Investigation into the relationship between surrounding locale on property values of suburbs in Melbourne, Australia

by

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Introduction and Business Problem

As the property values continue to fall in Australia's capital cities, many Australians are seeing it as an opportunity to take advantage of the lower prices and purchase new property. Westpac bank recently reported a 11.8 % increase in respondents who think it's a good time to buy property, led by consumers in New South Wales and Victoria [1]. For those looking to buy property be it for first time home buyers, investors or business owners; location has one of the biggest impacts on purchase price, resale value or in determining if a business will do well, However, what makes good location or a bad one is a subjective topic depending on each individual's wants and needs.

This study is aimed towards informing home buyers and property investors of selected suburbs in the state of Victoria, Australia. Buyers will be able to use this information to aid them in making decision on purchasing properties in suburbs that are within their budget and explore popular venue categories in those areas while business owners are able to better decide which areas best suit their business model.

Objective

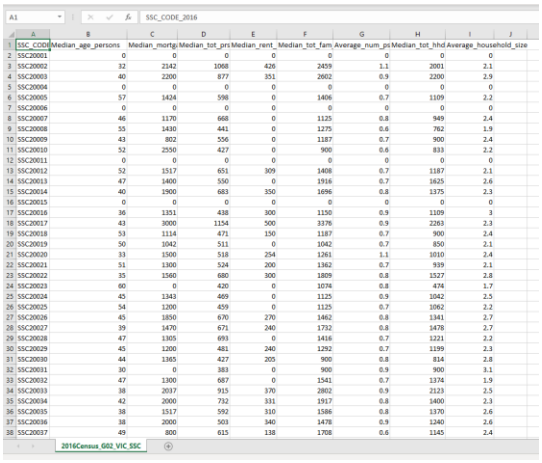
The objective of this paper is to investigate the relationship between the type of venues in the form of categories and the property values of houses and apartment units in Melbourne, Victoria.

Data Gathering

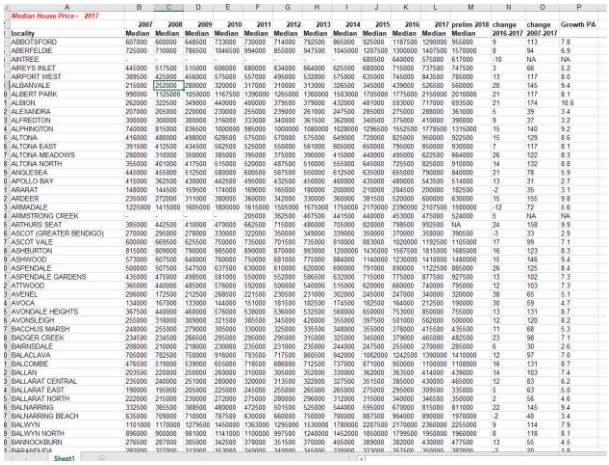
The data used for this analysis was obtained from two sources: the first are the suburb profiles collected from the 2016 census of population and housing performed by the Australian Bureau of Statistics (ABS). The data set is publicly available for download on the ABS website. This is a large dataset containing many features ranging from labour force status, family composition, occupation to qualifications for every suburb in the state of Victoria. For the purpose of this analysis only the dataset label '2016Census_G02_VIC_SSC' and '2016Census_G41_VIC_SSC' will be used. The first one contains the median values of certain feature for each suburb including age, mortgage monthly repay, personal income, household income, family weekly income, average household size and number of persons per bedroom. However, emphasis will be placed on weekly household income and age. It should be noted that the

data on incomes are from those who are 15 years or older and the survey form list income in ranges rather than requesting a specific amount. While the second dataset contains the total population for each suburb. An example of the data set is shown in figure 1 below (left). Population only counts those who are 1 year or older.

The second and third data sets that was used are the ones containing the median house and unit values for every suburb in Victoria. This data set comes from the Victorian State Government of Australia and is available from their website. It is important to note that because the last census was performed in 2016 and the next one is only scheduled for 2021, the 2016 version will be used for the analysis despite being outdated as this data is the most complete that is publicly available. The 2016 median house and unit prices will be used for consistency with the rest of the data. An example is shown in figure 1 (right).



