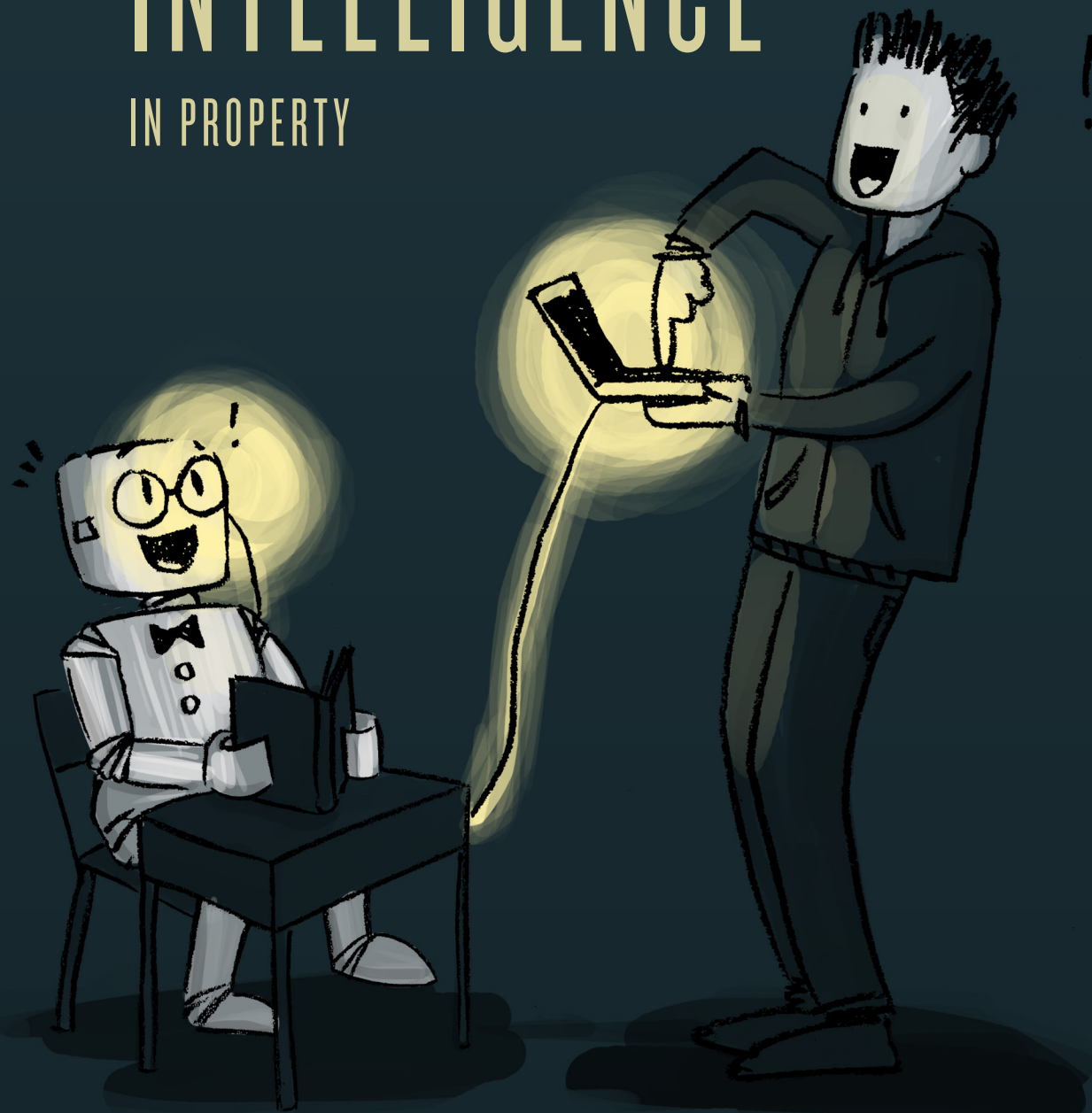


ARTIFICIAL INTELLIGENCE

IN PROPERTY



The Inside Perspective

3 THE VALUE OF ARTIFICIAL INTELLIGENCE FOR PROPERTY

This month, Secret Agent takes a closer look at artificial intelligence, with a focus on property prices in Melbourne. By examining regression and classification methods, we use machine learning to discover trends and patterns in data.

"By far, the greatest danger of Artificial Intelligence is that people conclude too early that they understand it."

Eliezer Yudkowsky

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View our Scorecard summary online

The Value of Artificial Intelligence for Property

by Daniel Schulz

Artificial intelligence and machine learning have been among the top buzzwords for the past few years; and with good reason, they're here to stay.

Additionally they change everything we know about data from how it is collected and processed, to how it is used to find trends which otherwise would have gone unnoticed.

Machine learning, a type of artificial intelligence, may be broadly divided into two areas: regression and classification.

- **Regression** focuses on predicting the price or value of a good, using past prices to approximate future prices.
- **Classification** focuses on answering binary (yes/no) questions, compiling similar goods into clusters, and categorising goods automatically.

Additionally, machine learning tasks are divided into:

- **Supervised learning**¹ – in which a person helps the machine learning algorithm to understand the rules that define example inputs and desired outputs.
- **Unsupervised learning**² – in which no input/output examples are given to the algorithm, thus allowing the algorithm to find structures and patterns itself.
- **Reinforcement learning** – in which the algorithm interacts with external stimuli to achieve a certain goal – the most prominent example of this being a self-driving vehicle.

This report will focus on property prices in Melbourne by examining regression and classification methods. We therefore use machine learning to discover trends and patterns in the data, which would otherwise be unseen.

Regression

Based on experimental data we can obtain functions that approximate prices for a suburb and evaluate which regression methods provide a plausible result³. To make meaningful comparisons four different Melbourne suburbs are evaluated. Our suburbs of interest include: Richmond, Brunswick, South Yarra and Hawthorn.

Linear & Polynomial

Using data obtained from 2011 – 2016 we obtain a linear

function, more commonly known as line of best fit, which is a standard straight-line function. What is not so commonly known, is that this first-order linear polynomial, may be expanded to higher order polynomials such as quadratics or cubics. This is known as a Taylor Expansion, which allows any function to be approximated by a polynomial function. Applying this technique for various degrees of polynomials results in the graphs shown in Figures 1-4.

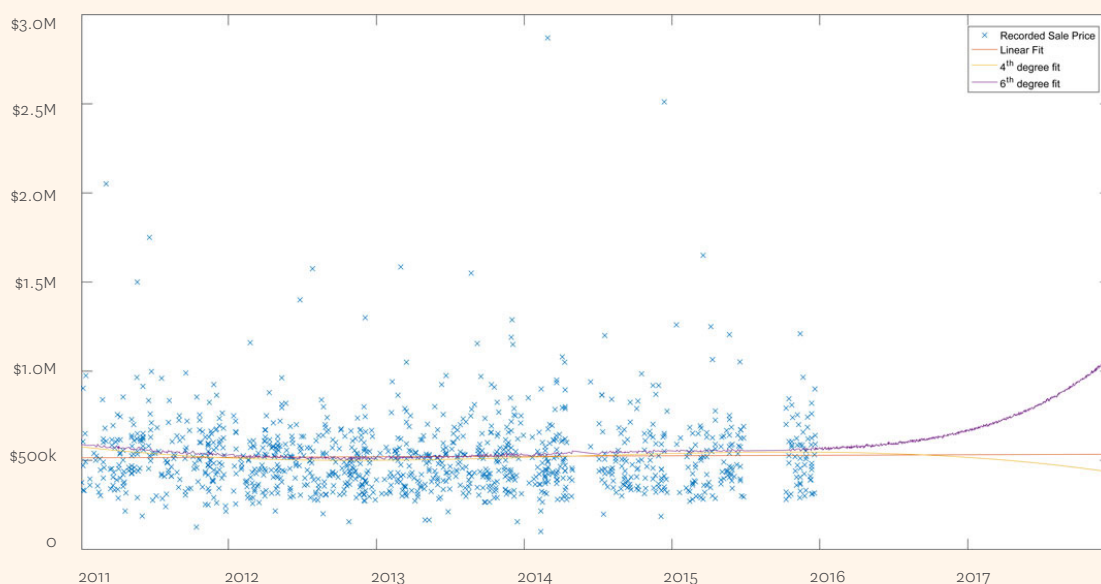
The different functions are expressed by the different coloured lines in the graphs. Each line represents a different degree. Degrees are simply the highest power of our input variable "time". We see from this, that polynomial regression has its

limitations, as higher degree polynomials do not account for errors, and in fact become worse at predicting prices over longer periods of time.

This is particularly noticeable for the 6th degree polynomial for the Hawthorn dataset, which would have predicted a rather large dip and recovery for 2017, which has obviously not been the case.

It is important to note, that some degree polynomials fit data better than others, and therefore the same degree polynomials cannot be used for all data sets. The most appropriate degrees have been chosen for these graphs.

