Time Series Forecasting

Why will this analysis help?

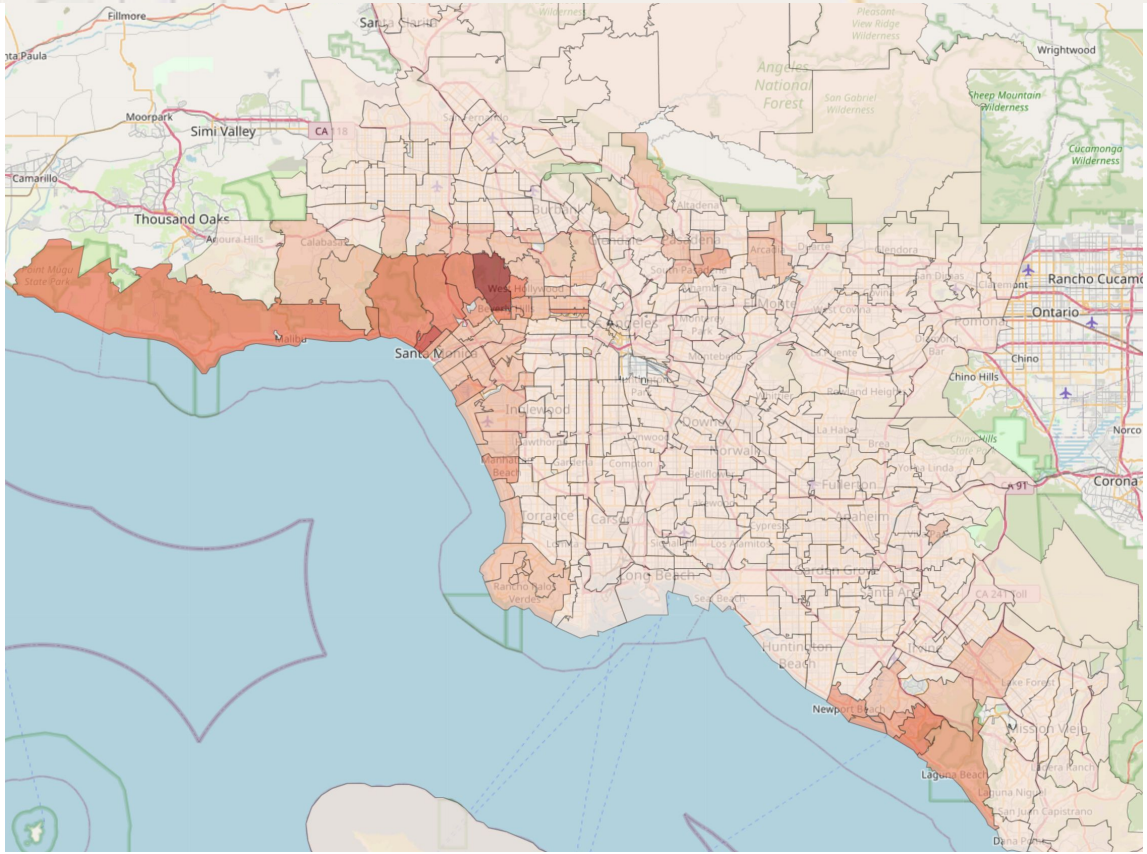
- **Real Estate Investment**
  What are the top 5 best zip codes for us to invest in?
- **Diverse Portfolio**

  Client has $5,000,000 to invest across different Zip Codes

LA House Prices - 2018

226,600 1,164,617 2,102,633 3,040,650 3,978,667 4,916,683 5,854,700

Home Value in 2018



Deliverables

The Criteria for choosing zip codes to invest in are as follows:

