



# The Right Move

## **“What makes for a profitable property”**

Team 6

Advisor: Professor Douglas Rolph

# Our Team



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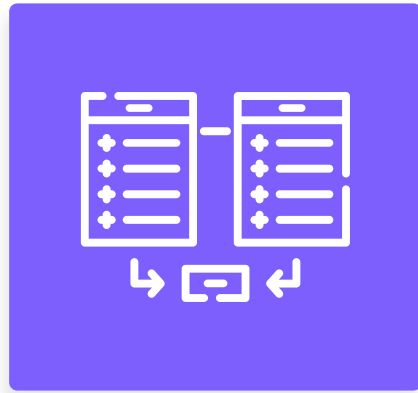
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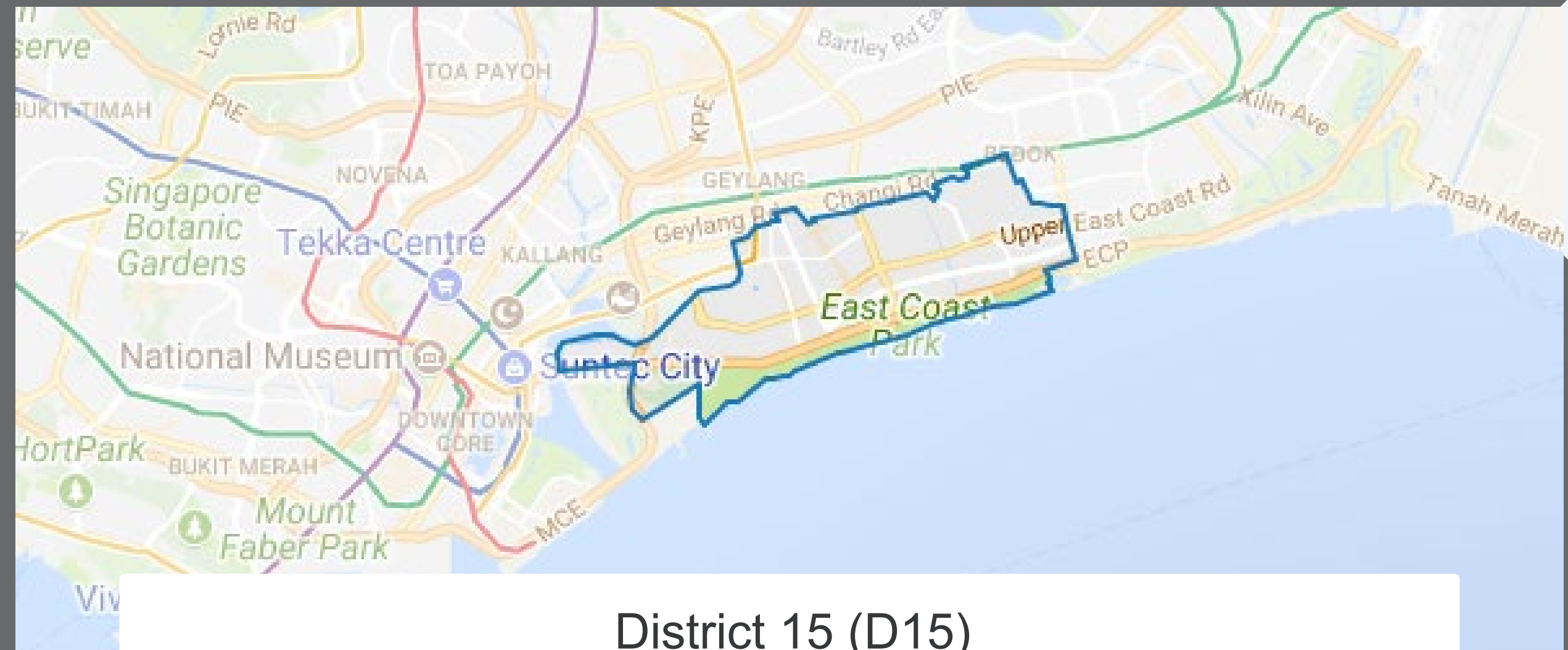


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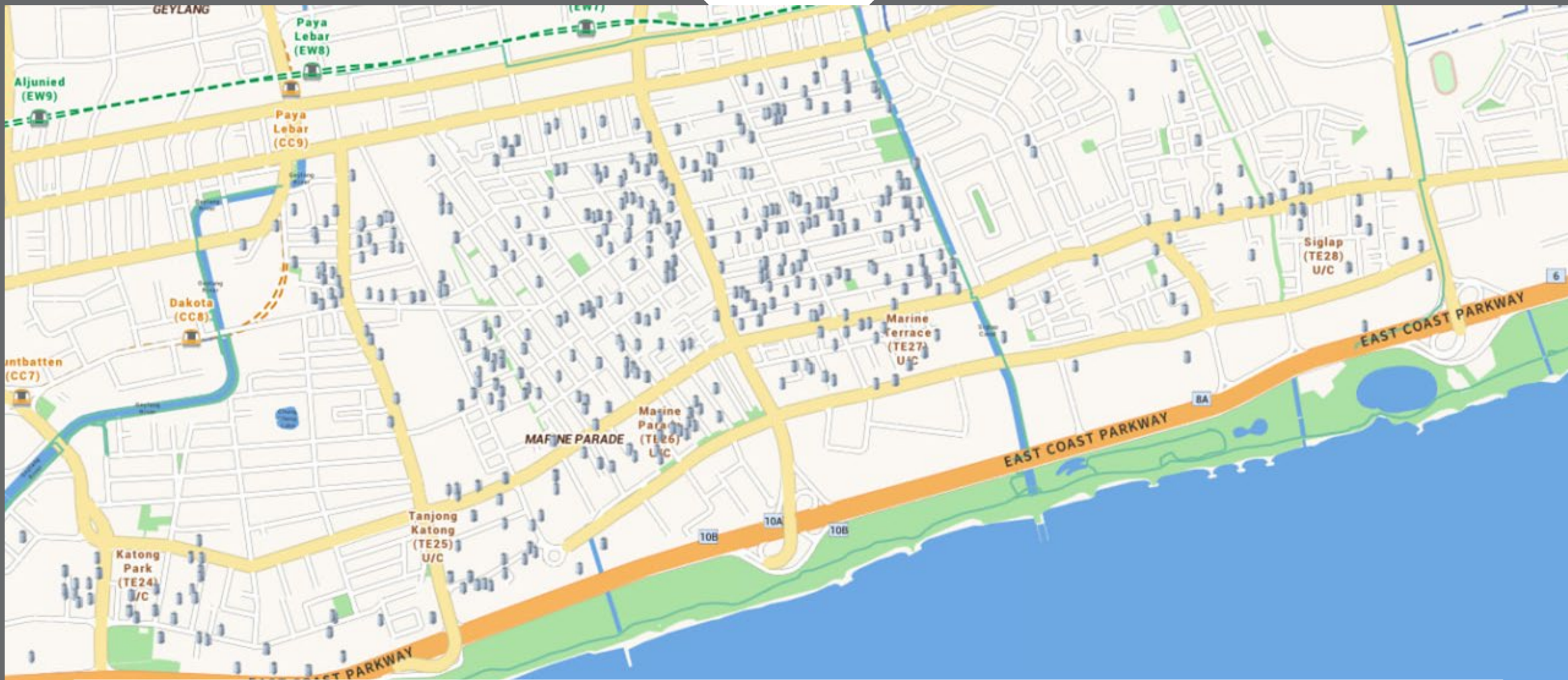
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# Data Available and Visualisations