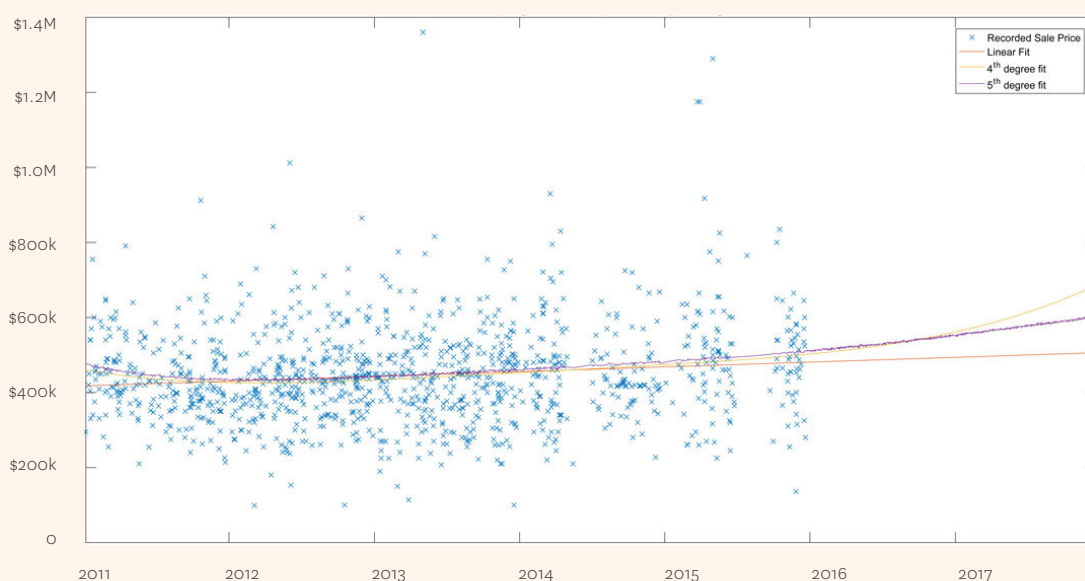
Figure 1 Richmond Property Sale Prices (2011-2017) with regression



Richmond

We see that prices within Richmond are relatively stable, as per the linear fit trend. This particular set of prices, shows the fallacies of relying solely in regression analysis, as the 4th order predicts a downward trend, while the 6th order predicts an unrealistic upward trend.

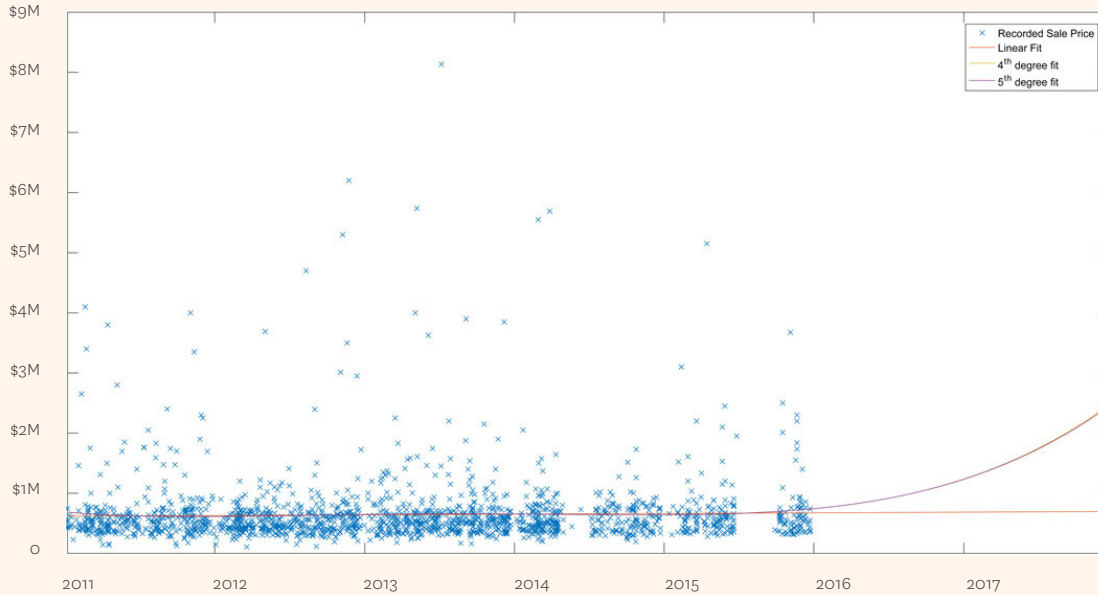
Figure 2 Brunswick Property Sale Prices (2011-2017) with regression



Brunswick

We can see for Brunswick, that all regressors predict an upward trend – this is in line of what is currently expected, due to the immense growth in the suburb, due to its proximity to the CBD and Universities. Despite the growth in construction, it suggests that there is no shortfall of demand and that prices are increasing.

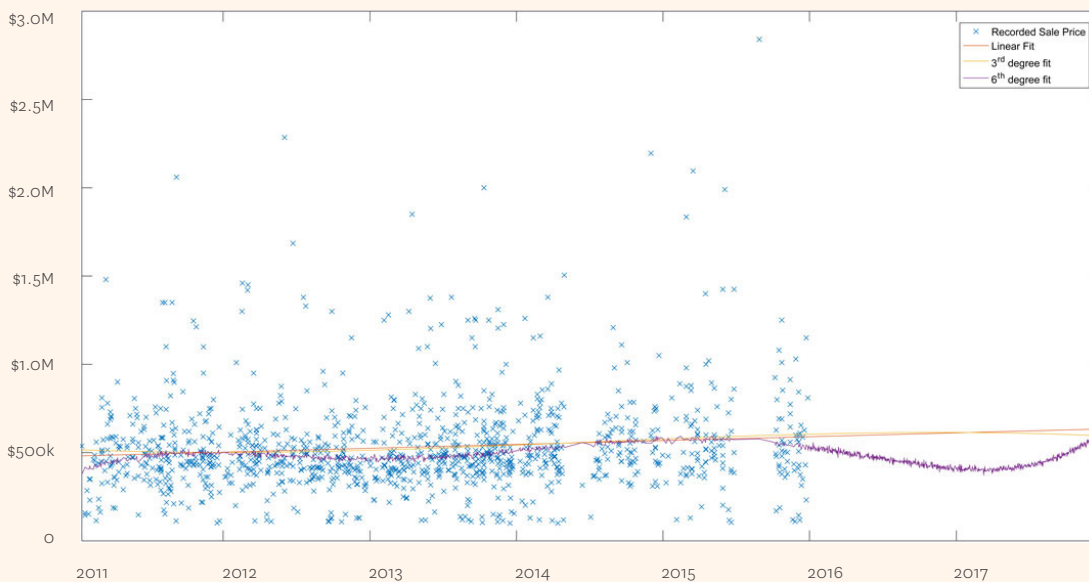
Figure 3 South Yarra Property Sale Prices (2011-2017) with regression



South Yarra

Much like Richmond, we see that prices in South Yarra are relatively flat, however we may see a slight upward trend. This once again highlights limitations of pure regression analysis.

Figure 4 Hawthorn Property Sale Prices (2011-2017) with regression



Hawthorn

In Hawthorn we see a slight upward trend – which like Brunswick, is likely attributed to the proximity to the CBD and various universities.

Classification & Regression: Gradient Boost

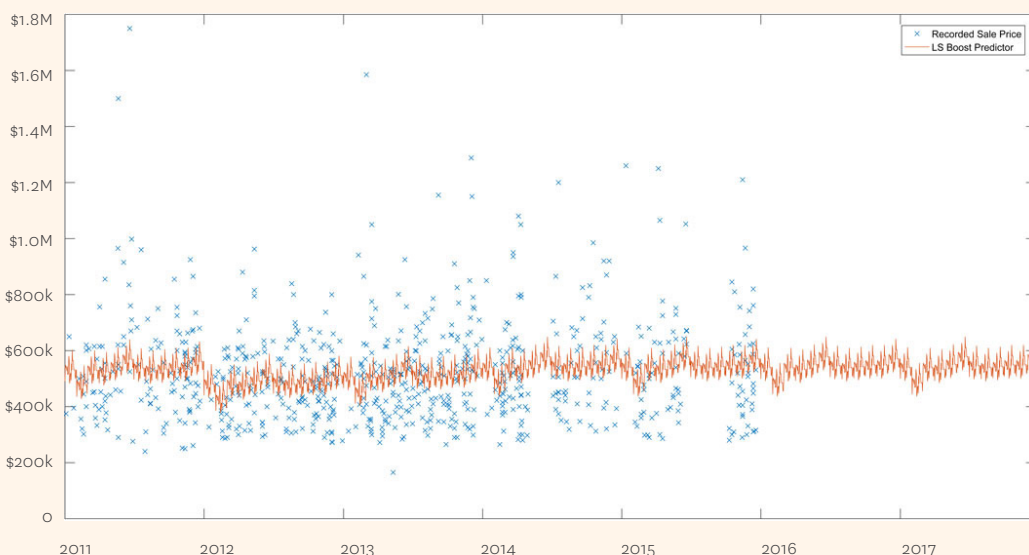
The deficiencies in the above method lead us to a slightly different method: Gradient Boost, which combines aspects of both classification and regression.

