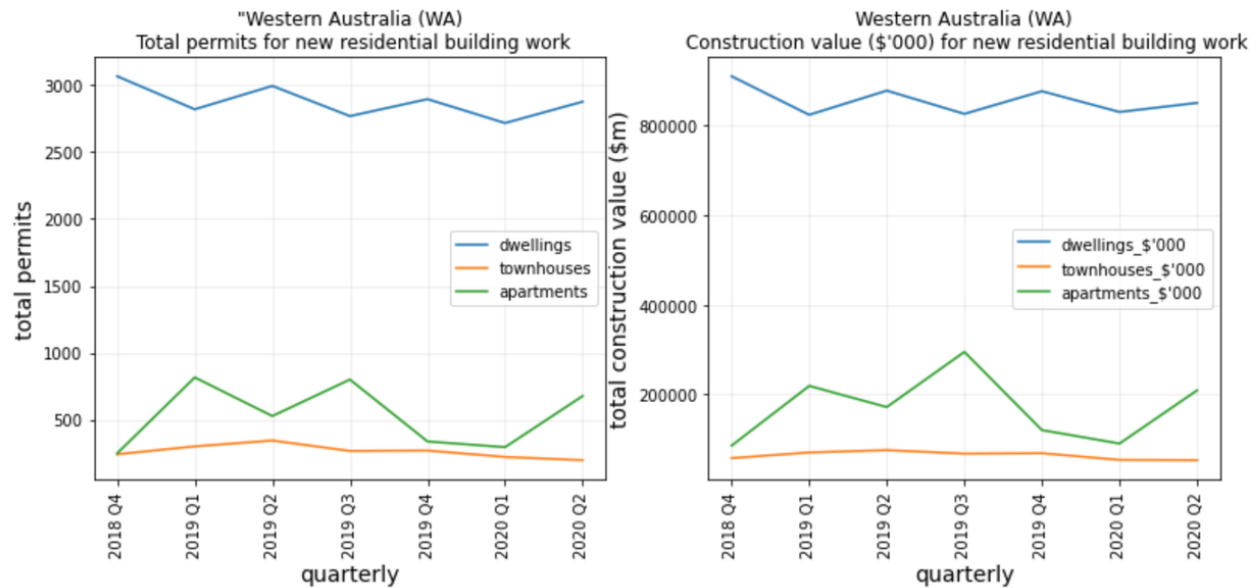
- Analysis:
 - Permits issued & value Australia wide compared to WA per quarter.



- Permits issued & value for WA of each quarter.