District 15 (D15)



## Apartments and Condominiums in D15

## Property Data

Private Residential ▾ Commercial ▾ Help ▾

# Private Residential Property Transactions

### Results

List Analysis

Download ▾ Show ▾ Select ▾

1 2 3 4 5 ▶

Project Name ▾	Transacted Price (\$) ▾	Area (SQFT) ▾	Unit Price (\$ PSF) ▾	Sale Date ▾	Type of Sale ▾	Property Type ▾	Tenure ▾	Market Segment ▾
SEVENTY SAINT PATRICK'S	2,580,000	1,216.33	2,121	Feb-23	Resale	Condominium	<del>Freehold</del>	Outside Central Region
NEPTUNE COURT	1,800,000	1,636.13	1,100	Feb-23	Resale	<del>Apartment</del>	99 yrs lease commencing from 1975	Outside Central Region
MEYER MANSION	3,759,800	1,496.2	2,513	Feb-23	<del>New Sale</del>	<del>Apartment</del>	<del>Freehold</del>	Rest of Central Region
VILLA MARINA	1,668,000	1,280.92	1,302	Feb-23	Resale	Condominium	99 yrs lease commencing from 1995	Outside Central Region
THE ESTA	2,208,000	1,001.05	2,206	Feb-23	Resale	Condominium	<del>Freehold</del>	Rest of Central Region
AMBER PARK	2,080,000	742.72	2,801	Feb-23	<del>Sub Sale</del>	Condominium	<del>Freehold</del>	Rest of Central Region
AMBER PARK	5,459,160	2,142.04	2,549	Feb-23	<del>New Sale</del>	Condominium	<del>Freehold</del>	Rest of Central Region
SUITES @ EASTCOAST	946,000	570.49	1,658	Feb-23	Resale	Condominium	<del>Freehold</del>	Outside Central Region
HAIG 162	628,000	365.98	1,716	Feb-23	Resale	<del>Apartment</del>	<del>Freehold</del>	Rest of Central Region

Project Name	Number of records
COSTA RHU	142
MANDARIN GARDENS	111
SANCTUARY GREEN	107
COTE D'AZUR	103
THE SHORE RESIDENCES	102
VILLA MARINA	96
WATER PLACE	92
PEBBLE BAY	90
SILVERSEA	87
DUNMAN VIEW	42
RIVEREDGE	42
TANJONG RIA CONDOMINIUM	33
CASUARINA COVE	24
LEGENDA AT JOO CHIAT	24
CAMELOT BY-THE-WATER	17
KATONG PARK TOWERS	1
<b>Total</b>	<b>1113</b>



Project Name	Unit Price (\$psf)	Date of Sale
MANDARIN GARDENS	1282	Jan-23
MANDARIN GARDENS	1363	Jan-23
MANDARIN GARDENS	1282	Dec-22
MANDARIN GARDENS	1247	Dec-22
MANDARIN GARDENS	1153	Oct-22
MANDARIN GARDENS	1196	Sep-22
MANDARIN GARDENS	1285	Sep-22
MANDARIN GARDENS	1305	Sep-22
MANDARIN GARDENS	1005	Sep-22
MANDARIN GARDENS	1273	Aug-22
MANDARIN GARDENS	1349	Aug-22
MANDARIN GARDENS	1089	Jul-22
MANDARIN GARDENS	1256	Jul-22
MANDARIN GARDENS	1177	Jun-22
MANDARIN GARDENS	1092	May-22
MANDARIN GARDENS	1035	May-22
MANDARIN GARDENS	1332	Apr-22
MANDARIN GARDENS	1106	Apr-22
MANDARIN GARDENS	1328	Mar-22
MANDARIN GARDENS	1388	Mar-22
MANDARIN GARDENS	1298	Mar-22
MANDARIN GARDENS	1366	Mar-22
MANDARIN GARDENS	1275	Mar-22
MANDARIN GARDENS	1298	Feb-22
MANDARIN GARDENS	1072	Feb-22



Forecasted PSF  
**NOT GOOD ENOUGH**



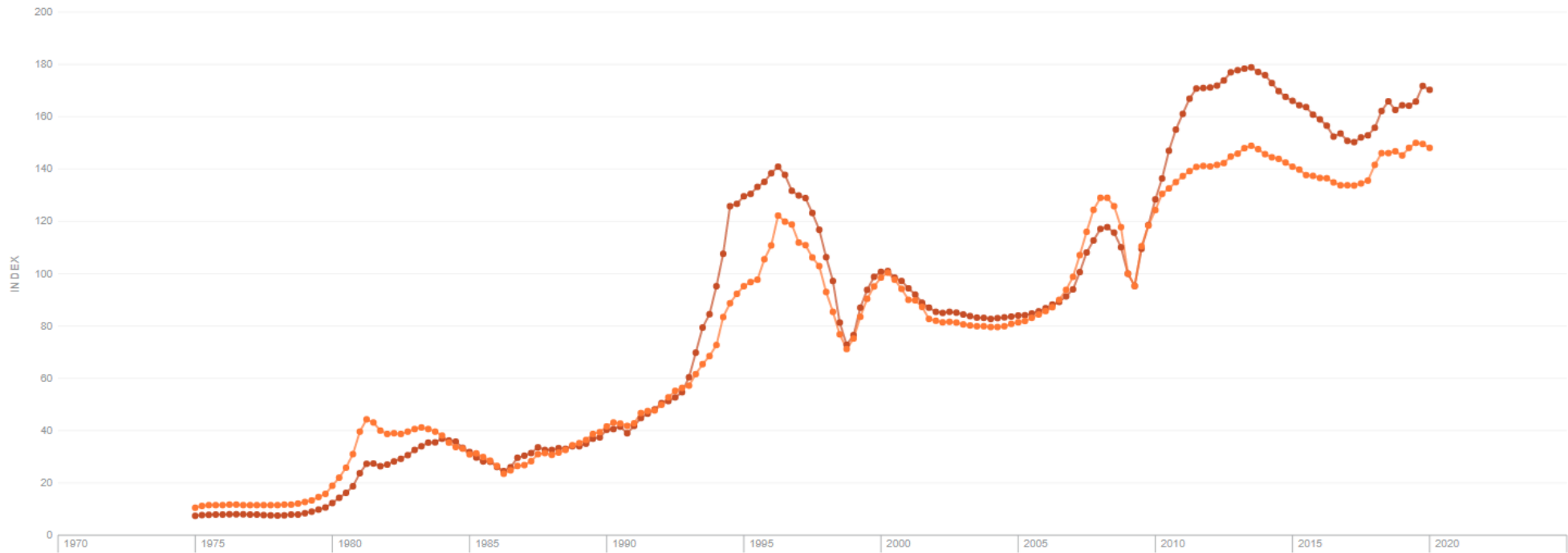
# Private Residential Property Price Index