The underlying algorithms and models behind this method are known as Decision Tree models. These are a series of questions starting with broad open-ended questions, to low-level granular questions; each level of questioning narrows down a possible answer and leads to a predicted data point. “Boosting” uses this type of methodology but, “boosts” or places greater importance on incorrectly predicted points by combining them to form a stronger and more robust predictor⁴.

The major advantage of using Gradient Boost, is that we may now incorporate features in the dataset, such as: number of rooms in the house, municipality, agency who managed the sale, and so forth. For our analysis we will only use the date, at which the properties were sold to allow us to compare more easily with the regressed polynomial predictions.

Applying the gradient boost method to the same datasets used earlier, we see quite different predictions (Figures 5-9).

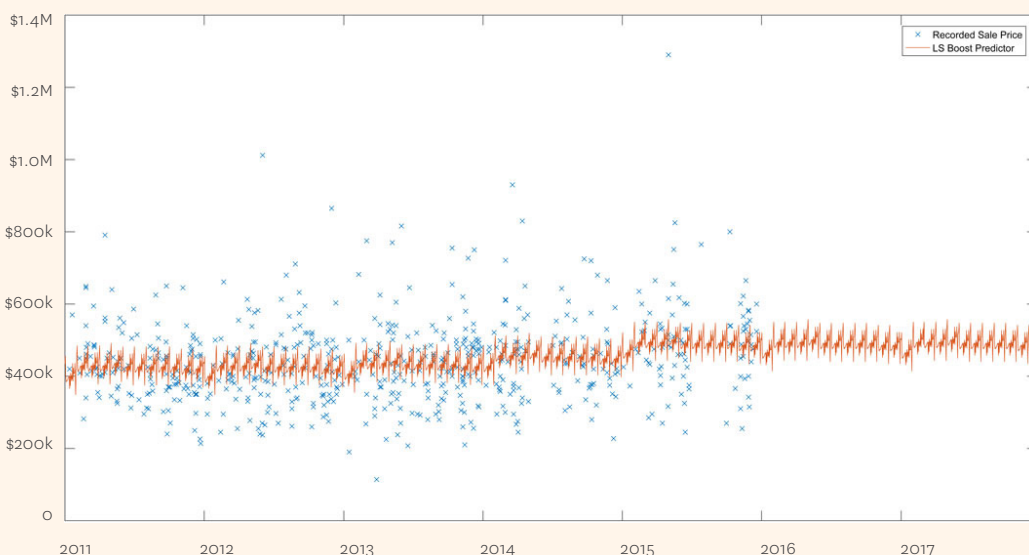
Figure 5 Richmond Property Sale Prices (2011-2017) with LS Boost regression



Richmond

This shows, that the predicted best day in the month to achieve the highest price, is the 20th of every month for Richmond. This should be taken with grain of salt, as most auctions occur during the weekend, rather than a specific day per month – an interesting trend nonetheless.

Figure 6 Brunswick Property Sale Prices (2011-2017) with LS Boost regression



Brunswick

In Brunswick, we see a similar pattern as seen in Richmond, with a slight decline in prices at the start of every year; this makes intuitive sense due to the festive season and the higher absorption requirements from the spring selling season. Having such a variance in prices, we may look further at the difference between various property types in Brunswick (Figure 7).

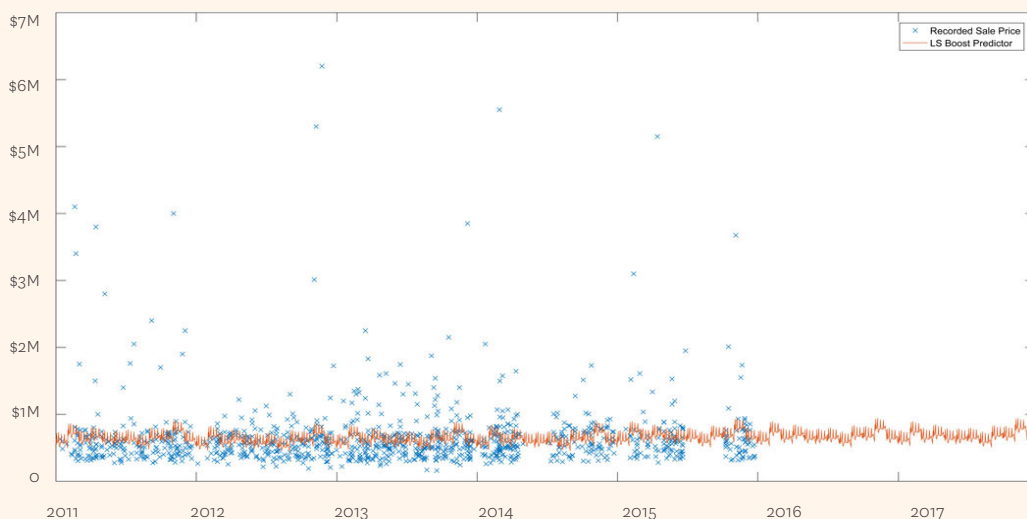
Figure 7 Brunswick House vs Apartment Property Sale Prices (2011-2017) with LS Boost regression



Brunswick

Here we see an interesting trend – the prices of apartments in Brunswick are relatively stable, while the prices of houses are extremely variable, with a large jump in 2015. We can see once more, that the end of the year having the lowest house prices. It should be noted, that due to a relatively small sample size, that there would be quite a large error in such a prediction, however it does indeed show a recurring trend every year.

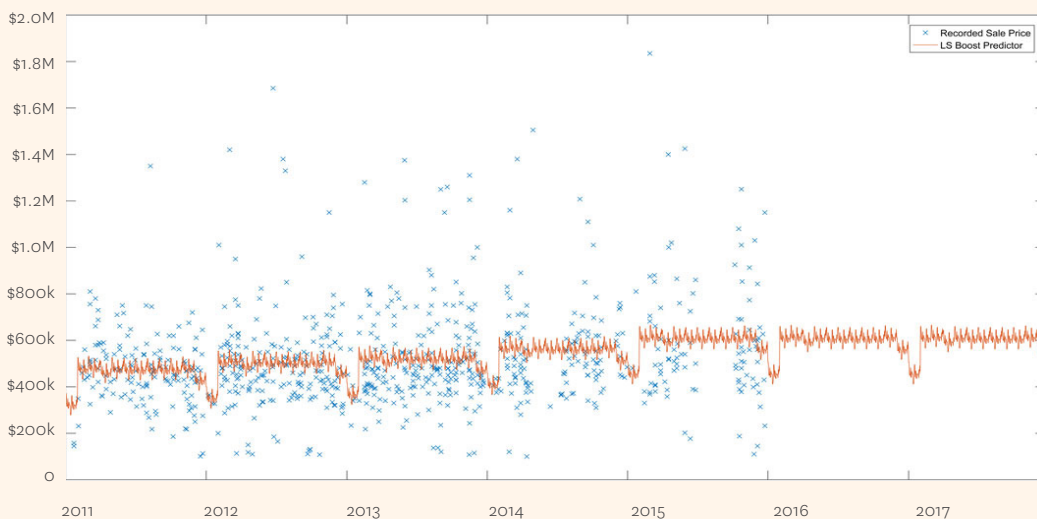
Figure 8 South Yarra Property Sale Prices (2011-2017) with LS Boost regression



South Yarra

In South Yarra, we see a somewhat oscillatory behaviour, where every 2 – 3 months there is a change in the average price for that 2-3 month period. The prices appear higher during the late spring and early summer months; decline during the late summer period and remain steady for the rest of the year.

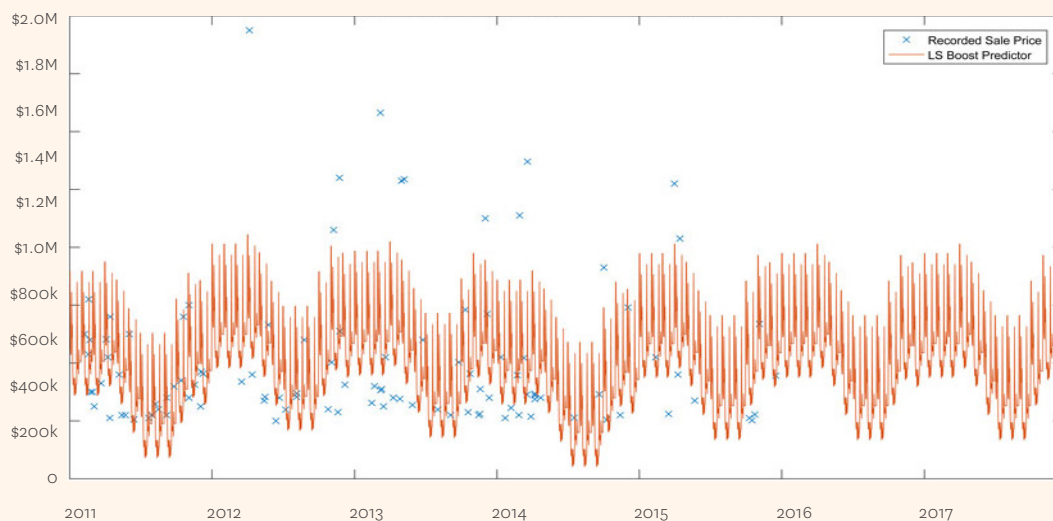
Figure 9 Hawthorn Property Sale Prices (2011-2017) with LS Boost regression



Hawthorn

Finally, in Hawthorn, we see an average increasing trend in price over the last 5 years, with a sharp decline in prices during the start of the year, similar to Richmond.