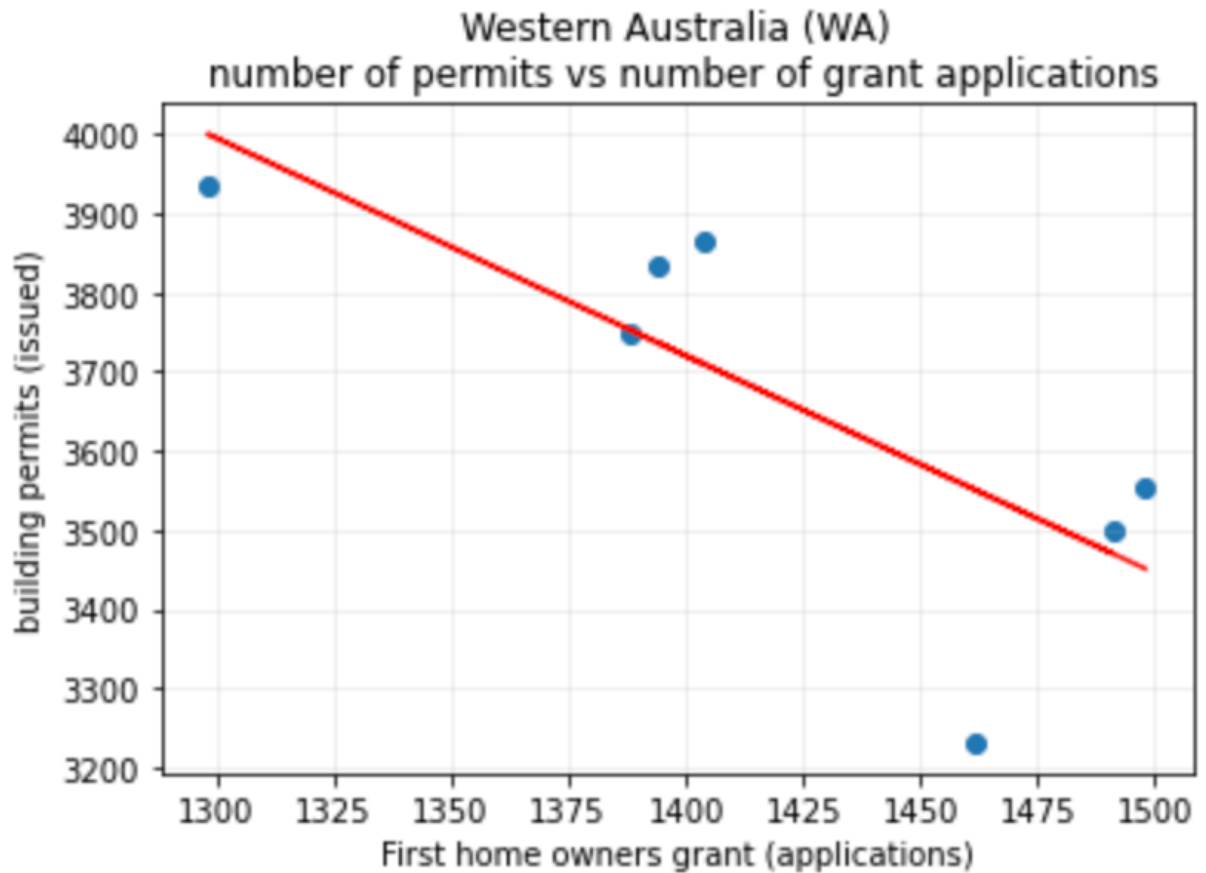


- Permits issued & value for WA of each quarter separated by type of residential construction.



- Conclusion:
 - Dip in the issuing of permits in 2020 Q1. This may be related to the announcement of COVID-19 in December by WHO. But quickly recovered in the 2nd quarter.
 - The amount of permits issued versus the value it represents remains fairly constant. Indicates that the average value per permit does not vary much, which means that the distribution of high spec homes versus low spec homes is fairly equal.
- Correlation - First home owners grant applications vs Building permits:

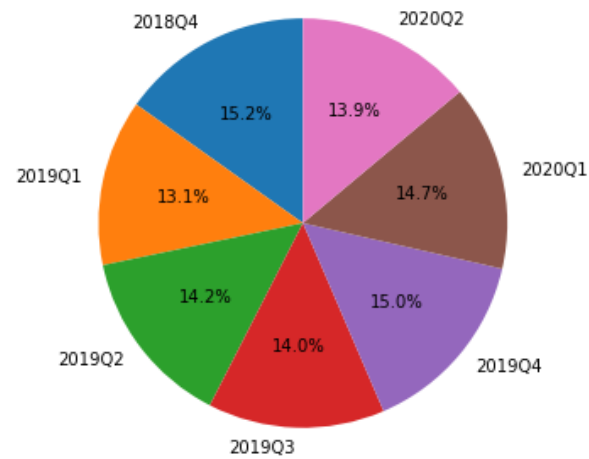
The r-squared is: 0.5971298445529775



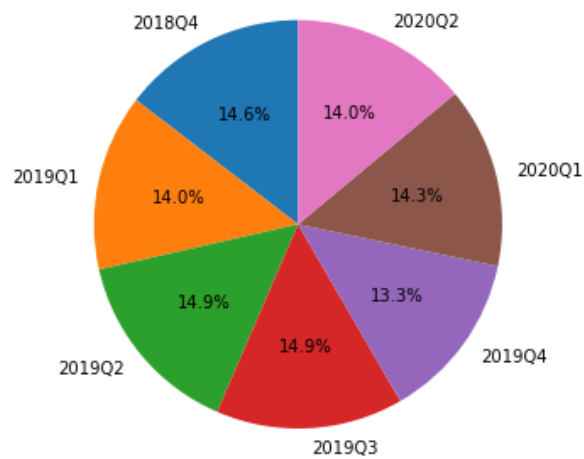
First home owners grant - Lauren Prins

- Question: Are the number of applications and paid grants for first home owners impacted by the COVID-19 crisis?
- Data:
 - Revenue WA, www.wa.gov.au
 - Excel spreadsheet format
- Cleanup & exploration:
 - Month by month
 - Established houses v new dwellings
 - Applications made vs Applications paid
- Analysis:

