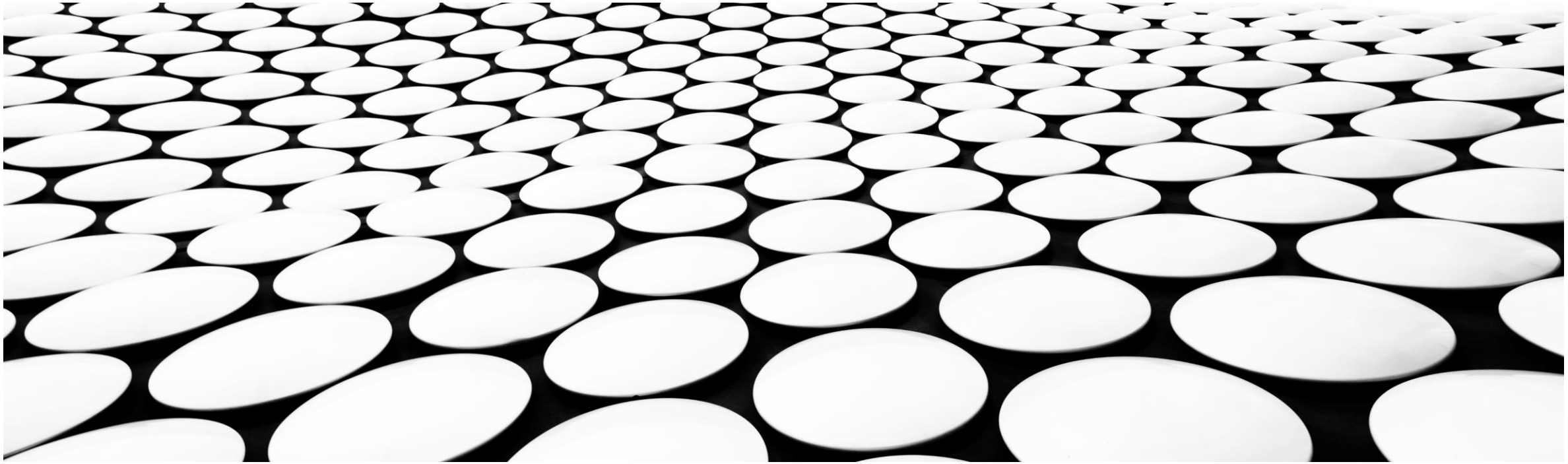
Rental Property Investment With Time Series Model

Collin Loo



OBJECTIVE

Business Case	Solution
Identify top 5 zip codes for rental property investment	» Develop a time series model to forecast future home values » Compute ROI and Risk » Select Zip Codes

`

INVESTMENT STRATEGIES

Metrics	Criteria
Zip Code Evaluation Metrics » Return on Investment (ROI) » Price-to-Rent Ratio (PTR) » Cash-on-Cash (COC) » Rental Index Standard Deviation (RISD)	» ROI > 10% » PTR between 11 & 25 » COC > 8% » RISD between 30th and 60th quantiles

Appendix: Metrics Calculation

DATA SOURCE

Obtain	Preprocess	Merge
Zillow median home sale price » Median sale price in 14,723 zip codes » Date range 1996 to 2018 Zillow rental index » Average rent in 106 metro areas » Date range 2014 to 2020	Calculate historical metrics with » Home sale price » Rental index	Combine the two data sets based on metro information