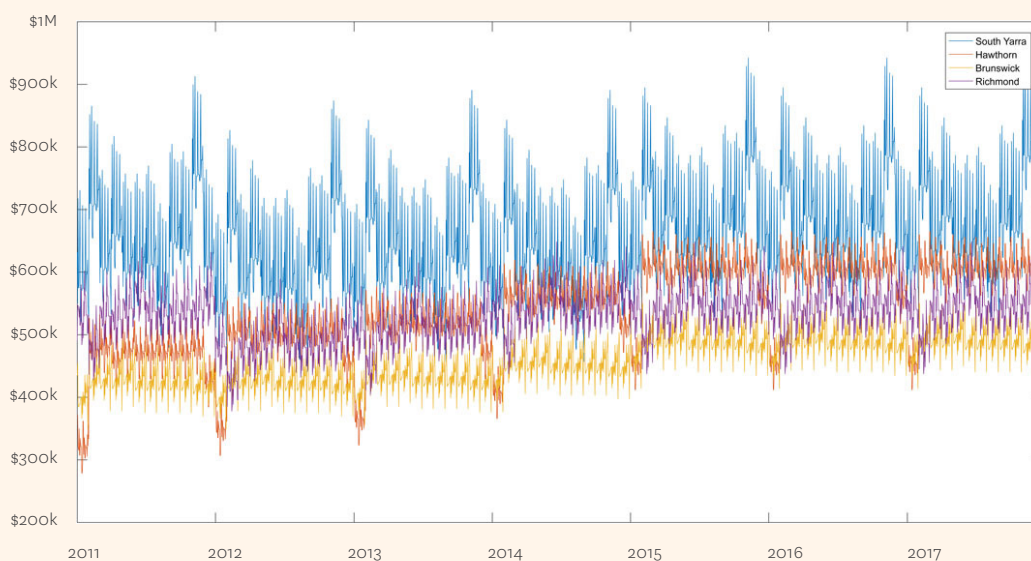
Figure 10 \$2,000,000+ Property Sale Prices (2011-2017) with LS Boost regression



\$2 Million+ Category

Refining our analysis to properties in the \$2 million plus range, we see an interesting trend that is unlike others - a downward turn during the middle months of the year, and peaks during the start of each year. We could attribute this to two reasons. The first being that the weather plays a significant role in the appearance of luxury homes, and thus results in higher prices during the warmer and sunnier summer months. Secondly, due to the end of financial year being in June, we may see an increase in supply for those wanting a return on investment for the current financial year.

Figure 11 South Yarra, Hawthorn, Brunswick and Richmond Gradient Boost predictions (2011-2017)



Conclusion

When comparing the gradient boost functions for all suburbs, it's clear to see the trend in property prices is increasing and that the prices are cyclical throughout the year.

To summarise, machine learning is a powerful tool that can be applied to many contexts, including property prices. Different techniques such as regression and classification exist which can be applied in different contexts. Overall, one should

always bear in mind that such predictions inherently contain a degree of error. It is also important to realise, the data used contains all types of dwellings, meaning a studio apartment is treated in the same manner as a 10-bedroom mansion. Machine learning is best used to discover hidden trends, and cycles which may otherwise have gone amiss to the naked eye. ♦

References

- ¹ <https://www.mathworks.com/discovery/supervised-learning.html>
- ² <https://au.mathworks.com/discovery/unsupervised-learning.html>
- ³ <https://www.analyticsvidhya.com/blog/2015/08/comprehensive-guide-regression/>
- ⁴ <http://blog.kaggle.com/2017/01/23/a-kaggle-master-explains-gradient-boosting/>

Market Review

by Paul Osborne and Ken Premtic

Daylight saving has now been officially switched on. With grand final week behind us, stock levels will continue to grow, especially after this latest round of school holidays has ceased.

Yet, while the stock levels will continue to grow, it's the quality of the offerings that count. We have seen a number of Springs with below average quality and this is making those that are "extra choosy" easily frustrated.

We think that there is a combination of reasons out there for this, including;

- The low interest rate environment makes it extremely difficult for a vendor to release a quality offering. Higher interest rates create "burn" and quality offerings are generally subject to low yields forcing owners to consider a sale when the cost of money begins to increase. Credit conditions are still on the cheap side and this is holding back the quality.
- The continued interest in the inner city. Demographics including downsizers, young professionals and families are all fighting to get closer to rich amenities and this often means closer to the CBD. Looking at world cities, this trend will only accelerate.
- Those seeking quality homes often have a quality home themselves they may need to sell. As they cannot buy, they sit and wait and the vicious cycle continues.

However, for those that aren't as choosy, we are expecting a smorgasbord of options to hit the market over the coming month.

Looking at the stats for the month we see a continual decline in inner houses and apartments with an average decline of 3.5% for the most recent quarter while townhouses have edged forwards.

From an observational perspective we are seeing:

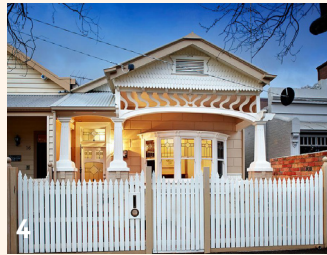
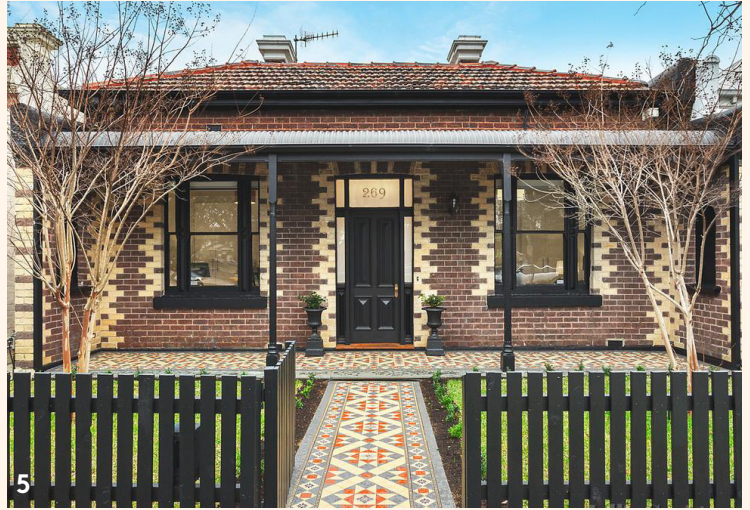
- Less bidders per auctions than a number of months ago.
- Softening / flatlining results for most properties.
- Quality residential and commercial offerings still getting record prices.
- Flat and falling commercial prices for property further out on the risk curve such as petrol stations etc.
- Strong prices for quality office investments within the CBD now commonly transacting at \$10,000 per m2. In some cases this is double from their previous sales in 2012/2013.
- Financing restrictions have eased somewhat with many buyers locking in more favourable interest rates than some months ago.

Secret Agent believes there should be good buying opportunities over the next couple of weeks as supply increases. Prospective purchasers are remaining vigilant and we are not sensing the same urgency we experienced in Spring 2016. 💎