Download

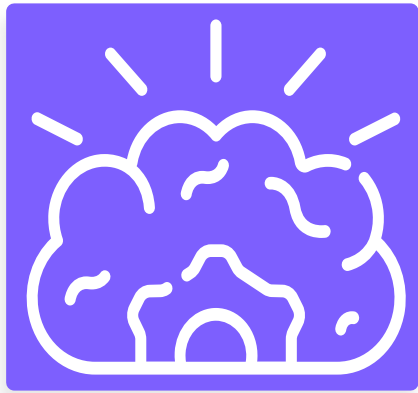
Views:  

Embed Chart

Data API



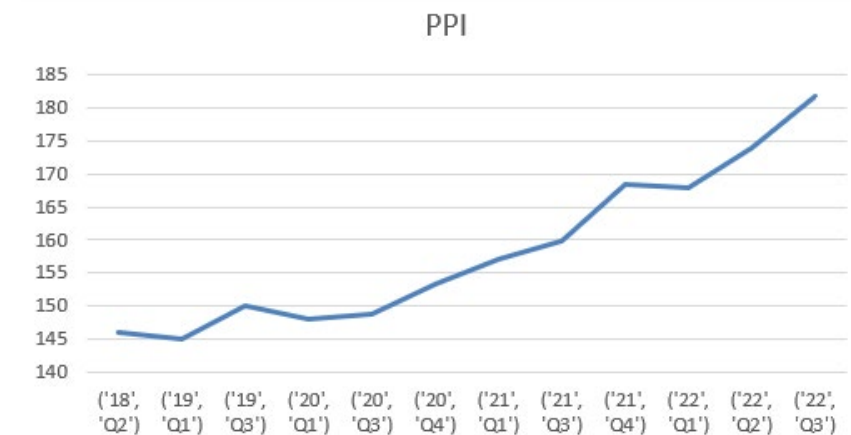
## Private residential Property Price Index (PPI)



# Methodology

# Rationale

- Predict the price per square feet of a property in the future
- Suspicions on property price relating to the Property market via Property Price Index.
- True growth of property price is hard to determine when Property market is affecting the price
- Goal is to remove PPI dependencies on property price so a better representation of the growth on property pricing can be evaluated, while figuring out dependencies to the market



# Regression Model

$$\Delta PSF = \alpha + \beta(\Delta PPI) + \epsilon_t$$

$\Delta PSF$ : change in property price per square feet between  $(t + 1)^{th}$  and  $t^{th}$  observation ;  $PSF_{t+1} - PSF_t$

$\Delta PPI$ : change in Property Price Index between  $(t + 1)^{th}$  and  $t^{th}$  observation ;  $PPI_{t+1} - PPI_t$

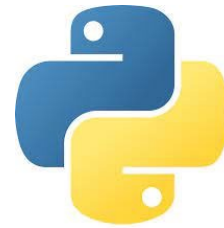
$\epsilon_t$ : deviation in pricing (independant of the market)

$\alpha$ : average monthly change in property pricing (independant of the market)

$\beta$ : dependancy factor on property price to the market

# Sequence of software used

- Data cleaning and grouping – Python(Pandas)
- Visualising and processing data – Python(matplotlib)



Project Name	Transacted Price (\$)	Area (SQFT)	Unit Price (\$ PSF)	Sale Date	Street Name	Type of Sale	Type of Area	Area (SQM)	Unit Price (\$ PSM)	Nett Price(\$)	Property Type	Number of Units	Tenure	Postal District	Market Segment	Floor Level
SEVENTY SAINT PATRICK'S	2,580,000	1,216.33	2,121	Feb-23	ST. PATRICK'S ROAD	Resale	Strata	113	22,832	-	Condominium	1	Freehold	15	Outside Central Region	01 to 05
NEPTUNE COURT	1,800,000	1,636.13	1,100	Feb-23	MARINE VISTA	Resale	Strata	152	11,842	-	Apartment	1	99 yrs lease commencing from 1975	15	Outside Central Region	11 to 15
VILLA MARINA	1,668,000	1,280.92	1,302	Feb-23	JALAN SEMPADAN	Resale	Strata	119	14,017	-	Condominium	1	99 yrs lease commencing from 1995	15	Outside Central Region	01 to 05
THE ESTA	2,208,000	1,001.05	2,206	Feb-23	AMBER GARDENS	Resale	Strata	93	23,742	-	Condominium	1	Freehold	15	Rest of Central Region	16 to 20
SUITES @ EASTCOAST	946,000	570.49	1,658	Feb-23	UPPER EAST COAST ROAD	Resale	Strata	53	17,849	-	Condominium	1	Freehold	15	Outside Central Region	01 to 05

## Past transactions from URA



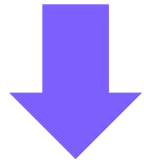
- Keep only 99-year lease resale condos
- Sort by project name
- Separate projects by individual excel sheets
- Sort by date



S/N	Project Name	Street Name	Type	Market Segm	Tenure	Type of Sale	No. of Unit	Price (\$)	Area (Sqft)	Type of Area	Unit Price (\$)	Date of Sale
11	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1960000	1227	Strata	1597	Jan-23
32	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1970000	1227	Strata	1605	Jan-23
36	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1935888	1216	Strata	1592	Jan-23
73	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1900000	1216	Strata	1562	Dec-22
101	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1938000	1227	Strata	1579	Dec-22
161	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1990000	1281	Strata	1554	Nov-22
215	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	2345678	1453	Strata	1614	Oct-22
378	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1930000	1216	Strata	1587	Aug-22
421	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1980000	1281	Strata	1546	Jul-22
452	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	2138000	1356	Strata	1576	Jul-22
527	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1933000	1216	Strata	1589	Jun-22
547	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	2090000	1496	Strata	1397	Jun-22
687	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1910000	1227	Strata	1557	May-22
831	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1900000	1227	Strata	1548	Apr-22
851	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1820000	1216	Strata	1496	Apr-22
867	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1870000	1227	Strata	1524	Mar-22
869	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1830000	1216	Strata	1505	Mar-22
946	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	2150000	1453	Strata	1480	Mar-22
1037	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	2100000	1572	Strata	1336	Feb-22
1067	WATER PLACE	TANJONG	Condomir	RCR	99 yrs lease	Resale	1	1816000	1227	Strata	1480	Jan-22

quarter	property_type	index	
0	1975-Q1	All Residential	8.9
1	1975-Q1	Landed	7.4
2	1975-Q1	Non-Landed	10.5
3	1975-Q2	All Residential	9.1
4	1975-Q2	Landed	7.7

PPI from data.gov.sg

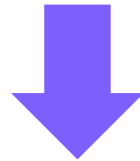


- Extract only non-landed entries
- Sort by year and quarter

Year	Quarter	quarter	property_type	index
75	Q1	1975-Q1	Non-Landed	10.5
	Q2	1975-Q2	Non-Landed	11.2
	Q3	1975-Q3	Non-Landed	11.5
	Q4	1975-Q4	Non-Landed	11.5
76	Q1	1976-Q1	Non-Landed	11.5