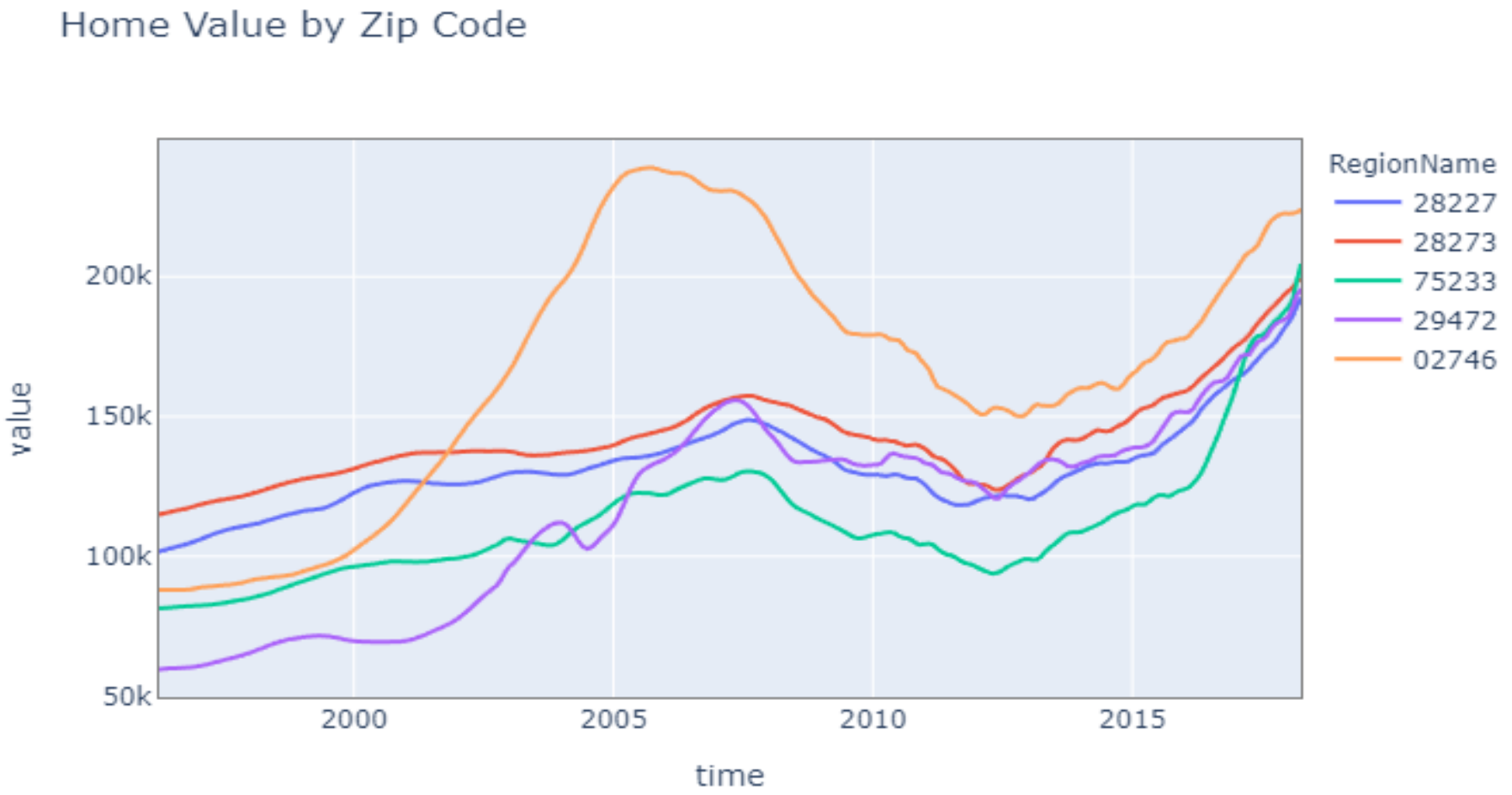
STREAMLINE DATA

Filter	Subset	Select
Retain zip codes that meet the following » ROI > 10% » PTR between 11- 25 » COC > 8% » RISD between 30th and 60th quantile	Select top 3 zip code with the highest ROI from each state	Zip codes with highest ROI and minimum risk » 28227 Mint Hill, NC » 29472, Ridgeville, SC » 28273, Charlotte, NC » 75233, Dallas, TX » 02746, New Bedford, MA

EXAMINE DATA I

General Trend

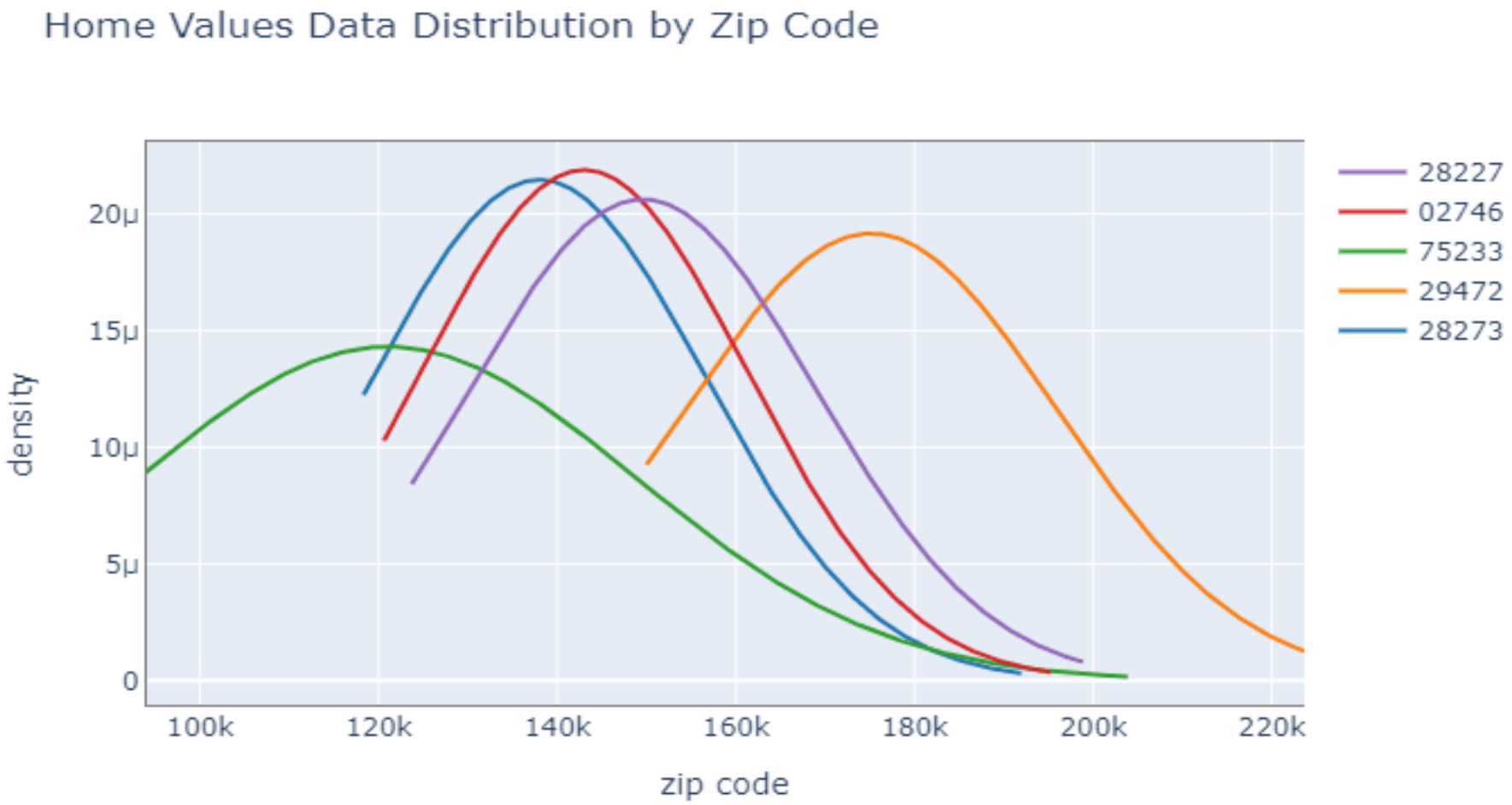
- 2008 housing bubble caused the 2008 -2010 decline in home value
- 02746 posted the biggest decline