Top Sales

SEP 2017



AI & Property
Vol.60 October 2017



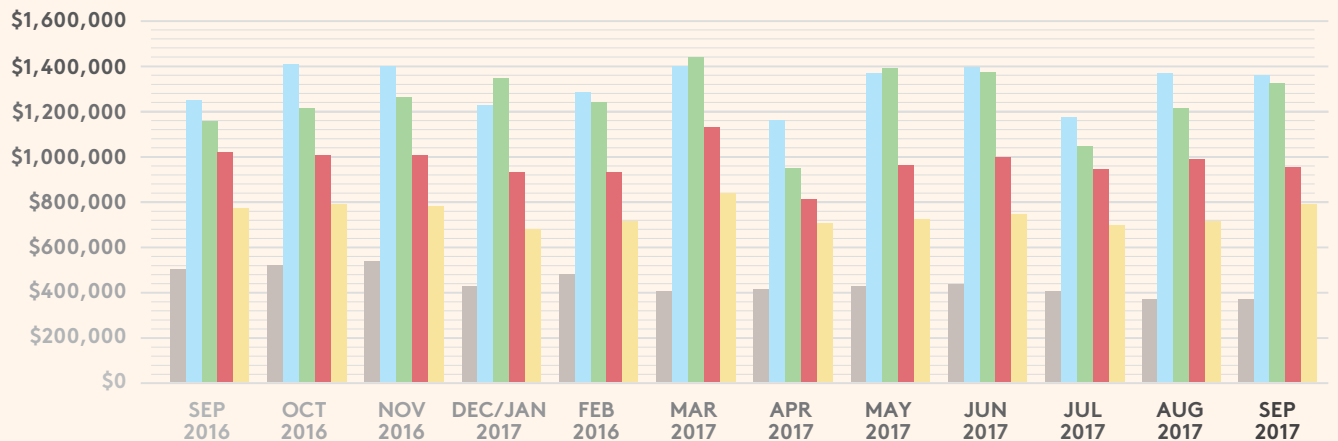
- 1 **\$1,720,000** 7/10 Waltham Place, Richmond
- 2 **\$2,720,000** 8 Graham Street, Albert Park
- 3 **\$2,250,000** 14 Cunningham Street, Northcote
- 4 **\$1,950,000** 14 Mountain Street, South Melbourne
- 5 **\$3,270,000** 269 Coppin Street, Richmond
- 6 **\$1,650,000** 18/8 Trenerry Crescent, Abbotsford
- 7 **\$3,610,000** 18/21 Marine Parade, St Kilda
- 8 **\$1,770,000** 22 Stanley Street, Brunswick
- 9 **\$2,000,000** 96 Fergie Street, Fitzroy North
- 10 **\$3,575,000** 423 Napier Street, Fitzroy

Quarterly Scorecard

JUL - SEP 2017

	Apartments	Houses	Townhouses
QUARTERLY GROWTH/DECLINE	-3.57% ↓	-3.42% ↓	+5.74% ↑
MEDIAN PRICE	\$540,000	\$1,447,500	\$1,052,500
AVERAGE PRICE	\$596,100	\$1,693,975	\$1,167,698
MEDIAN SQM	\$8,882	\$7,903	\$11,953
STOCK INVENTORY	3,265 +3.40% ↑	442 +51.00% ↑	110 +7.80% ↑
 BOOM	Flemington ↑ Kensington ↑ Richmond ↑	Abbotsford ↑ Albert Park ↑ Flemington ↑ Parkville ↑	-
 BUST	Abbotsford ↓ Carlton ↓ Docklands ↓ East Melbourne ↓ Fitzroy ↓ Melbourne ↓ Middle Park ↓	Brunswick ↓ Brunswick East ↓ Burnley ↓ Collingwood ↓ Kensington ↓ Port Melbourne ↓ South Yarra ↓	-

YEAR ON YEAR LOOK Median Prices



SEP 2016 - SEP 2017 GROWTH/DECLINE

■ -25.45% CBD Apartments
 ■ +5.60% Inner South Apartments, Townhouses and Houses (A,T & H)
 ■ +12.22% Inner East (A,T & H)
 ■ -6.79% Inner North (A,T & H)
 ■ +2.67% Inner West (A,T & H)

LEGEND

1. Inner Melbourne is defined by suburbs falling into the 8km radius of the CBD.
2. Overall growth/decline is based on changes in median price between quarters.
3. A boom! is recorded when a category records three consecutive quarters of positive growth.
4. A bust! is recorded when a category records two consecutive quarters of negative growth.

Quarterly Turnover

JUL - SEP 2017

AI & Property
Vol.60 October 2017

		PREVIOUS QUARTER (APR, MAY, JUN 2017)				CURRENT QUARTER (JUL, AUG, SEP 2017)			
		Apartments	Apartments (by area)	Houses & Townhouses	Houses & Townhouses (by area)	Apartments	Apartments (by area)	Houses & Townhouses	Houses & Townhouses (by area)
Central	Docklands	1.30%		-		1.18%		2.22%	
	Melbourne	0.94%	1.02%	1.52%	6.30%	0.94%	0.97%	-	5.04%
	Southbank	1.07%		-		0.95%		-	
Inner North	Brunswick	1.14%		0.75%		1.21%		0.80%	
	Brunswick East	1.89%		0.80%		1.98%		1.16%	
	Carlton	0.39%		0.45%		0.50%		1.29%	
	Carlton North	0.76%		0.91%		0.38%		0.77%	
	Clifton Hill	1.40%		0.87%		0.40%		0.87%	
	Collingwood	1.41%	0.87%	1.15%	0.77%	1.68%	0.86%	0.70%	0.89%
	Fitzroy	0.68%		1.02%		0.50%		1.34%	
	Fitzroy North	0.75%		0.62%		1.33%		0.70%	
	North Melbourne	0.51%		0.83%		0.81%		0.78%	
	Northcote	1.50%		0.51%		0.78%		0.78%	
	Parkville	0.94%		0.72%		0.58%		0.29%	
Princes Hill	-		0.32%		-		-		
Inner East	Abbotsford	2.43%		1.20%		4.68%		1.35%	
	Burnley	0.68%		0.98%		1.36%		0.98%	
	Cremorne	1.66%		0.39%		0.55%		0.20%	
	East Melbourne	0.69%	1.32%	0.53%	0.76%	0.50%	1.10%	0.71%	0.83%
	Hawthorn	1.04%		1.00%		0.91%		0.80%	
	Prahran	1.82%		0.89%		1.49%		1.17%	
	Richmond	1.46%		0.80%		1.10%		1.04%	
	South Yarra	1.29%		0.84%		0.91%		1.06%	
Inner South	Albert Park	0.20%		0.77%		0.59%		0.53%	
	Middle Park	0.21%	1.11%	0.85%	0.89%	0.21%	0.93%	0.60%	0.92%
	Port Melbourne	1.54%		0.93%		1.22%		1.02%	
	South Melbourne	0.89%		1.19%		0.74%		1.38%	
Inner West	Flemington	0.36%		1.37%		0.48%		1.15%	
	Kensington	1.43%	1.05%	0.92%	0.92%	0.40%	0.73%	0.89%	0.82%
	Travancore	1.87%		0.74%		1.46%		0.37%	
	West Melbourne	1.42%		1.20%		1.30%		0.80%	

Total sales for the period against total housing supply. Table compiled from data collected from April to September 2017.
Total private dwellings information from the 2011 Census Report from the Australian Bureau of Statistics.