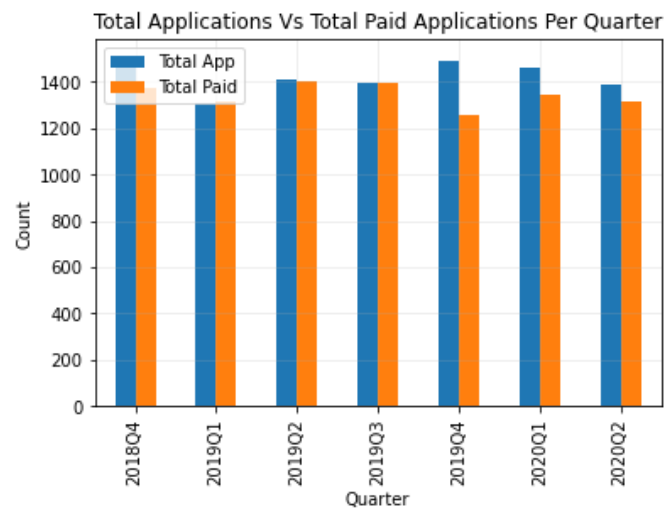
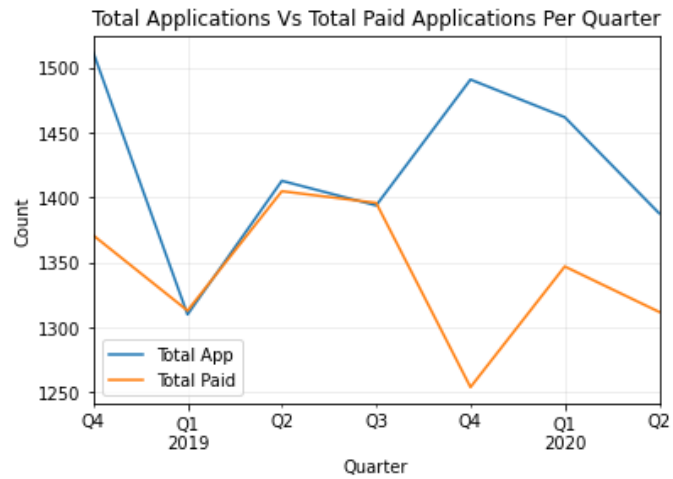
Total Applications made in WA for First Home Owner Grants



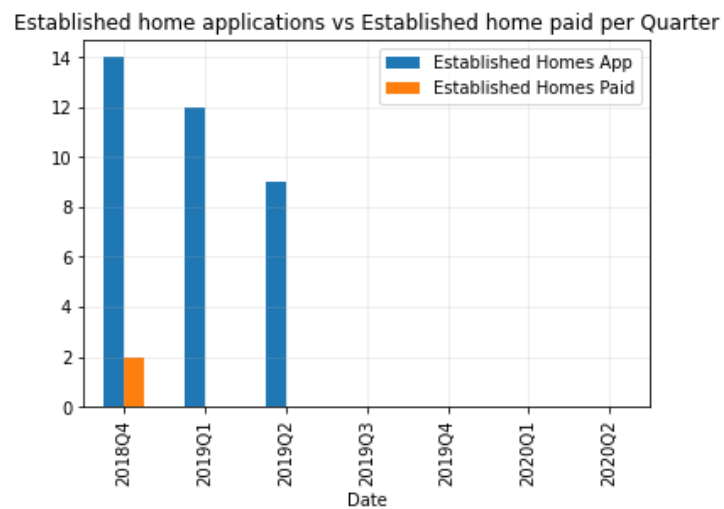
Total Paid Applications in WA for First Home Owner Grants



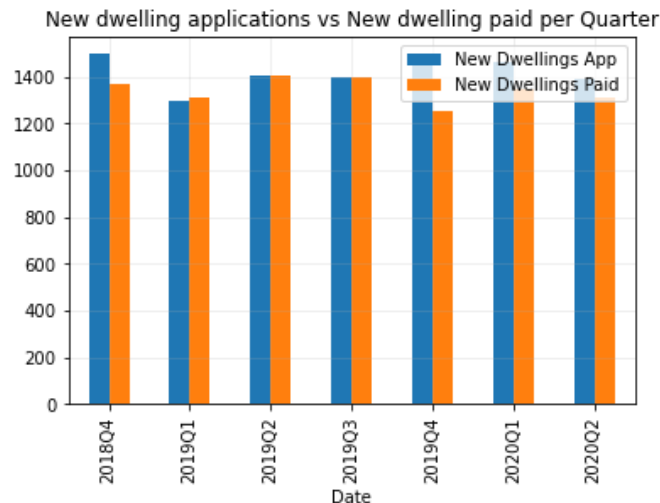
- “utilising Matplotlib to display a bar and line graph for total applications made and paid; both displaying a slight decrease for 2020.”



- "Grants only available for new dwellings from start of 2019"



I found it interesting that the excel document informs the viewer that the grant guidelines changed in 2019 and the FHOOG would only be available for New Dwellings. I displayed this information in the first graph below where you can see a sudden decline and a flat line from 2019 in applications and paid grants to established homes. The second graph shows a steady amount of paid grants for new dwellings.



Conclusion

Did we find what we expected to find? Not quite

- R-Square value of 0.59 between building permits and first home owner grants as they both showed no significant decreases in the data sets since the announcement of the covid pandemic.
- R-Square value of 0.08 between building permits and volume of sales in WA as there was a decrease in house sales, median house price & average house price,
- Drop in share values and share volumes from Mar 2020.

Limitations & difficulties

Time, accessibility, & data

If we had more time

- Extend our data time to include more previous years to compare to, and expand with Q3 and Q4 of 2020.
- Compare WA's performance against other states and possibly the world.
- Add commercial development.
- Explore trends by suburb in more detail.

Questions??