EXAMINE DATA II

Data Distribution

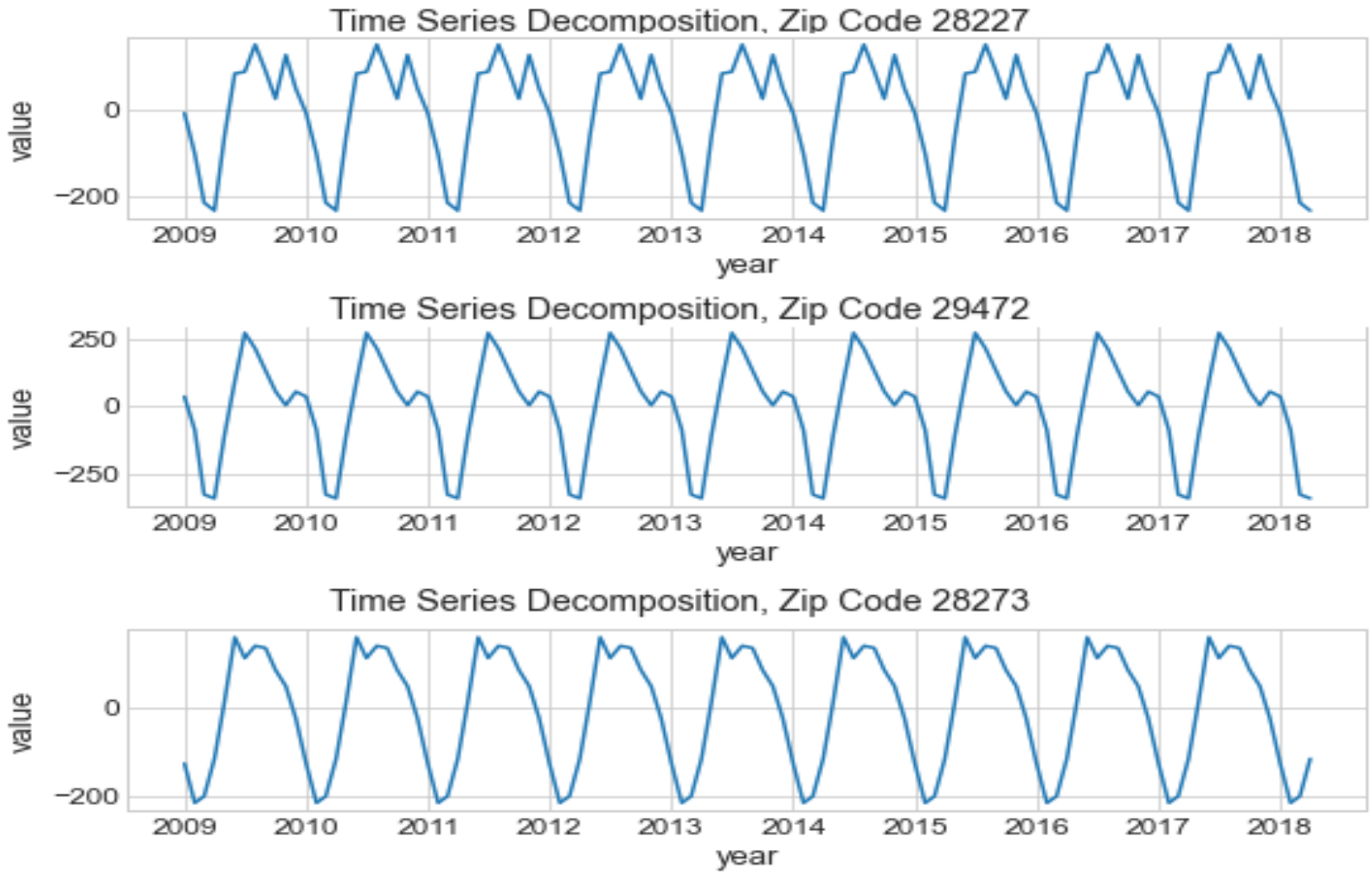
- Home values are normally distributed
- Normality in data is crucial to the model