SSC_CODE	Median_age_persons	Median_mortg	Median_tot_prs	Median_rent	Median_tot_fam	Average_num_ps	Median_tot_hhd	Average_household_size
SSC20001	0	0	0	0	0	0	0	0
SSC20002	32	2142	1068	426	0	2459	1.1	2001	2.1
SSC20003	40	2200	877	351	0	2602	0.9	2200	2.9
SSC20004	0	0	0	0	0	0	0	0	0
SSC20005	57	1424	598	0	0	1406	0.7	1109	2.2
SSC20006	0	0	0	0	0	0	0	0	0
SSC20007	46	1170	668	0	0	1125	0.8	949	2.4
SSC20008	55	1430	441	0	0	1275	0.6	762	1.9
SSC20009	43	802	556	0	0	1187	0.7	900	2.4
SSC20010	52	2550	427	0	0	900	0.6	833	2.2
SSC20011	0	0	0	0	0	0	0	0	0
SSC20012	52	1517	651	309	0	1408	0.7	1187	2.1
SSC20013	47	1400	550	0	0	1916	0.7	1625	2.6
SSC20014	40	1500	683	350	0	1696	0.8	1375	2.3
SSC20015	0	0	0	0	0	0	0	0	0
SSC20016	36	1351	438	300	0	1150	0.9	1109	3
SSC20017	43	3000	1154	500	0	3376	0.9	2263	2.3
SSC20018	53	1114	471	150	0	1187	0.7	900	2.4
SSC20019	50	1042	511	0	0	1042	0.7	850	2.1
SSC20020	33	1500	518	254	0	1261	1.1	1010	2.4
SSC20021	51	1300	524	200	0	1362	0.7	939	2.1
SSC20022	35	1560	680	300	0	1809	0.8	1527	2.8
SSC20023	60	0	420	0	0	1074	0.8	474	1.7
SSC20024	45	1343	469	0	0	1125	0.9	1042	2.5
SSC20025	54	1200	459	0	0	1125	0.7	1062	2.2
SSC20026	45	1850	670	270	0	1462	0.8	1341	2.7
SSC20027	39	1470	671	240	0	1732	0.8	1478	2.7
SSC20028	47	1305	693	0	0	1416	0.7	1221	2.2
SSC20029	45	1200	481	240	0	1252	0.7	1199	2.3
SSC20030	44	1365	427	205	0	900	0.8	814	2.8
SSC20031	30	0	383	0	0	900	0.9	900	3.1
SSC20032	47	1300	687	0	0	1541	0.7	1374	1.9
SSC20033	38	2037	915	370	0	2802	0.9	2123	3.5
SSC20034	42	2000	732	331	0	1917	0.8	1400	2.3
SSC20035	38	1517	592	310	0	1586	0.8	1370	2.6
SSC20036	38	2000	503	340	0	1478	0.9	1240	2.6
SSC20037	49	800	615	138	0	1708	0.6	1145	2.4