Home Value below

$500K

Houses must be below $500,000

Difference

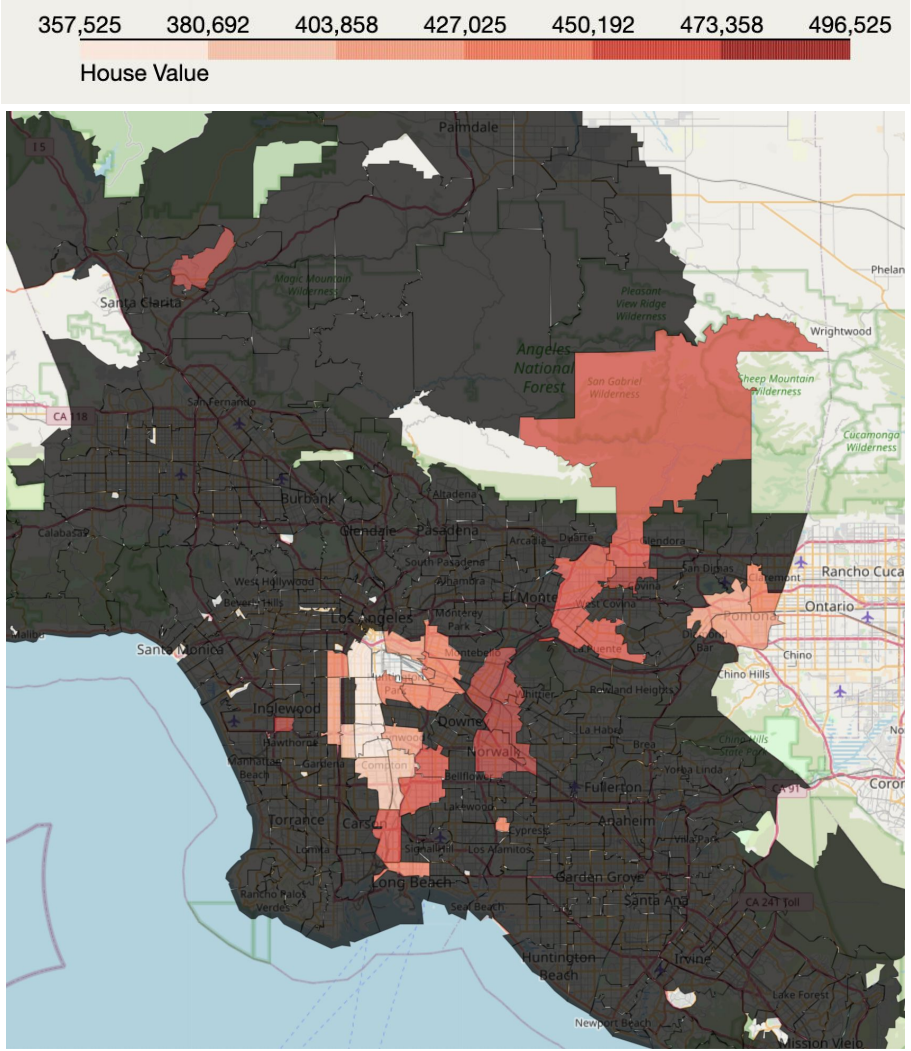
$20K

Home Values must be no more than 15,000 more or less than at 2006 peak

Return on Investment

10%

ROI for past 3 years must be greater than 10%



36

Zip codes