EXAMINE DATA III

Seasonality

- Samples of zip codes seasonality
- Data don't have significant cyclical patterns



ARIMA TIME SERIES MODEL

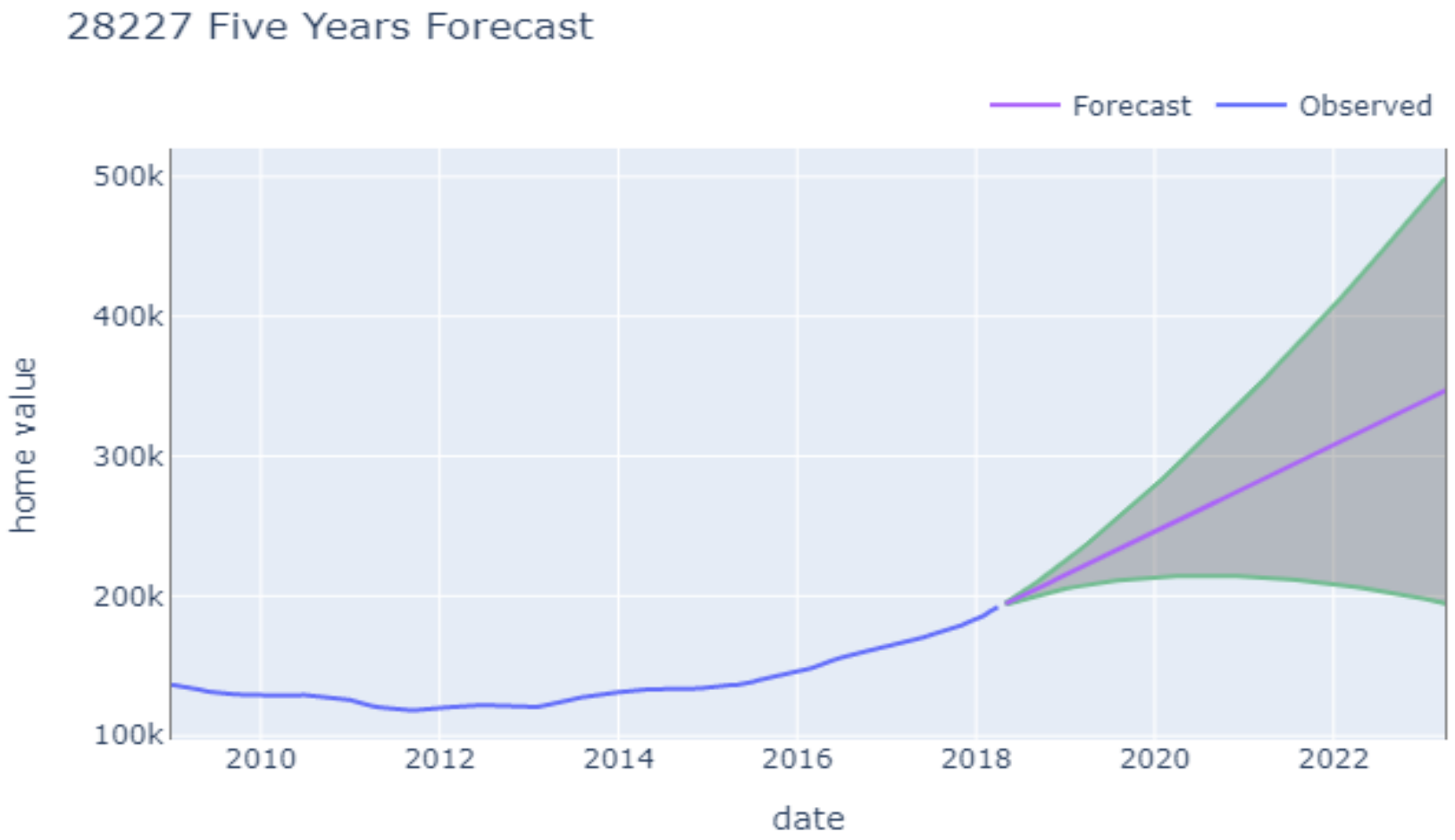
Optimization	Selection
» Define a range for the ARIMA model parameters » Calculate all possible combinations » Fit models with combinations	Select a model with the lowest Akaike's Information Criterion