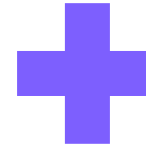


### PSF of condos



- Sort by year and quarter, averaging data per quarters

Year	Quarter	S/N	no. of Unit	Price (\$)	Area (Sqft)	Price (\$/sqft)
18	Q1	5030	2	2215000	1270.5	1766
	Q2	4751.4	5	2352000	1406	1625.4
	Q3	4541	2	2112500	1243.5	1714
	Q4	4277.667	3	1886667	1155.667	1636.667
19	Q1	4114	1	2850000	1572	1814
	Q2	3966.5	2	2034000	1297	1567.5
	Q3	3792.333	3	2626667	1715.333	1556.667
	Q4	3571.8	5	2164000	1313.2	1654.4
20	Q1	3441	4	2892222	1561	1768
	Q2	3318	1	2600000	1647	1579
	Q3	3162	5	2444600	1498.6	1643.2
	Q4	2852.8	5	1939000	1251	1551.6
21	Q1	2562.5	6	3160000	1790.5	1738
	Q2	2172.2	10	2998000	1738.4	1691.9
	Q3	1746.25	4	3142500	1754.25	1777.25
	Q4	1351	6	2877500	1665	1729.5
22	Q1	987.8	5	3756000	2058	1814
	Q2	665.3077	13	3371462	1688.308	1951.923
	Q3	384.5	4	4427500	2274	1950
	Q4	118	1	3800000	1679	2263



Calculate  $\Delta PPI$  and  $\Delta PSF$

S/N	Project Name	Type	Market Segm	Tenure	Type of Sale	No. of Unit	Price (\$)	Area (Sqft)	Type of Area	Price (\$/sqft)	Date of Sale
11	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1960000	1227	Strata	1597	Jan-23
32	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1970000	1227	Strata	1605	Jan-23
36	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1935888	1216	Strata	1592	Jan-23
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101	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1938000	1227	Strata	1579	Dec-22
161	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1990000	1281	Strata	1554	Nov-22
215	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	2345678	1453	Strata	1614	Oct-22
378	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1930000	1216	Strata	1587	Aug-22
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527	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1933000	1216	Strata	1589	Jun-22
547	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	2090000	1496	Strata	1397	Jun-22
687	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1910000	1227	Strata	1557	May-22
831	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1900000	1227	Strata	1548	Apr-22
851	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1820000	1216	Strata	1496	Apr-22
867	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1870000	1227	Strata	1524	Mar-22
869	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1830000	1216	Strata	1505	Mar-22
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1037	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	2100000	1572	Strata	1336	Feb-22
1067	WATER PL TANJONG	Condomir	RCR	99 yrs leas	Resale	1	1816000	1227	Strata	1480	Jan-22

Year	Quarter	S/N	No. of Unit	Price (\$)	Area (Sqft)	Unit Price (\$/Sqft)	quarter	operty_ty	index	delta_PSF	delta_PPI
18	Q1	5030	2	2215000	1270.5	1766	2018-Q1	Non-Land	141.6		
	Q2	4751.4	5	2352000	1406	1625.4	2018-Q2	Non-Land	146.1	-140.6	4.5
	Q3	4541	2	2112500	1243.5	1714	2018-Q3	Non-Land	146.1	88.6	0
	Q4	4277.667	3	1886667	1155.667	1636.667	2018-Q4	Non-Land	146.8	-77.3333	0.7
19	Q1	4114	1	2850000	1572	1814	2019-Q1	Non-Land	145.2	177.3333	-1.6
	Q2	3966.5	2	2034000	1297	1567.5	2019-Q2	Non-Land	148.1	-246.5	2.9
	Q3	3792.333	3	2626667	1715.333	1556.667	2019-Q3	Non-Land	150	-10.8333	1.9
	Q4	3571.8	5	2164000	1313.2	1654.4	2019-Q4	Non-Land	149.6	97.73333	-0.4
20	Q1	3441	4	2892222	1561	1768	2020-Q1	Non-Land	148.1	113.6	-1.5
	Q2	3318	1	2600000	1647	1579	2020-Q2	Non-Land	148.7	-189	0.6
	Q3	3162	5	2444600	1498.6	1643.2	2020-Q3	Non-Land	148.8	64.2	0.1
	Q4	2852.8	5	1939000	1251	1551.6	2020-Q4	Non-Land	153.3	-91.6	4.5
21	Q1	2562.5	6	3160000	1790.5	1738	2021-Q1	Non-Land	157.1	186.4	3.8
	Q2	2172.2	10	2998000	1738.4	1691.9	2021-Q2	Non-Land	158.8	-46.1	1.7
	Q3	1746.25	4	3142500	1754.25	1777.25	2021-Q3	Non-Land	159.9	85.35	1.1
	Q4	1351	6	2877500	1665	1729.5	2021-Q4	Non-Land	168.4	-47.75	8.5
22	Q1	987.8	5	3756000	2058	1814	2022-Q1	Non-Land	167.9	84.5	-0.5
	Q2	665.3077	13	3371462	1688.308	1951.923	2022-Q2	Non-Land	173.9	137.9231	6
	Q3	384.5	4	4427500	2274	1950	2022-Q3	Non-Land	181.6	-1.92308	7.7
	Q4	118	1	3800000	1679	2263	2022-Q4	Non-Land	182.1	313	0.5

◀ ▶ ...
SILVERSEA
TANJONG RIA CONDOMINIUM
THE SHORE RESIDENCES
VILLA MARINA
WATER PLACE



# Running the prediction

1. Splitting training and testing data
  - a. Random
  - b. Latest Values

delta\_PSF delta\_PPI

NaN	NaN
-49.380952	4.5
-157.685714	0.0
10.400000	0.7
432.333333	-1.6
-175.000000	2.9
-59.000000	1.5
186.666667	-1.5
-115.000000	0.6
-67.000000	0.1
23.000000	4.5
-77.166667	3.8
69.944444	1.7
-54.349206	1.1
157.142857	8.5
-20.142857	-0.5
29.821429	6.0
74.321429	7.7
31.178571	0.5