$433,739

Average House Price

20%

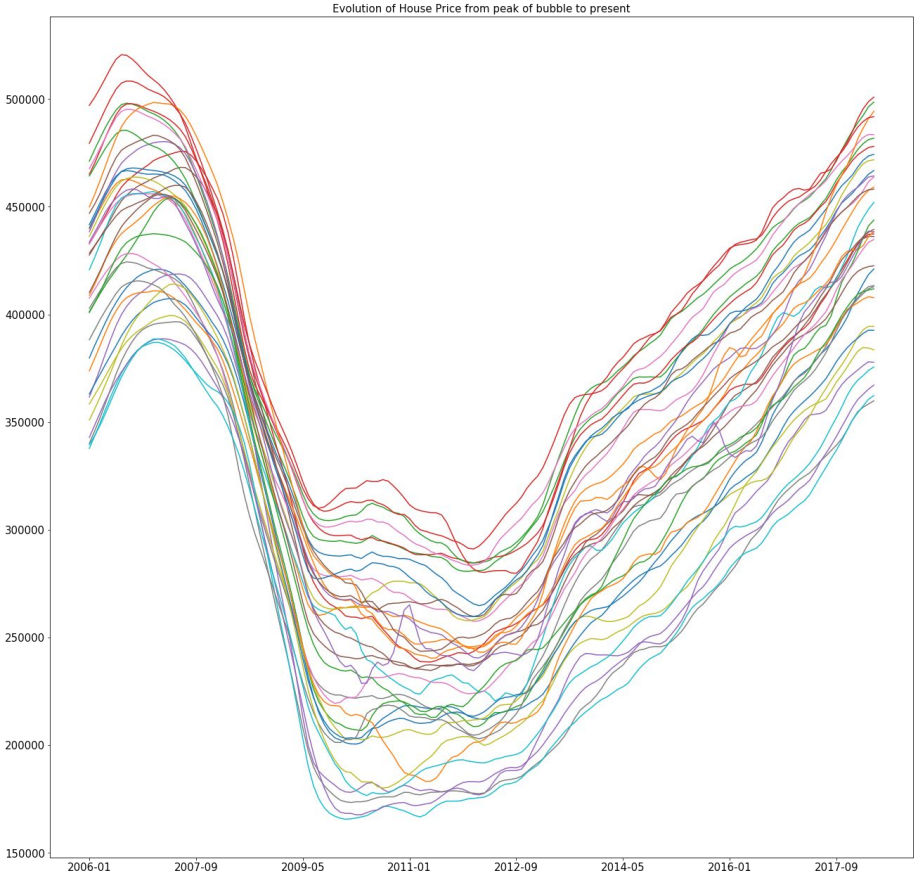
Average 3 year Return on Investment

Market trends on eligible Zip Codes

Market Crash

House Prices in these Zip Codes followed the same trend when market crashed

- Home Values in 2012 were 45% 2006 values.