MODEL FORECAST HOME VALUE

Mint Hill, NC

Forecast values at 2023-04

- Avg: 347K
- Max: 499K
- Min: 195K

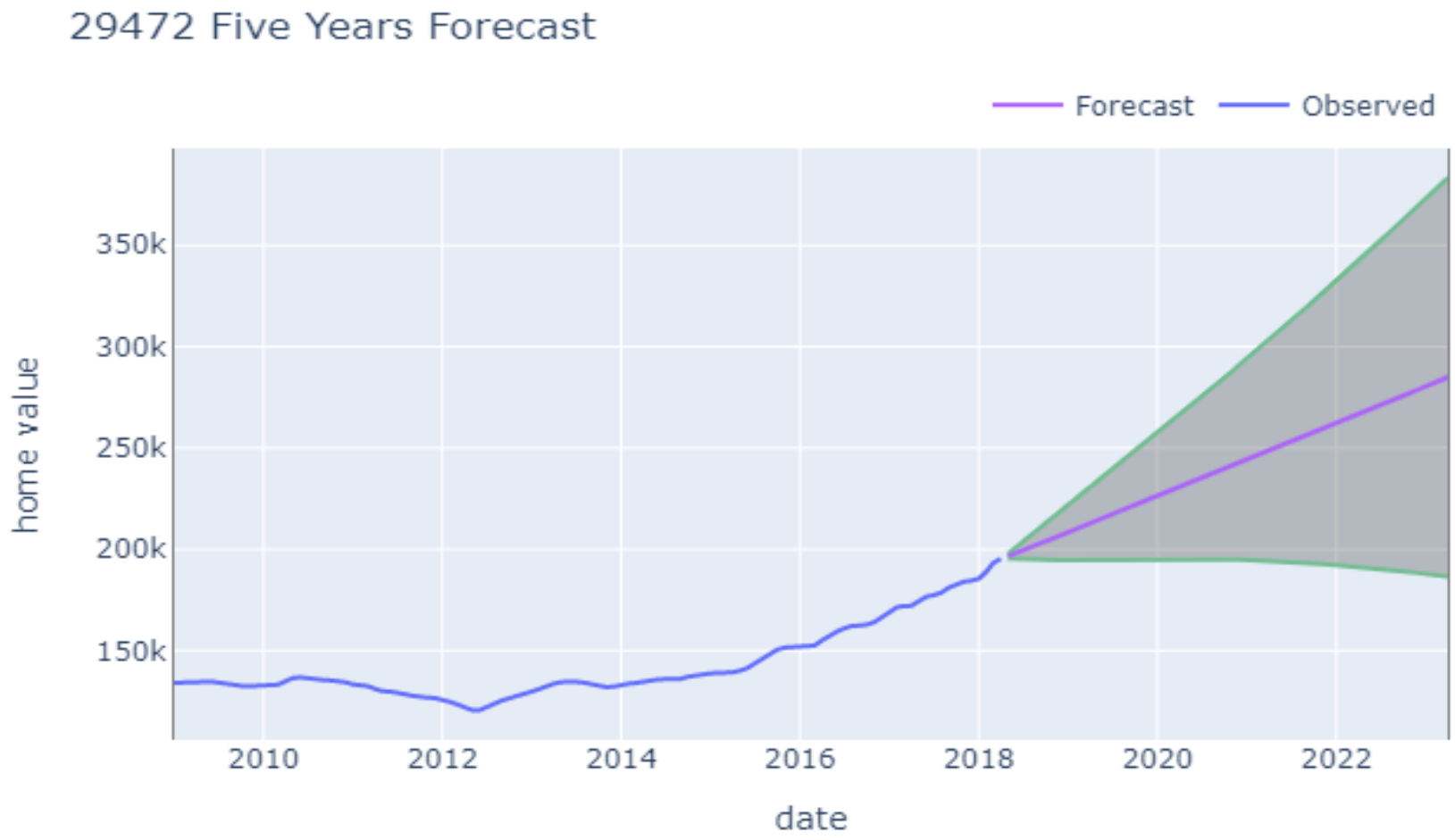


MODEL FORECAST HOME VALUE

Ridgeville, SC