0.92%

Apartments

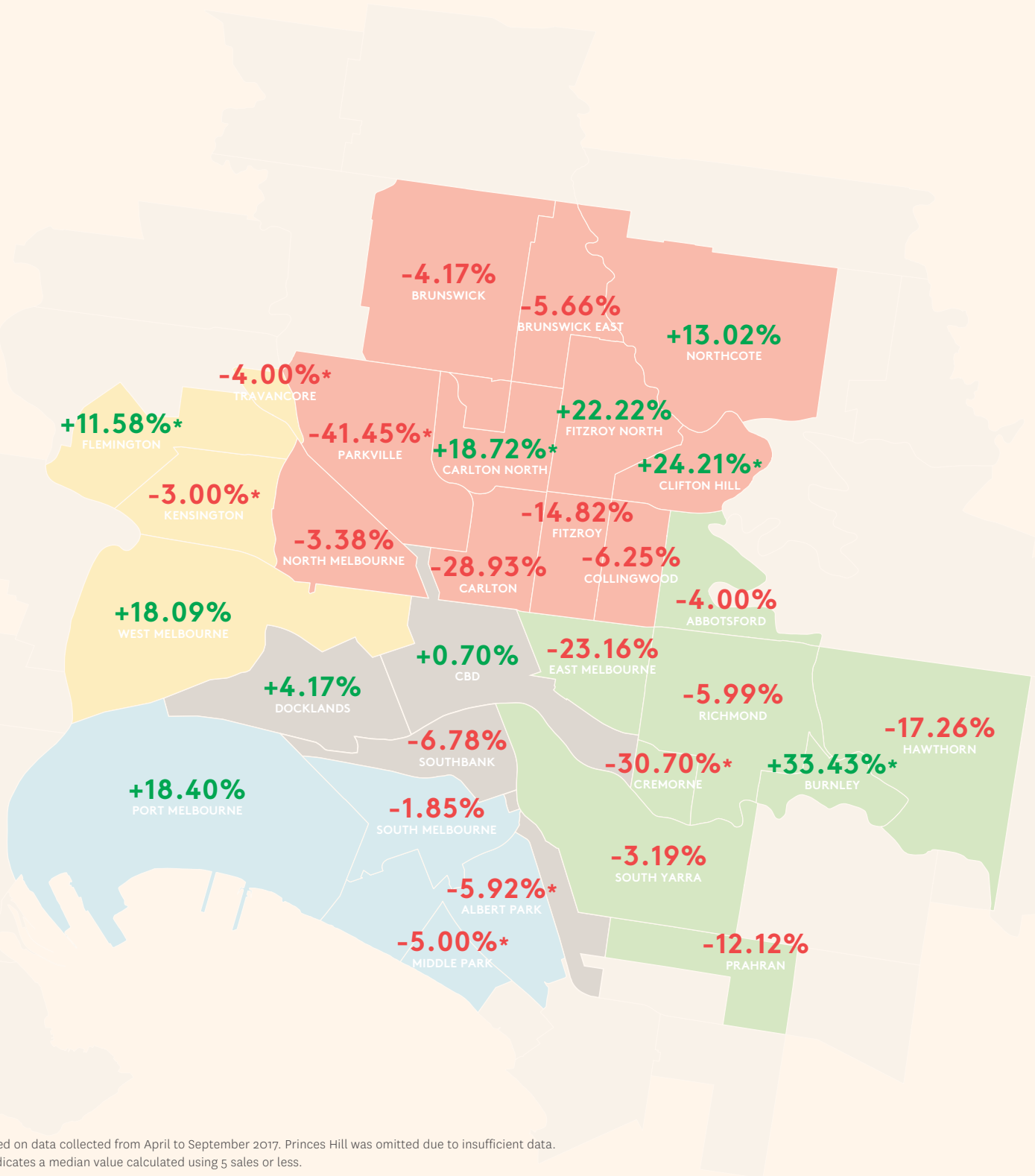
PRICE COMPARISONS BY ROLLING QUARTERS

	PREVIOUS QUARTER (APR, MAY, JUN 2017)				CURRENT QUARTER (JUL, AUG, SEP 2017)				
	Average Price	Median Price	Lowest Sale	Highest Sale	Average Price	Median Price	% change	Lowest Sale	Highest Sale
Docklands	\$660,386	\$536,500	\$280,000	\$1,925,000	\$574,081	\$558,888	↑ 4.17%	\$301,000	\$1,200,000
Melbourne	\$585,643	\$499,000	\$165,000	\$2,270,000	\$570,104	\$502,500	↑ 0.70%	\$142,000	\$1,710,000
Southbank	\$656,188	\$590,000	\$335,000	\$1,680,000	\$538,614	\$550,000	↓ -6.78%	\$325,000	\$935,000
Brunswick	\$483,575	\$480,000	\$202,000	\$755,000	\$475,069	\$460,000	↓ -4.17%	\$250,000	\$1,030,000
Brunswick East	\$529,200	\$530,000	\$365,000	\$835,000	\$489,523	\$500,000	↓ -5.66%	\$320,000	\$662,000
Carlton	\$644,062	\$689,500	\$220,000	\$1,135,000	\$582,350	\$490,000	↓ -28.93%	\$150,000	\$1,325,000
Carlton North	*\$464,875	*\$487,500	\$285,000	\$599,500	*\$578,750	*\$578,750	↑ 18.72%	\$502,500	\$655,000
Clifton Hill	\$601,857	\$636,000	\$465,000	\$712,000	*\$790,000	*\$790,000	↑ 24.21%	\$550,000	\$1,030,000
Collingwood	\$715,875	\$600,000	\$230,000	\$2,301,000	\$689,531	\$562,500	↓ -6.25%	\$335,000	\$1,305,000
Fitzroy	\$1,015,272	\$772,500	\$655,000	\$2,265,000	\$736,550	\$658,000	↓ -14.82%	\$545,000	\$1,130,000
Fitzroy North	\$522,000	\$441,000	\$330,000	\$995,000	\$567,283	\$539,000	↑ 22.22%	\$250,000	\$1,350,000
North Melbourne	\$558,250	\$547,500	\$303,000	\$800,000	\$538,545	\$529,000	↓ -3.38%	\$140,000	\$1,080,000
Northcote	\$512,599	\$480,000	\$312,501	\$820,000	\$583,173	\$542,500	↑ 13.02%	\$330,000	\$1,150,000
Parkville	\$894,687	\$751,500	\$285,000	\$1,770,000	*\$656,200	*\$440,000	↓ -41.45%	\$340,000	\$1,203,000
Princes Hill	-	-	-	-	-	-	-	-	-
Abbotsford	\$630,666	\$500,000	\$310,000	\$1,690,000	\$573,517	\$480,000	↓ -4.00%	\$300,000	\$1,650,000
Burnley	*\$335,000	*\$335,000	\$335,000	\$335,000	*\$447,000	*\$447,000	↑ 33.43%	\$370,000	\$524,000
Cremorne	*\$562,666	*\$570,000	\$433,000	\$685,000	*\$395,000	*\$395,000	↓ -30.70%	\$395,000	\$395,000
East Melbourne	\$1,355,428	\$680,000	\$503,000	\$5,300,000	\$935,916	\$522,500	↓ -23.16%	\$195,000	\$3,150,000
Hawthorn	\$682,597	\$627,500	\$155,000	\$1,780,000	\$618,518	\$519,200	↓ -17.26%	\$252,500	\$2,340,000
Prahran	\$630,420	\$660,000	\$117,000	\$1,020,000	\$612,228	\$580,000	↓ -12.12%	\$326,000	\$1,310,000
Richmond	\$554,350	\$534,000	\$53,500	\$960,000	\$521,500	\$502,000	↓ -5.99%	\$305,000	\$927,000
South Yarra	\$712,415	\$642,000	\$253,000	\$2,600,000	\$716,100	\$621,500	↓ -3.19%	\$312,500	\$2,175,000
Albert Park	*\$600,000	*\$600,000	\$600,000	\$600,000	*\$678,166	*\$564,500	↓ -5.92%	\$420,000	\$1,050,000
Middle Park	*\$800,000	*\$800,000	\$800,000	\$800,000	*\$760,000	*\$760,000	↓ -5.00%	\$760,000	\$760,000
Port Melbourne	\$757,324	\$625,000	\$402,500	\$2,250,000	\$782,187	\$740,000	↑ 18.40%	\$410,000	\$1,631,000
South Melbourne	\$827,535	\$593,500	\$370,000	\$2,920,000	\$603,908	\$582,500	↓ -1.85%	\$285,000	\$1,555,500
Flemington	\$445,833	\$475,000	\$292,000	\$603,000	*\$464,300	*\$530,000	↑ 11.58%	\$259,000	\$540,000
Kensington	\$509,000	\$500,000	\$355,000	\$876,000	*\$527,400	*\$485,000	↓ -3.00%	\$411,500	\$722,500
Travancore	*\$399,800	*\$375,000	\$319,000	\$535,000	*\$352,500	*\$360,000	↓ -4.00%	\$325,000	\$365,000
West Melbourne	\$599,265	\$558,888	\$295,000	\$1,180,000	\$583,555	\$660,000	↑ 18.09%	\$345,000	\$805,000

Table compiled from data collected from April to September 2017. A dash indicates no recorded sales for the quarter, inability to show a quarterly change or no quarterly change. Directional arrows indicate change in comparison to the previous rolling quarter. * indicates an average or median value calculated using 5 sales or less.

Apartments

QUARTERLY MEDIAN CHANGE BY SUBURB



Based on data collected from April to September 2017. Princes Hill was omitted due to insufficient data.
* indicates a median value calculated using 5 sales or less.