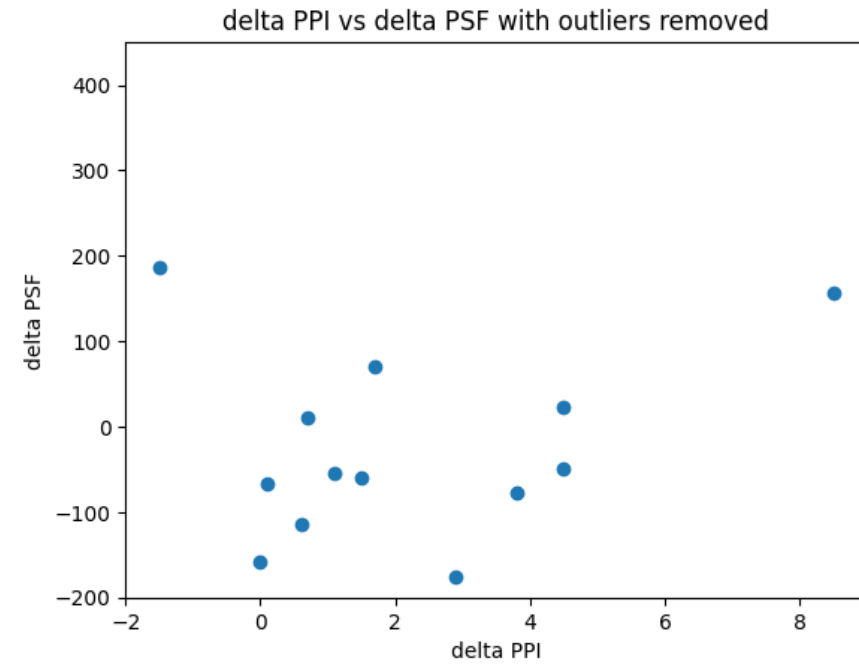
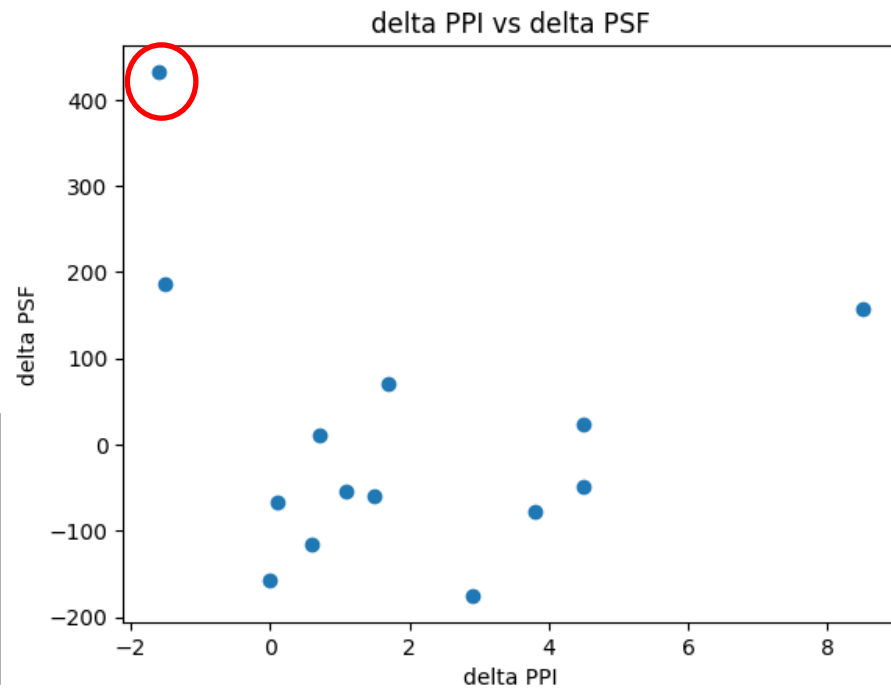
Training data (80%)

Testing data (20%)

# Running the prediction

## 2. Removing outliers

- a. None
- b. Z-Score
- c. Inter Quartile Range
- d. Local Outlier Factor



Condo Name			Outliers removed	MAE	MSE	
CAMELOT BY-THE-WATER	109.6369797	-46.11159713	0	303.3941273	92359.11231	-27.59390651
CASUARINA COVE	-24.73519838	6.016539104	1	19.79084191	404.0521345	0.885869039
COSTA RHU	48.02971739	-12.55184546	1	50.73921601	2623.635331	-7.665770699
COTE D'AZUR	62.74021719	-9.410134631	1	44.18635689	2308.459479	0.086225818
DUNMAN VIEW	0.677586899	5.378560218	1	37.34772669	1504.974639	-0.664965489
LEGENDA AT JOO CHIAT	13.47806402	-2.076087348	0	121.8435437	15326.32031	-0.220135097
MANDARIN GARDENS	-9.837732341	16.18354484	1	88.07447442	13544.65422	-1.150361089
PEBBLE BAY	-42.33435488	8.553452185	1	41.83342401	2127.092342	-0.901607125
RIVEREDGE	2.440886042	7.506004804	0	91.93855084	8723.520554	-0.005544247
SANCTUARY GREEN	23.61261137	1.037153228	1	77.85168314	6464.145066	-0.549344357
SILVERSEA	33.76499963	-20.26026099	0	169.0013942	37701.55387	-1.84646579
TANJONG RIA CONDOMINIUM	24.07706848	0.459459263	1	22.15809421	608.8031898	-0.825192774
THE SHORE RESIDENCES	0.794371452	3.788923239	2	47.81043791	3258.392078	0.304368334
VILLA MARINA	-10.07326547	13.14166223	0	23.88999691	1093.29558	0.776275177
WATER PLACE	12.0341209	0.334498381	0	35.91961127	1909.169565	-1.170820922