Forecast values at 2023-04

- Avg: 285K
- Max: 383K
- Min: 186K

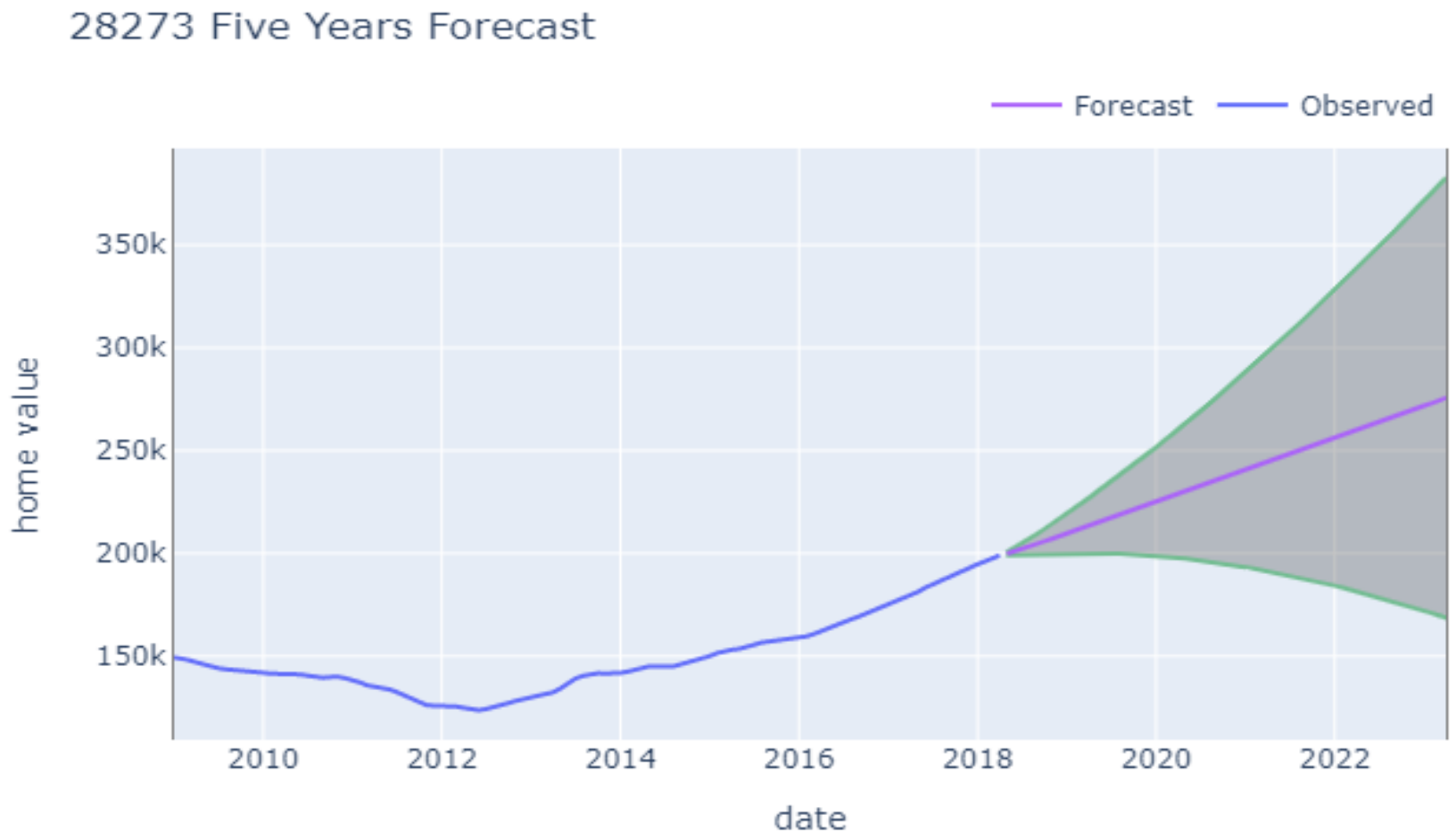


MODEL FORECAST HOME VALUE

Charlotte, NC

Forecast values at 2023-04

- Avg: 276K
- Max: 383K