Median House Price - 2017

locality	2007 Median	2008 Median	2009 Median	2010 Median	2011 Median	2012 Median	2013 Median	2014 Median	2015 Median	2016 Median	2017 Median	prelim 2018 Median	change 2016-2017	change 2007-2017	Growth PA
ABBOTSFORD	607000	600000	648500	723000	730000	714000	792500	865000	925000	1187500	1290000	950000	9	113	7.9
ABERFELDIE	725000	710000	786500	1046500	994000	850000	947500	1045000	1297500	1300000	1407500	1570000	8	94	6.9
AINTREE	-	-	-	-	-	-	-	-	-	680500	640000	575000	-10	NA	NA
AIREYS INLET	445000	517500	515000	606000	680000	634000	664000	625500	688000	716000	737500	747500	3	66	5.2
AIRPORT WEST	389500	425000	456000	575000	557000	495000	532000	575000	635000	745000	843500	785000	13	117	8.0
ALBANVALE	215000	252000	280000	320000	317000	310000	313000	326500	345000	439000	526500	560000	20	145	9.4
ALBERT PARK	990000	1125000	1050000	1167500	1390000	1265000	1360000	1563000	1705000	1775000	2150000	2010000	21	117	8.1
ALBION	262000	322500	349000	440000	400000	379500	379000	432000	481000	593000	717000	693500	21	174	10.6
ALEXANDRA	207000	205000	220000	230000	255000	239000	261000	247500	285000	275000	288000	361000	5	39	3.4
ALFREDTON	300000	300000	300000	316000	333000	340000	361500	362000	340500	375000	410000	390000	9	37	3.2
ALPHINGTON	740000	815000	836500	1000000	985000	1000000	1080000	1028000	1296500	1552500	1778500	1315000	15	140	9.2
ALTONA	416000	488000	498000	628500	575000	570000	575000	649000	720000	825000	950000	922500	15	129	8.6
ALTONA EAST	391500	412500	434500	562500	525000	550000	561000	605000	650000	796000	850000	930000	7	117	8.1
ALTONA MEADOWS	280000	310000	350000	385000	395000	375000	390000	415000	440000	490000	622500	664000	26	122	8.3
ALTONA NORTH	355000	401000	417500	515000	520000	487500	510000	555000	645000	725000	825000	910000	14	132	8.8
ANGLESEA	445000	455000	512500	580000	600500	587500	550000	612500	635000	655000	790000	840000	21	78	5.9
APOLLO BAY	415000	362500	430000	442500	490000	432500	460000	460000	435000	480000	543500	514000	13	31	2.7
ARARAT	148000	144500	159500	174000	169000	165000	180000	200000	210000	204500	200000	182500	-2	35	3.1
ARDEER	235000	272000	311000	380000	360000	342000	330000	360000	381500	520000	600000	630000	15	155	9.8
ARMADALE	1225000	1415000	1605000	1800000	1615000	1505000	1675000	1750000	2170000	2390000	2107500	1500000	-12	72	5.6
ARMSTRONG CREEK	-	-	-	-	205000	362500	467500	441500	440000	453000	475000	524000	5	NA	NA
ARTHURS SEAT	395000	442500	410000	470000	662500	715000	488000	705000	820000	798500	992500	NA	24	158	9.9
ASCOT (GREATER BENDIGO)	270000	290000	278000	330000	322000	350000	349000	339000	350000	370000	358000	390000	-3	33	2.9
ASCOT VALE	600000	669500	625500	750000	735000	701500	735000	810000	883000	1020000	1192500	1105000	17	99	7.1
ASHBURTON	815000	809000	790000	985000	890000	870000	993000	1200000	1435000	1567500	1815000	1685000	16	123	8.3
ASHWOOD	573000	607500	640000	760000	750000	681000	775000	884000	1140000	1230000	1410000	1480000	15	146	9.4
ASPENDALE	500000	507500	547500	637500	630000	610000	620000	690000	791000	890000	1122500	885000	26	125	8.4
ASPENDALE GARDENS	435000	475000	498500	581000	550000	552000	586500	632000	715000	775000	877500	927500	13	102	7.3
ATTWOOD	365000	440000	485000	576000	592000	500000	540000	515000	620000	660000	740000	795000	12	103	7.3
AVENEL	206000	172500	212500	268500	221500	230500	231000	302900	245000	247000	340000	320000	38	65	5.1
AVOCA	134000	167000	133000	144000	151000	181500	182500	174500	182500	164000	212500	190000	30	59	4.7
AVONDALE HEIGHTS	367500	440000	468000	576000	538000	536000	532500	560000	650000	753000	850000	755000	13	131	8.7
AVONSLEIGH	255000	318000	309000	321500	380500	345000	429000	355000	397500	591000	562000	500000	12	120	8.2
BACCHUS MARSH	248000	255000	279000	305000	330000	325000	335500	348000	365000	376000	415500	435500	11	68	5.3
BADGER CREEK	234500	234500	266500	295000	295000	295000	315000	325000	345000	379000	465000	482500	23	98	7.1
BAIRNSDALE	208000	210000	218000	230000	235000	231000	235000	244000	247500	255000	270000	286000	6	30	2.6
BALACLAVA	705000	782500	750000	916000	793500	717500	860500	942000	1062000	1242500	1390000	1410000	12	97	7.0
BALCOMBE	476500	519000	553000	655000	716500	686000	712500	737000	871000	950000	1100000	1108000	16	131	8.7
BALLAN	203500	220000	250000	260000	310000	305000	302000	330000	362900	363500	414000	398000	14	103	7.4
BALLARAT CENTRAL	235000	249000	251000	280000	320000	313500	322000	327500	351500	385000	430000	465000	12	83	6.2
BALLARAT EAST	190000	195000	205000	225000	241000	256000	260000	265000	275000	295000	309500	335000	5	63	5.0
BALLARAT NORTH	222000	215000	230000	272000	275000	280000	296000	312000	315000	340000	346500	350000	2	56	4.6
BALNARRING	332500	365500	388500	480000	472500	501500	525000	544000	595000	670000	815000	811000	22	145	9.4
BALNARRING BEACH	626000	709000	710000	787500	630000	660000	710000	700000	887500	994000	890000	1970000	-2	40	3.4
BALWYN	1101000	1170000	1275600	1450000	1363000	1295000	1530000	1780000	2207500	2170000	2360000	2255000	9	114	7.9
BALWYN NORTH	896000	900000	981000	1141000	1100000	997500	1240000	1452000	1850000	1795000	1960000	1960000	8	118	8.1
BANNOCKBURN	276500	287000	305000	342500	378000	351500	370000	405000	389000	382000	430000	477500	13	55	4.5
BARANDUDA	293000	327000	333000	363000	369000	340000	344000	339000	373000	367500	360000	383000	-2	30	1.8

Figure 1: Preview of dataset from the 2016 census of population and housing (left) and median housing price (right).