# Prediction Results (other outlier removal methods)

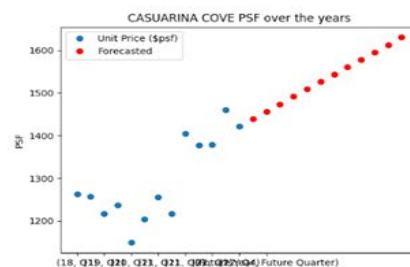
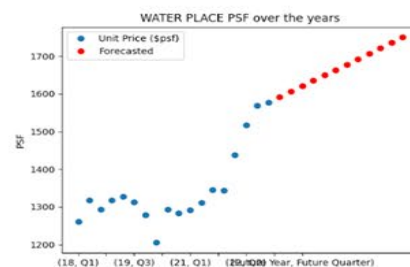
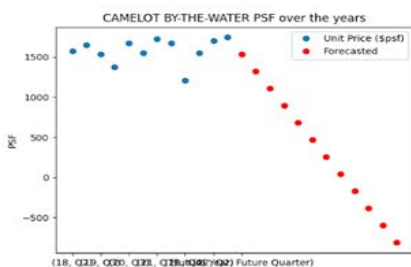
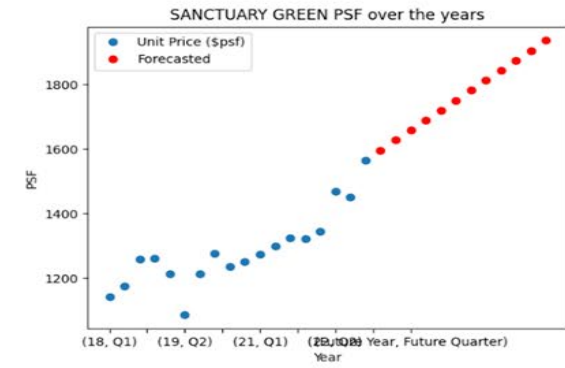
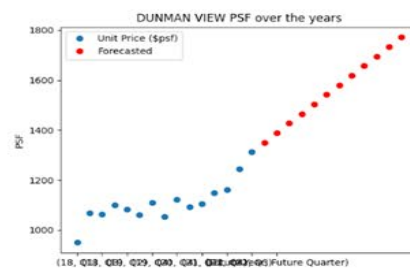
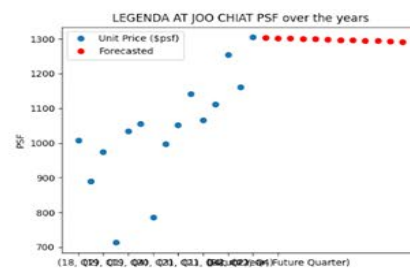
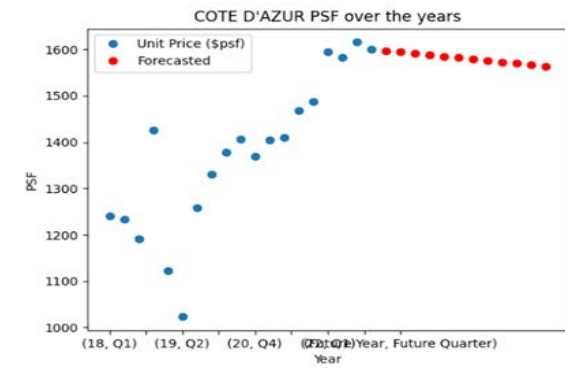
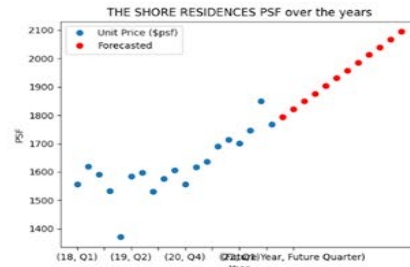
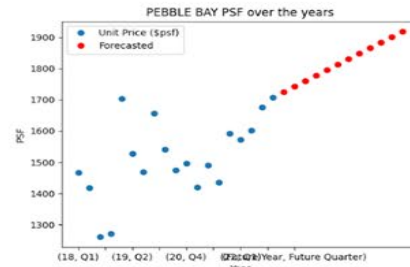
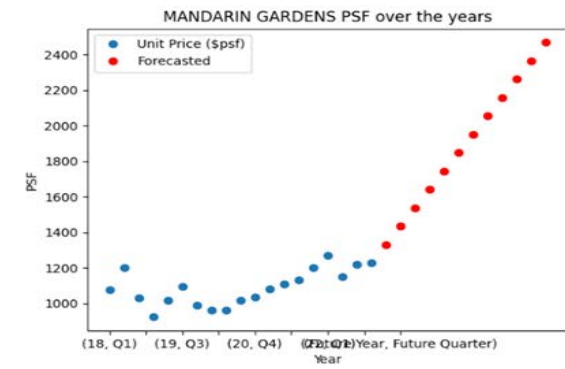
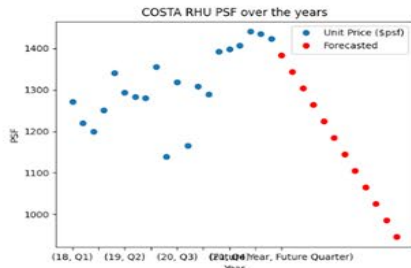
Condo Name	a	b	Outliers removed	MAE	MSE	r2_score	Condo Name	a	b	Outliers removed	MAE	MSE	r2_score	Condo Name	a	b	Outliers removed	MAE	MSE	r2_score
CAMELOT BY-THE-WATER	109.637	-46.1116	0	303.3941	92359.11	-27.5939	CAMELOT BY-THE-WATER	109.637	-46.1116	0	303.3941	92359.11	-27.5939	CAMELOT BY-THE-WATER	109.637	-46.1116	0	303.3941	92359.11	-27.5939
CASUARIN A COVE	6.306737	2.012648	0	46.21653	2136.783	0.396431	CASUARIN A COVE	6.306737	2.012648	0	46.21653	2136.783	0.396431	CASUARIN A COVE	6.306737	2.012648	0	46.21653	2136.783	0.396431
COSTA RHU	25.49341	-9.53707	0	40.4136	1894.798	-5.25845	COSTA RHU	48.02972	-12.5518	1	50.73922	2623.635	-7.66577	COSTA RHU	25.49341	-9.53707	0	40.4136	1894.798	-5.25845
COTE D'AZUR	9.528837	4.215346	0	46.21207	3347.789	-0.32518	COTE D'AZUR	62.74022	-9.41013	1	44.18636	2308.459	0.086226	COTE D'AZUR	9.528837	4.215346	0	46.21207	3347.789	-0.32518
DUNMAN VIEW	-3.34512	12.88504	0	45.06384	3240.108	-2.58456	DUNMAN VIEW	-3.34512	12.88504	0	45.06384	3240.108	-2.58456	DUNMAN VIEW	-3.34512	12.88504	0	45.06384	3240.108	-2.58456
LEGENDA AT JOO CHIAT	13.47806	-2.07609	0	121.8435	15326.32	-0.22014	LEGENDA AT JOO CHIAT	13.47806	-2.07609	0	121.8435	15326.32	-0.22014	LEGENDA AT JOO CHIAT	13.47806	-2.07609	0	121.8435	15326.32	-0.22014
MANDARIN GARDENS	-26.2567	18.32438	0	95.40683	14160.16	-1.24808	MANDARIN GARDENS	-9.83773	16.18354	1	88.07447	13544.65	-1.15036	MANDARIN GARDENS	-26.2567	18.32438	0	95.40683	14160.16	-1.24808
PEBBLE BAY	26.65743	-9.2649	0	59.58586	5085.74	-3.54662	PEBBLE BAY	26.65743	-9.2649	0	59.58586	5085.74	-3.54662	PEBBLE BAY	26.65743	-9.2649	0	59.58586	5085.74	-3.54662
RIVEREDGE	2.440886	7.506005	0	91.93855	8723.521	-0.00554	RIVEREDGE	2.440886	7.506005	0	91.93855	8723.521	-0.00554	RIVEREDGE	2.440886	7.506005	0	91.93855	8723.521	-0.00554
SANCTUARY GREEN	15.6302	-0.56741	0	79.87066	7683.608	-0.84163	SANCTUARY GREEN	35.92162	-2.04638	2	72.51527	5907.919	-0.41603	SANCTUARY GREEN	15.6302	-0.56741	0	79.87066	7683.608	-0.84163
SILVERSEA	33.765	-20.2603	0	169.0014	37701.55	-1.84647	SILVERSEA	33.765	-20.2603	0	169.0014	37701.55	-1.84647	SILVERSEA	33.765	-20.2603	0	169.0014	37701.55	-1.84647
TANJONG RIA CONDOMINIUM	-2.40273	6.520892	0	33.40927	1550.769	-3.64921	TANJONG RIA CONDOMINIUM	-2.40273	6.520892	0	33.40927	1550.769	-3.64921	TANJONG RIA CONDOMINIUM	-2.40273	6.520892	0	33.40927	1550.769	-3.64921
THE SHORE RESIDENCES	-10.7868	11.50802	0	29.24026	1674.089	0.6426	THE SHORE RESIDENCES	-10.7868	11.50802	0	29.24026	1674.089	0.6426	THE SHORE RESIDENCES	-10.7868	11.50802	0	29.24026	1674.089	0.6426
VILLA MARINA	-10.0733	13.14166	0	23.89	1093.296	0.776275	VILLA MARINA	-10.0733	13.14166	0	23.89	1093.296	0.776275	VILLA MARINA	-10.0733	13.14166	0	23.89	1093.296	0.776275
WATER PLACE	12.03412	0.334498	0	35.91961	1909.17	-1.17082	WATER PLACE	12.03412	0.334498	0	35.91961	1909.17	-1.17082	WATER PLACE	12.03412	0.334498	0	35.91961	1909.17	-1.17082