- Min: 167K

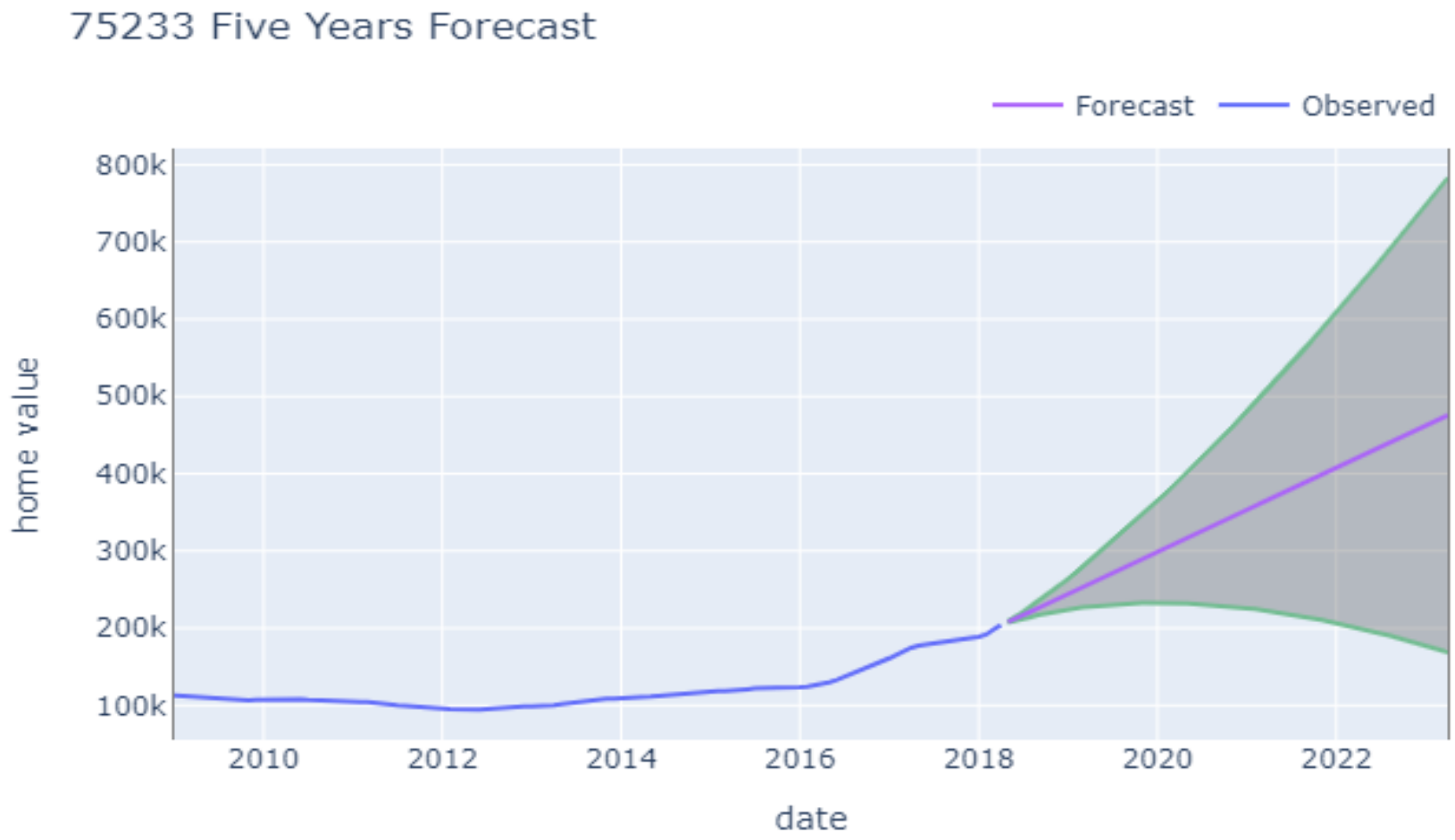


MODEL FORECAST HOME VALUE

Dallas, TX

Forecast values at 2023-04

- Avg: 476K
- Max: 783K
- Min: 169K

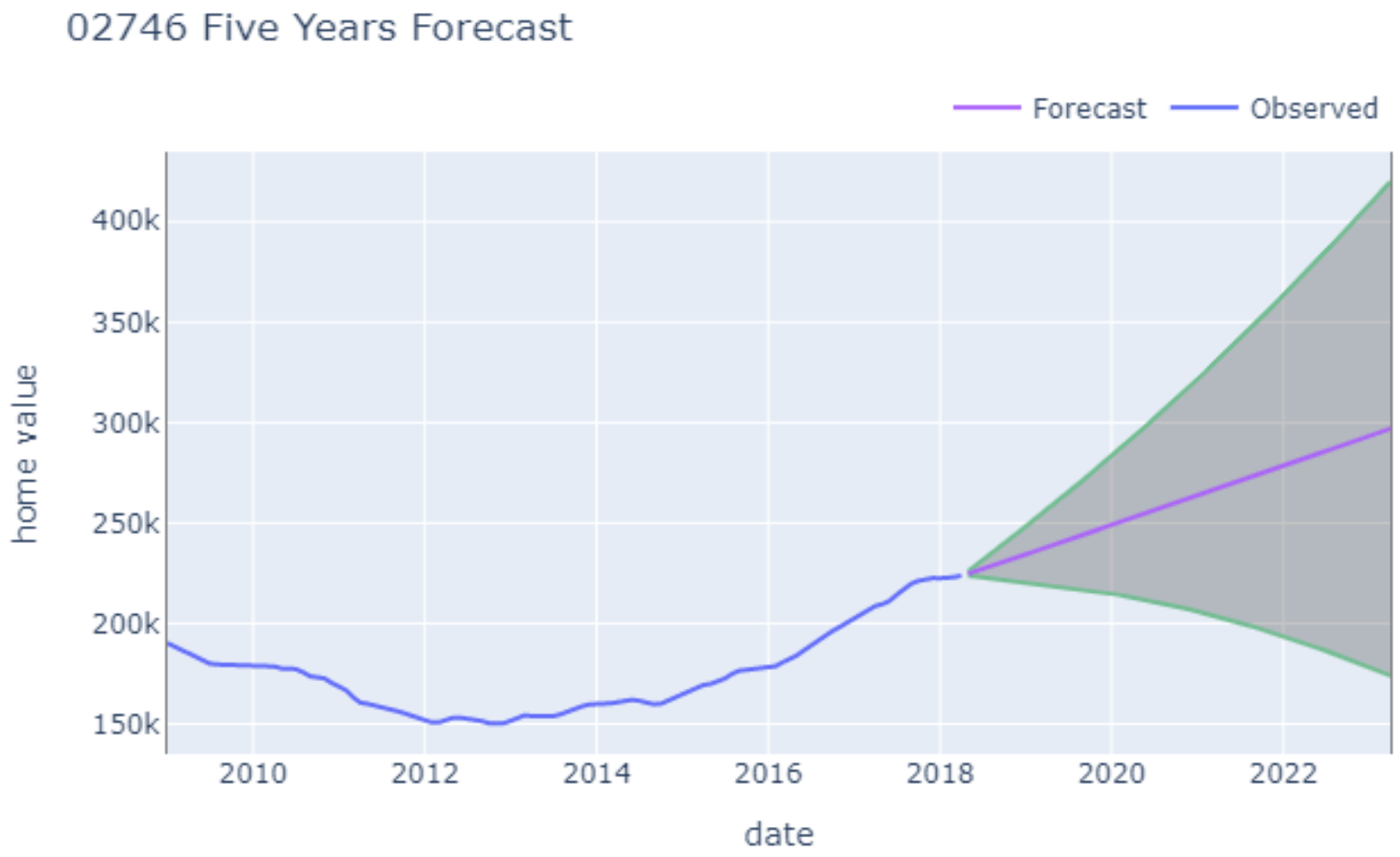