Data Limitations

This study is limited by the data available as it relies on publicly available datasets. These datasets may not be up to date or may lack certain details. The dataset containing prices of houses and units do not include details such as number of rooms, size, age, building if it's a unit or type of house. Furthermore, a full-scale study of all suburbs in the state of Victoria is not possible due to time constraints and hardware limitations. Therefore, this study will analyse selected suburbs in and around Melbourne city and should be taken as a general overview rather than a definitive indicator.

Defining the Analysis Area

For this study the methodology involves sourcing the relevant data, cleaning the data, exploration and analysis. The selected region is Melbourne located in the state of Victoria, Australia. Melbourne is second largest and populous city behind Sydney. Owing to the large number of suburbs in the Victoria, only the ones located in Melbourne city and its surroundings will be used for this analysis. The suburbs in Victoria are grouped into regions that are under the authority of various local city councils as shown in the figure 2 below.

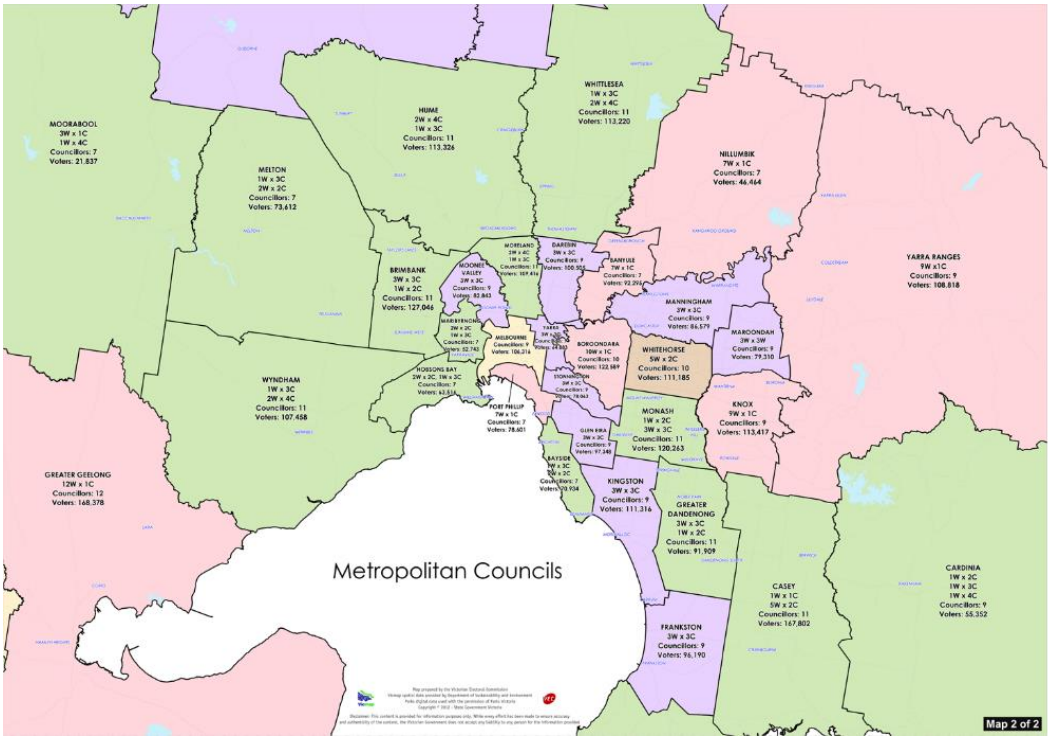


Figure 2: Map showing the city councils in Victoria [5].

The city councils chosen for this study are:

- City of Melbourne
- City of Port Phillip
- City of Yarra
- City of Boroondara
- City of Stonnington
- City of Monash
- City of Whitehorse
- City of Moonee Valley
- City of Maribyrnong
- City of Hobsons Bay
- City of Brimbank
- City of Greater Dandenong
- City of Darebin
- City of Moreland

These councils are in and around the city of Melbourne with more being on the eastern side and southern eastern part of the city and some on the western parts. This is to not bloat the analysis area by taking large land areas such as City of Melton, Hume and Wyndham.

Leveraging on Foursquare Places API

As part of the requirement of this Capstone course as laid out by IBM, Foursquare's place API is used to obtain location data for each suburb, this will be in the form of venues categories located around the suburbs of interest. Foursquare includes a "explore" method that returns venues for a user specified location. The datasets mentioned previously containing median housing values, median unit values and suburb profile data will be combined with the location data from Foursquare. Unsupervised learning will be applied to the newly formed datasets in order to group similar suburbs together. This will enable selection of suburbs based on property value and types of venues.