None

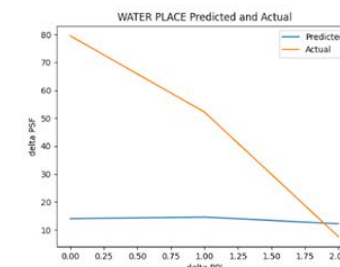
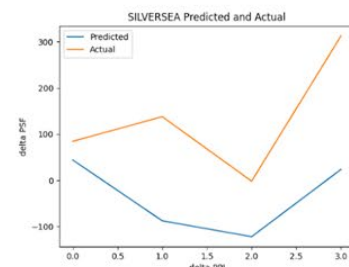
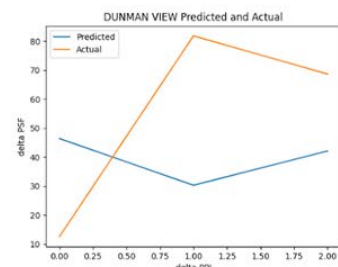
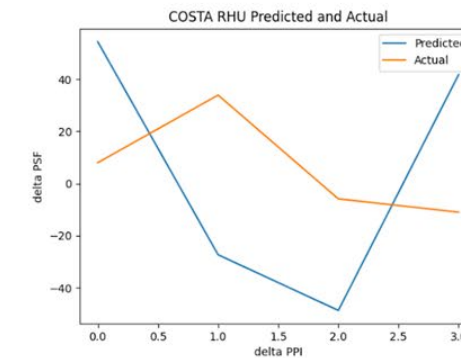
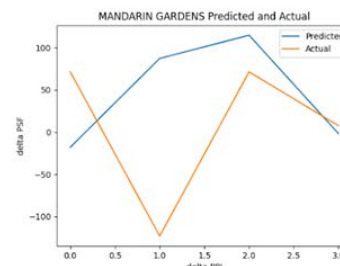
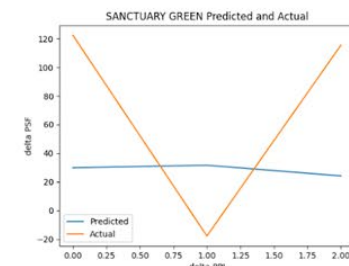
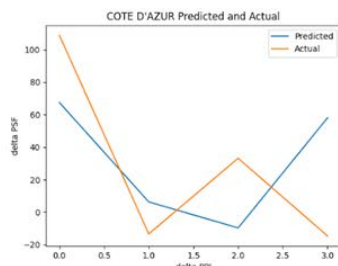
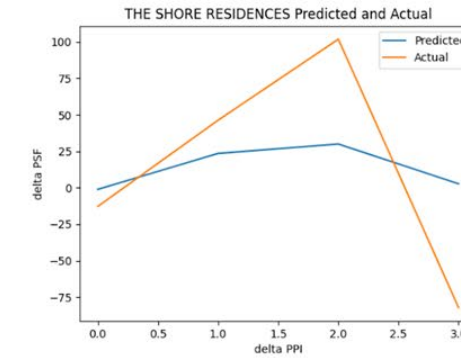
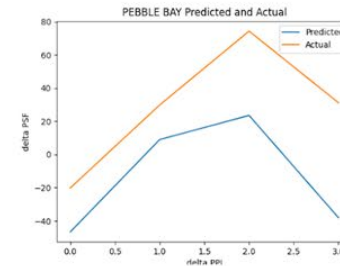
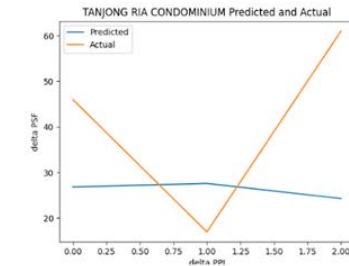
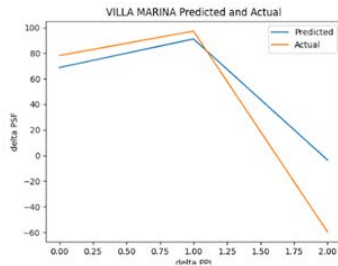
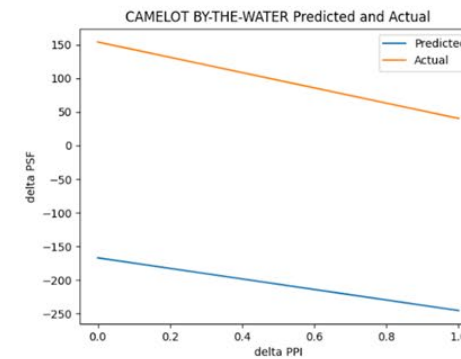
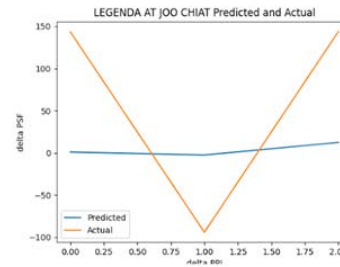
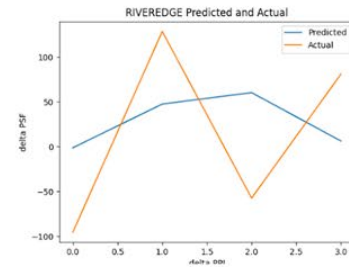
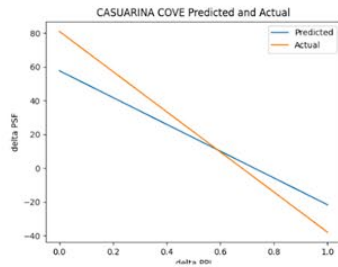
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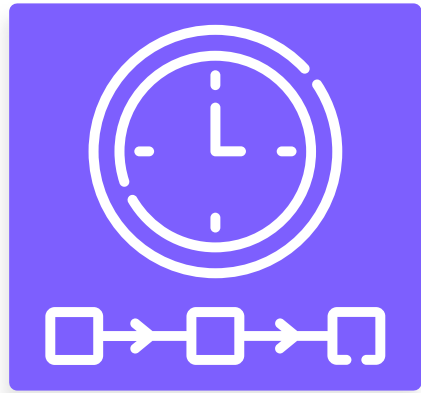
LOF