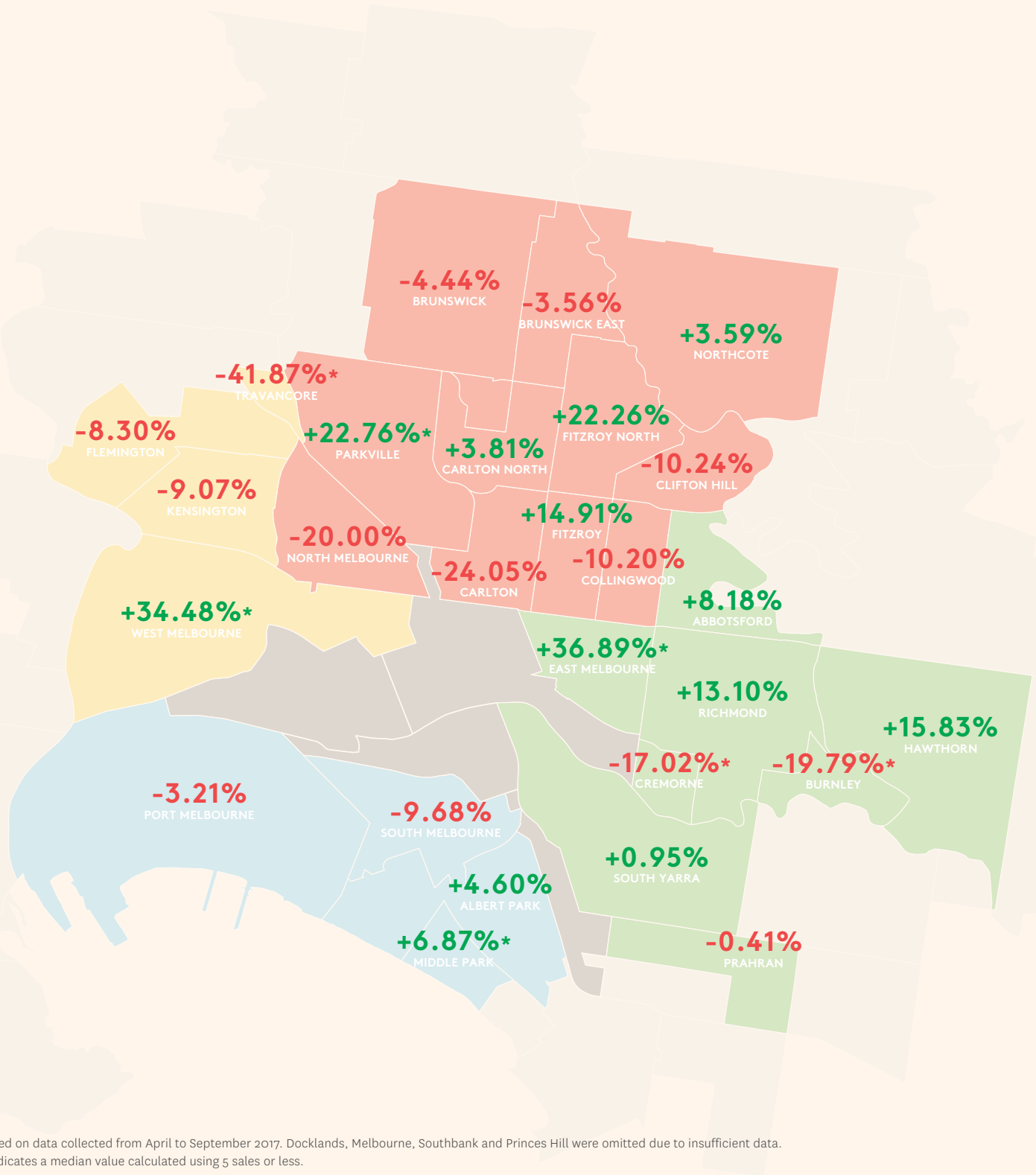
PRICE COMPARISONS BY ROLLING QUARTERS

	PREVIOUS QUARTER (APR, MAY, JUN 2017)				CURRENT QUARTER (JUL, AUG, SEP 2017)				
	Average Price	Median Price	Lowest Sale	Highest Sale	Average Price	Median Price	% change	Lowest Sale	Highest Sale
Docklands	-	-	-	-	-	-		-	-
Melbourne	*\$1,130,000	*\$1,130,000	\$1,130,000	\$1,130,000	-	-		-	-
Southbank	-	-	-	-	-	-		-	-
Brunswick	\$1,322,000	\$1,350,000	\$725,000	\$2,545,000	\$1,226,052	\$1,290,000	↓ -4.44%	\$650,000	\$1,790,000
Brunswick East	\$1,262,090	\$1,265,000	\$1,015,000	\$1,635,000	\$1,191,473	\$1,220,000	↓ -3.56%	\$501,000	\$1,725,000
Carlton	*\$2,460,750	*\$1,919,000	\$1,565,000	\$4,440,000	\$1,394,968	\$1,457,500	↓ -24.05%	\$882,500	\$1,850,000
Carlton North	\$2,024,617	\$1,628,000	\$1,150,000	\$5,255,000	\$1,901,733	\$1,690,000	↑ 3.81%	\$956,000	\$3,320,000
Clifton Hill	\$1,676,464	\$1,573,000	\$882,000	\$3,680,000	\$1,620,750	\$1,412,000	↓ -10.24%	\$692,000	\$3,900,000
Collingwood	\$1,329,250	\$1,225,000	\$960,000	\$2,385,000	\$1,214,111	\$1,100,000	↓ -10.20%	\$970,000	\$1,750,000
Fitzroy	\$2,041,818	\$1,630,000	\$1,150,000	\$4,900,000	\$1,899,666	\$1,873,000	↑ 14.91%	\$905,000	\$3,575,000
Fitzroy North	\$1,563,105	\$1,325,000	\$960,000	\$2,900,000	\$1,619,392	\$1,620,000	↑ 22.26%	\$1,100,000	\$2,136,000
North Melbourne	\$1,562,555	\$1,700,000	\$940,000	\$2,161,000	\$1,304,000	\$1,360,000	↓ -20.00%	\$516,000	\$1,820,000
Northcote	\$1,402,360	\$1,295,000	\$805,000	\$2,600,000	\$1,513,042	\$1,341,500	↑ 3.59%	\$142,500	\$3,390,000
Parkville	*\$2,607,125	*\$2,765,500	\$927,500	\$3,970,000	*\$3,395,000	*\$3,395,000	↑ 22.76%	\$3,395,000	\$3,395,000
Princes Hill	*\$1,980,000	*\$1,980,000	\$1,550,000	\$2,410,000	-	-		-	-
Abbotsford	\$1,353,461	\$1,271,000	\$745,000	\$2,300,000	\$1,348,066	\$1,375,000	↑ 8.18%	\$655,000	\$1,830,000
Burnley	*\$1,433,750	*\$1,433,750	\$1,030,000	\$1,837,500	*\$1,150,000	*\$1,150,000	↓ -19.79%	\$1,150,000	\$1,150,000
Cremorne	*\$1,301,500	*\$1,301,500	\$1,253,000	\$1,350,000	*\$1,080,000	*\$1,080,000	↓ -17.02%	\$1,080,000	\$1,080,000
East Melbourne	*\$3,137,500	*\$3,137,500	\$2,000,000	\$4,275,000	*\$4,295,000	*\$4,295,000	↑ 36.89%	\$3,715,000	\$4,875,000
Hawthorn	\$2,585,578	\$1,990,000	\$885,000	\$7,650,000	\$2,446,958	\$2,305,000	↑ 15.83%	\$990,000	\$5,610,000
Prahran	\$2,049,208	\$1,687,500	\$1,125,000	\$3,586,000	\$1,918,522	\$1,680,500	↓ -0.41%	\$900,000	\$4,200,000
Richmond	\$1,433,580	\$1,275,000	\$911,000	\$2,730,000	\$1,593,111	\$1,442,000	↑ 13.10%	\$785,000	\$3,380,000
South Yarra	\$3,301,538	\$1,810,000	\$1,200,000	\$11,100,000	\$2,532,138	\$1,827,250	↑ 0.95%	\$1,160,000	\$7,015,000
Albert Park	\$2,461,894	\$2,120,000	\$1,190,000	\$5,250,000	\$2,625,625	\$2,217,500	↑ 4.60%	\$1,125,000	\$5,025,000
Middle Park	*\$2,578,000	*\$2,620,000	\$1,630,000	\$3,430,000	*\$3,338,000	*\$2,800,000	↑ 6.87%	\$1,900,000	\$6,400,000
Port Melbourne	\$1,633,809	\$1,400,000	\$964,000	\$2,700,000	\$1,656,283	\$1,355,000	↓ -3.21%	\$1,000,000	\$4,750,000
South Melbourne	\$2,056,218	\$1,741,000	\$807,500	\$4,600,000	\$1,778,727	\$1,572,500	↓ -9.68%	\$855,000	\$4,512,000
Flemington	\$1,251,038	\$1,205,000	\$917,000	\$2,268,000	\$1,174,541	\$1,105,000	↓ -8.30%	\$791,500	\$1,810,000
Kensington	\$1,165,187	\$1,125,000	\$840,500	\$2,242,000	\$1,147,769	\$1,023,000	↓ -9.07%	\$840,000	\$2,350,000
Travancore	*\$1,415,000	*\$1,415,000	\$1,415,000	\$1,415,000	*\$822,500	*\$822,500	↓ -41.87%	\$822,500	\$822,500
West Melbourne	*\$1,400,000	*\$1,385,000	\$1,080,000	\$1,750,000	*\$1,903,750	*\$1,862,500	↑ 34.48%	\$1,460,000	\$2,430,000

Table compiled from data collected from April to September 2017. A dash indicates no recorded sales for the quarter, inability to show a quarterly change or no quarterly change. Directional arrows indicate change in comparison to the previous rolling quarter. * indicates an average or median value calculated using 5 sales or less.

Houses

QUARTERLY MEDIAN CHANGE BY SUBURB



Based on data collected from April to September 2017. Docklands, Melbourne, Southbank and Princes Hill were omitted due to insufficient data.
* indicates a median value calculated using 5 sales or less.