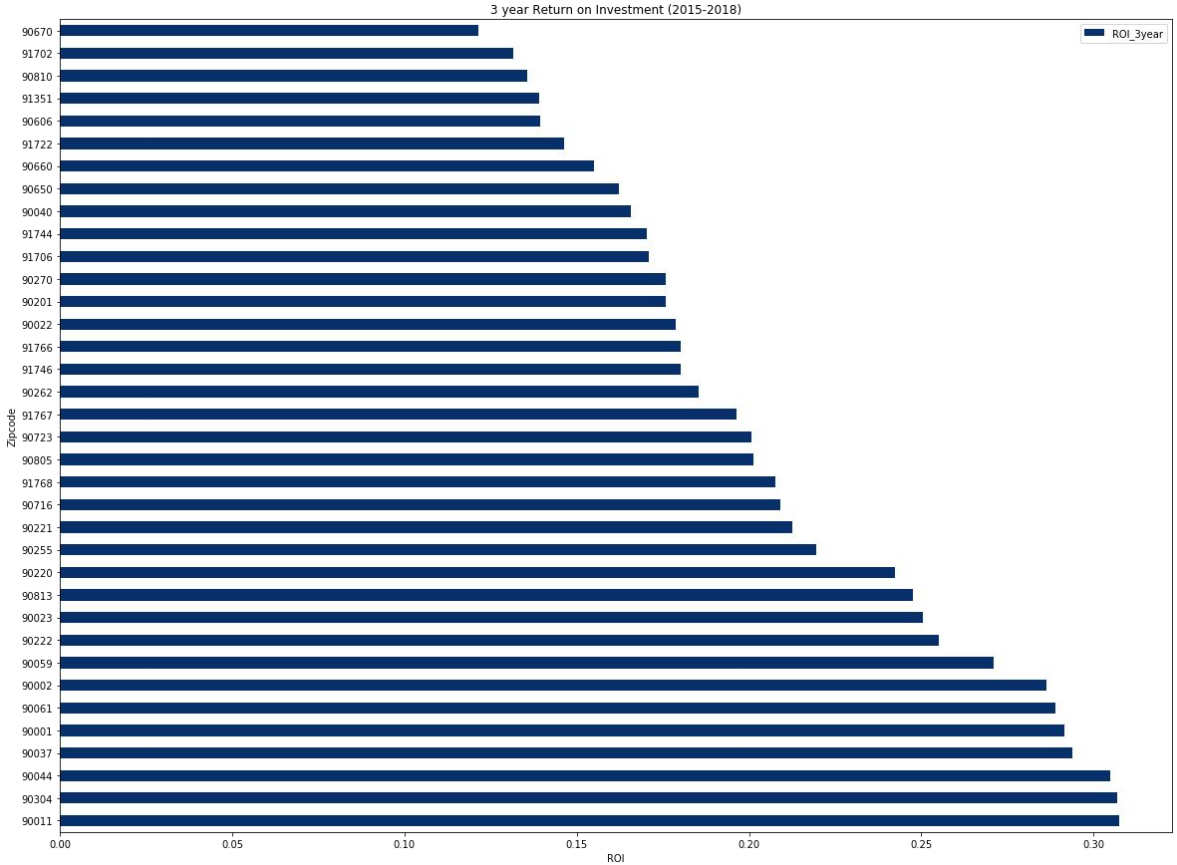


Market trends on eligible Zip Codes

3 year Return on Investment

Healthy ROI for the period 2015 to 2018

- Ranging from 12% to 30%



Forecasting Model

Predicting 3 year house price horizon

Cumulative Inflation = 4.68%

Top 5 Zip codes to Invest in:

- 90037 - 20.35%
- 90304 - 17.79%
- 90813 - 14.99%
- 90001 - 10.56%
- 91768 - 4.96%

See Appendix for more detailed explanation

Future Work

1. **More Data**
   Get actual sale values over time rather than list value.

2. **Find Optimal Parameters for each individual Zip Codes**

Thank You

Questions :)