# Extrapolated results (assuming $\Delta PPI = 7$ )



# Predicted vs Actual on testing data

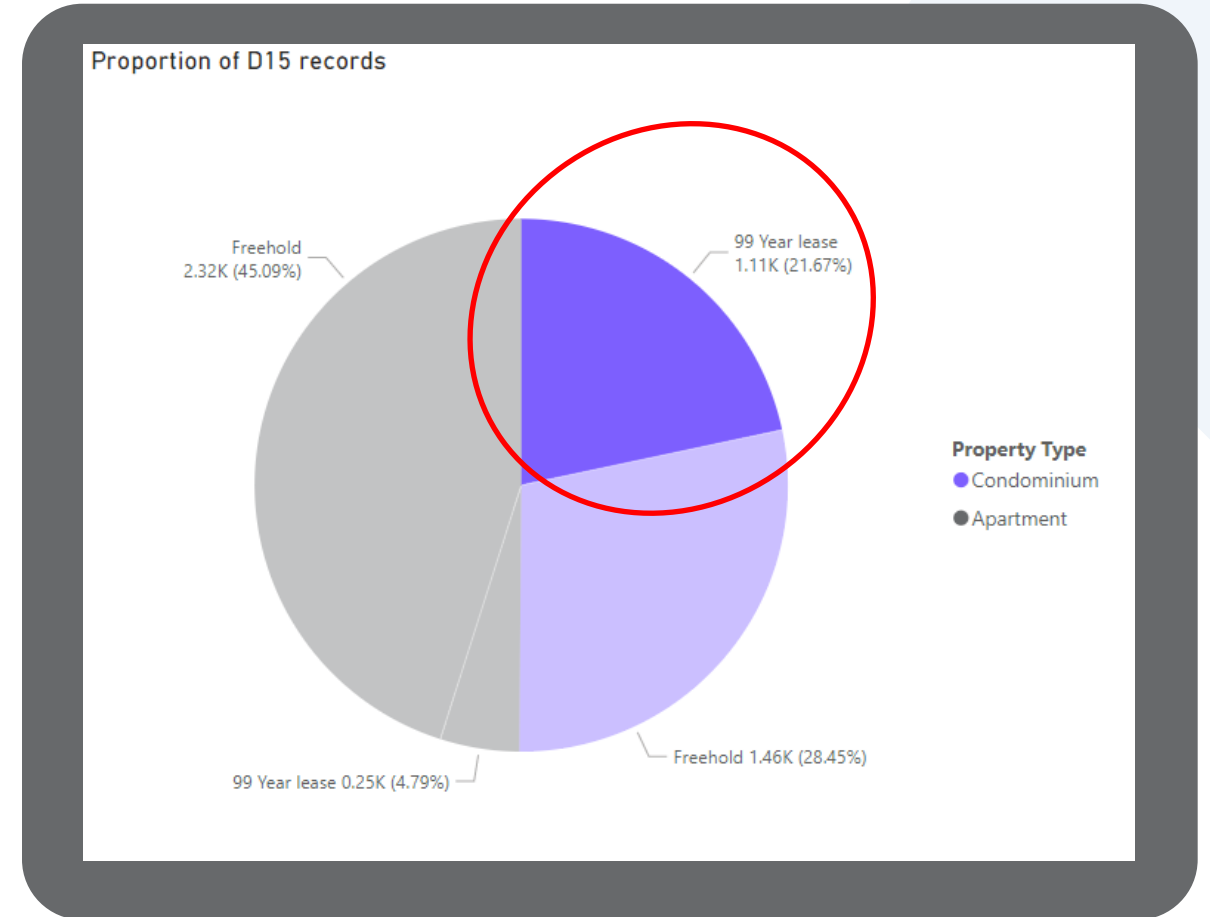




# Moving Forward

# Risks

Insufficient data if we continue working URA's past 5 years of transaction data





# Risks

year	quarter	MANDARIN GARDENS	VILLA MARINA	PEBBLE BAY	WATER PLACE
2018	Q1	1,063	823	1,521	1,279
2018	Q2	1,201	947	1,371	1,313
2018	Q3		1,015	1,321	1,340
2018	Q4	1,030		1,284	1,340
2019	Q1	923	1,001	1,688	1,296
2019	Q2	1,008	869	1,573	
2019	Q3	1,093	950		1,327
2019	Q4	997	1,025	1,485	1,327
2020	Q1	979	1,001	1,656	1,220
2020	Q2	986		1,541	
2020	Q3	996	858	1,394	1,250
2020	Q4	1,062	1,028	1,494	1,284
2021	Q1	1,077	1,064	1,382	1,306
2021	Q2	1,098	914	1,465	1,332
2021	Q3	1,117	1,089	1,436	1,385
2021	Q4	1,182	1,135	1,700	1,343
2022	Q1	1,298	959	1,610	1,467
2022	Q2	1,106	1,079	1,618	1,548
2022	Q3	1,264	1,210	1,716	1,576
2022	Q4	1,247	1,100	1,690	1,571
2023	Q1	1,323	1,329	1,821	1,597

Delta PSF has missing transactions (e.g. 2018 Q3)



# Moving on,

- Multiple linear regression
  - Identifying more critical independent variables
  - E.g. Floor level, unit size & No. of years left
- Finding methods to extract records beyond 5 years ago
  - Webscrapping a paid subscription website provided by client
- Trying out other forecasting methods
  - E.g. Moving average 3 & Holt-Winters' method
- Expanding our area of prediction
  - Other districts, and possibly other type or units aside from condominium



Thank You



Q&A

# Prediction Results

Condo Name			Outliers removed	MAE	MSE	
CAMELOT BY-THE-WATER	109.637	-46.1116	0	303.3941	92359.11	-27.5939
CASUARINA COVE	-24.7352	6.016539	1	19.79084	404.0521	0.885869
COSTA RHU	48.02972	-12.5518	1	50.73922	2623.635	-7.66577
COTE D'AZUR	62.74022	-9.41013	1	44.18636	2308.459	0.086226
DUNMAN VIEW	0.677587	5.37856	1	37.34773	1504.975	-0.66497
LEGENDA AT JOO CHIAT	13.47806	-2.07609	0	121.8435	15326.32	-0.22014
MANDARIN GARDENS	-9.83773	16.18354	1	88.07447	13544.65	-1.15036
PEBBLE BAY	-42.3344	8.553452	1	41.83342	2127.092	-0.90161
RIVEREDGE	2.440886	7.506005	0	91.93855	8723.521	-0.00554
SANCTUARY GREEN	23.61261	1.037153	1	77.85168	6464.145	-0.54934
SILVERSEA	33.765	-20.2603	0	169.0014	37701.55	-1.84647
TANJONG RIA CONDOMINIUM	24.07707	0.459459	1	22.15809	608.8032	-0.82519
THE SHORE RESIDENCES	0.794371	3.788923	2	47.81044	3258.392	0.304368
VILLA MARINA	-10.0733	13.14166	0	23.89	1093.296	0.776275
WATER PLACE	12.03412	0.334498	0	35.91961	1909.17	-1.17082