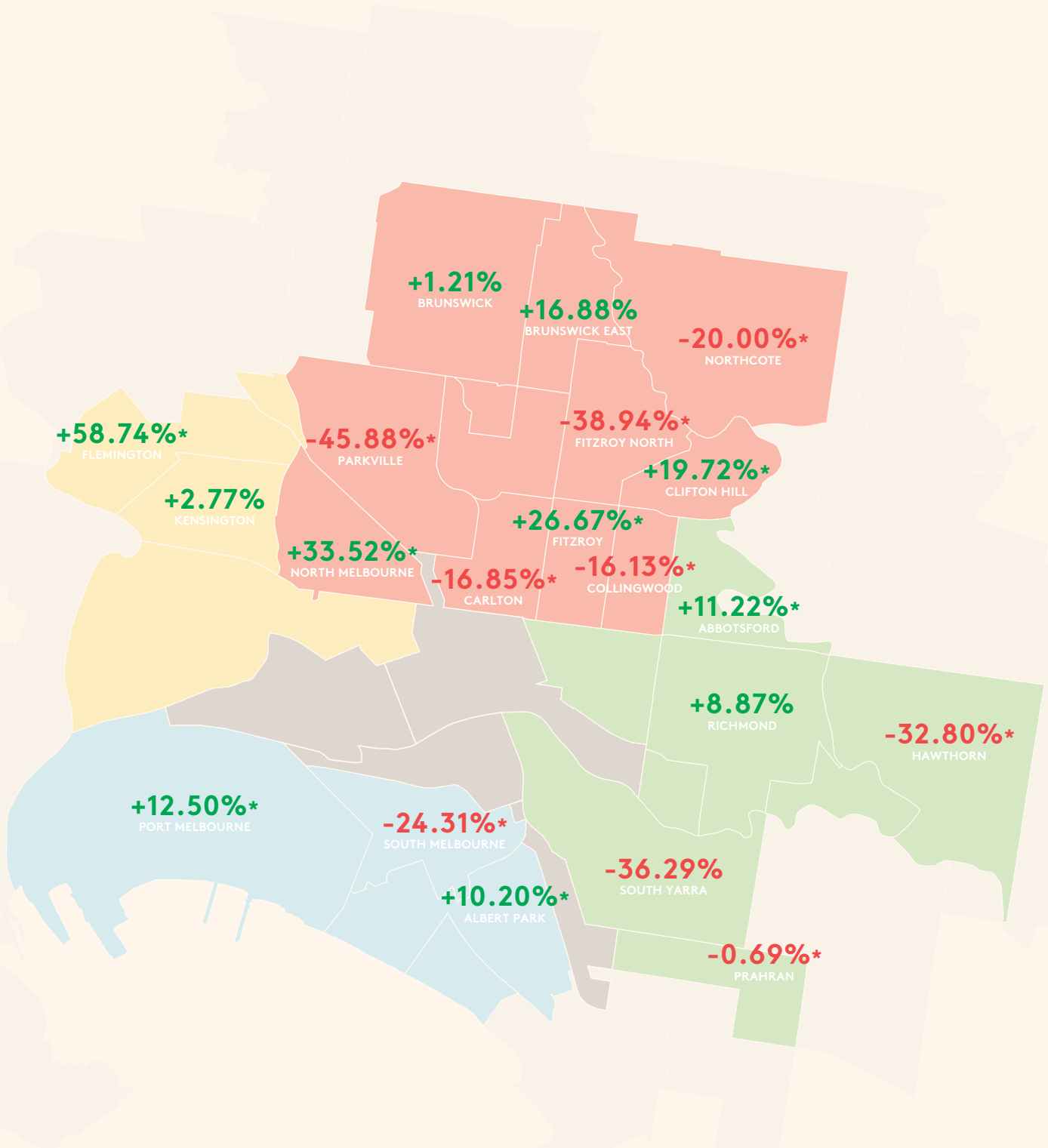
PRICE COMPARISONS BY ROLLING QUARTERS

	PREVIOUS QUARTER (APR, MAY, JUN 2017)				CURRENT QUARTER (JUL, AUG, SEP 2017)				
	Average Price	Median Price	Lowest Sale	Highest Sale	Average Price	Median Price	% change	Lowest Sale	Highest Sale
Docklands	-	-	-	-	-	-		-	-
Melbourne	*\$1,130,000	*\$1,130,000	\$1,130,000	\$1,130,000	-	-		-	-
Southbank	-	-	-	-	-	-		-	-
Brunswick	\$1,322,000	\$1,350,000	\$725,000	\$2,545,000	\$872,250	\$835,000	↑ 1.21%	\$601,000	\$1,340,000
Brunswick East	\$1,262,090	\$1,265,000	\$1,015,000	\$1,635,000	\$863,166	\$935,000	↑ 16.88%	\$687,500	\$995,000
Carlton	*\$2,460,750	*\$1,919,000	\$1,565,000	\$4,440,000	*\$1,043,500	*\$1,043,500	↓ -16.85%	\$1,043,500	\$1,043,500
Carlton North	\$2,024,617	\$1,628,000	\$1,150,000	\$5,255,000	-	-		-	-
Clifton Hill	\$1,676,464	\$1,573,000	\$882,000	\$3,680,000	*\$1,091,750	*\$1,181,000	↑ 19.72%	\$675,000	\$1,330,000
Collingwood	\$1,329,250	\$1,225,000	\$960,000	\$2,385,000	*\$931,000	*\$931,000	↓ -16.13%	\$931,000	\$931,000
Fitzroy	\$2,041,818	\$1,630,000	\$1,150,000	\$4,900,000	*\$1,316,666	*\$1,330,000	↑ 26.67%	\$1,260,000	\$1,360,000
Fitzroy North	\$1,563,105	\$1,325,000	\$960,000	\$2,900,000	*\$809,000	*\$809,000	↓ -38.94%	\$770,000	\$848,000
North Melbourne	\$1,562,555	\$1,700,000	\$940,000	\$2,161,000	*\$1,164,700	*\$1,220,000	↑ 33.52%	\$936,000	\$1,425,000
Northcote	\$1,402,360	\$1,295,000	\$805,000	\$2,600,000	*\$771,100	*\$800,000	↓ -20.00%	\$669,000	\$825,000
Parkville	*\$2,607,125	*\$2,765,500	\$927,500	\$3,970,000	*\$460,000	*\$460,000	↓ -45.88%	\$460,000	\$460,000
Princes Hill	*\$1,980,000	*\$1,980,000	\$1,550,000	\$2,410,000	-	-		-	-
Abbotsford	\$1,353,461	\$1,271,000	\$745,000	\$2,300,000	*\$1,412,500	*\$1,412,500	↑ 11.22%	\$1,300,000	\$1,525,000
Burnley	*\$1,433,750	*\$1,433,750	\$1,030,000	\$1,837,500	*\$692,000	*\$692,000		\$692,000	\$692,000
Cremorne	*\$1,301,500	*\$1,301,500	\$1,253,000	\$1,350,000	-	-		-	-
East Melbourne	*\$3,137,500	*\$3,137,500	\$2,000,000	\$4,275,000	-	-		-	-
Hawthorn	\$2,585,578	\$1,990,000	\$885,000	\$7,650,000	*\$1,192,500	*\$1,112,500	↓ -32.80%	\$830,000	\$1,715,000
Prahran	\$2,049,208	\$1,687,500	\$1,125,000	\$3,586,000	*\$1,186,333	*\$1,296,000	↓ -0.69%	\$800,000	\$1,463,000
Richmond	\$1,433,580	\$1,275,000	\$911,000	\$2,730,000	\$1,468,416	\$1,350,500	↑ 8.87%	\$735,000	\$3,350,000
South Yarra	\$3,301,538	\$1,810,000	\$1,200,000	\$11,100,000	\$1,717,142	\$1,400,000	↓ -36.29%	\$675,000	\$3,510,000
Albert Park	\$2,461,894	\$2,120,000	\$1,190,000	\$5,250,000	*\$2,080,000	*\$2,080,000	↑ 10.20%	\$1,440,000	\$2,720,000
Middle Park	*\$2,578,000	*\$2,620,000	\$1,630,000	\$3,430,000	*\$1,410,000	*\$1,410,000		\$1,410,000	\$1,410,000
Port Melbourne	\$1,633,809	\$1,400,000	\$964,000	\$2,700,000	*\$1,773,333	*\$1,665,000	↑ 12.50%	\$1,355,000	\$2,300,000
South Melbourne	\$2,056,218	\$1,741,000	\$807,500	\$4,600,000	*\$1,316,400	*\$1,300,000	↓ -24.31%	\$817,000	\$1,720,000
Flemington	\$1,251,038	\$1,205,000	\$917,000	\$2,268,000	*\$976,250	*\$976,250	↑ 58.74%	\$935,000	\$1,017,500
Kensington	\$1,165,187	\$1,125,000	\$840,500	\$2,242,000	\$858,208	\$853,000	↑ 2.77%	\$530,000	\$1,300,000
Travancore	*\$1,415,000	*\$1,415,000	\$1,415,000	\$1,415,000	-	-		-	-
West Melbourne	*\$1,400,000	*\$1,385,000	\$1,080,000	\$1,750,000	-	-		-	-

Table compiled from data collected from April to September 2017. A dash indicates no recorded sales for the quarter, inability to show a quarterly change or no quarterly change. Directional arrows indicate change in comparison to the previous rolling quarter. * indicates an average or median value calculated using 5 sales or less.

Townhouses

QUARTERLY MEDIAN CHANGE BY SUBURB




Based on data collected from April to September 2017. Docklands, Melbourne, Southbank, Carlton North, Princes Hill, Burnley, Cremorne, East Melbourne, Middle Park, Travancore and West Melbourne were omitted due to insufficient data. * indicates a median value calculated using 5 sales or less.

SECRET

INSIDE PERSPECTIVE

AGENT



Artificial Intelligence in Property
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