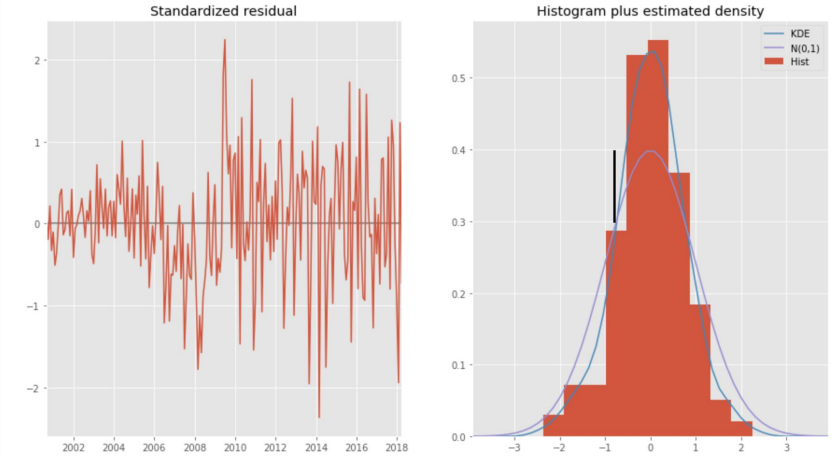
Appendix I

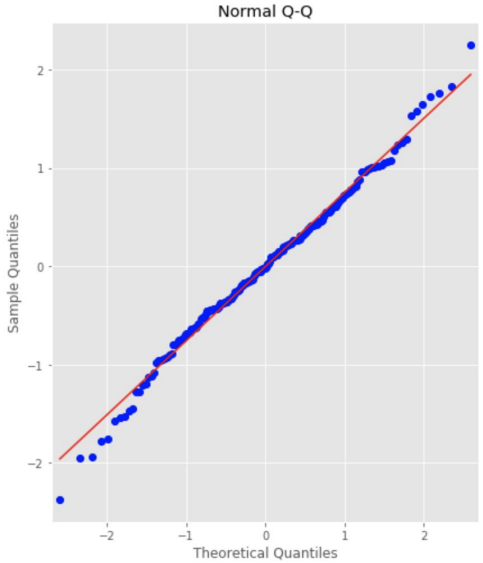
Example of Forecast

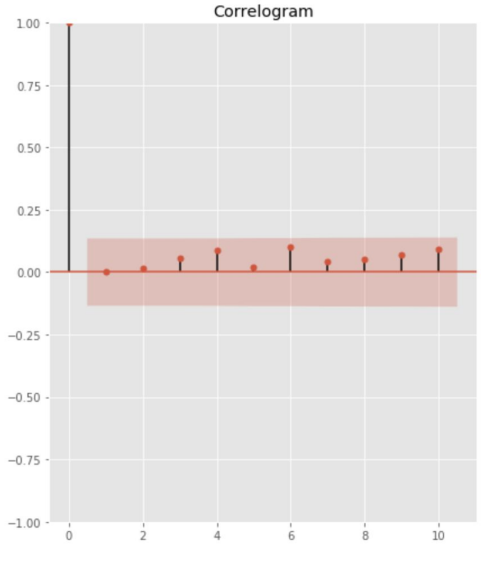
- Zip Code 90001

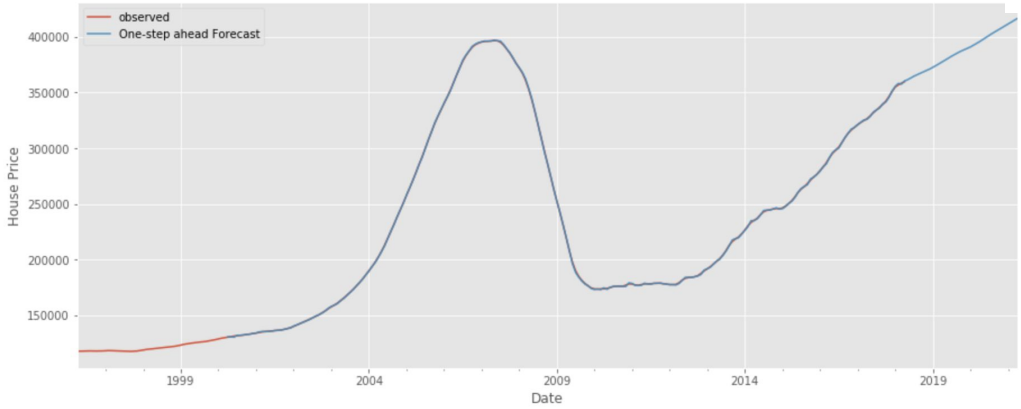
```
Building model for 90001

>>>>>>>>>>>>>
==============================================================================
                 coef    std err          z      P>|z|      [0.025      0.975]
------------------------------------------------------------------------------
ar.L1          0.7963      0.450      1.769      0.077      -0.086       1.679
ar.L2          0.1781      0.434      0.410      0.682      -0.673       1.030
ma.L1          1.0772      0.451      2.388      0.017       0.193       1.961
ma.L2          0.4155      0.481      0.863      0.388      -0.528       1.359
ma.L3         -0.1458      0.242     -0.603      0.546      -0.619       0.328
ar.S.L12       0.0332      0.259      0.128      0.898      -0.474       0.540
ma.S.L12      -0.9945      0.306     -3.255      0.001      -1.593      -0.396
ma.S.L24      -0.0455      0.311     -0.146      0.884      -0.656       0.565
ma.S.L36       0.1419      0.116      1.225      0.221      -0.085       0.369
sigma2      4.376e+05   7.7e+04      5.684      0.000    2.87e+05    5.88e+05
==============================================================================
```









The Mean Squared error of our forecast is 251573.22

The Root Mean Sqaured error of our forecast is 501.57

The home value currently is 359900.0

The predicted home value in 3 years is 416514.6738095915

The predicted ROI in 3 years is 15.73%

Appendix II

Optimal Parameters

Ran all possible combinations to determine optimal parameters by finding combination which minimised AIC

p = 1,2,3

q = 1,2,3

d = 1

(2, 1, 3) - (1, 1, 3, 12) - AIC = 3605.3