MODEL FORECAST HOME VALUE

New Bedford, MA

Forecast values at 2023-04

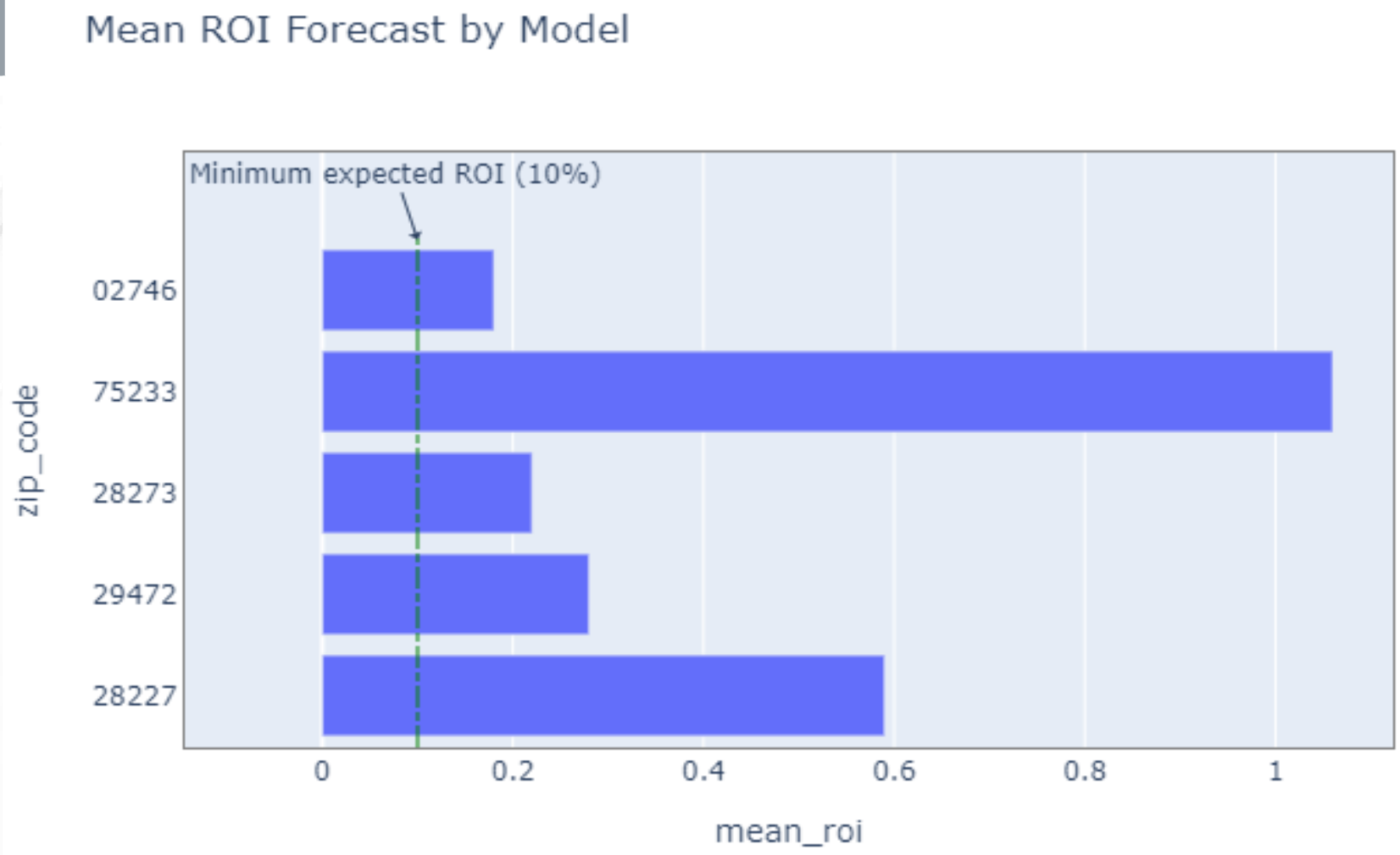
- Avg: 297K
- Max: 419K
- Min: 174K



MODEL FORECAST ROI

ROI by Zip Codes

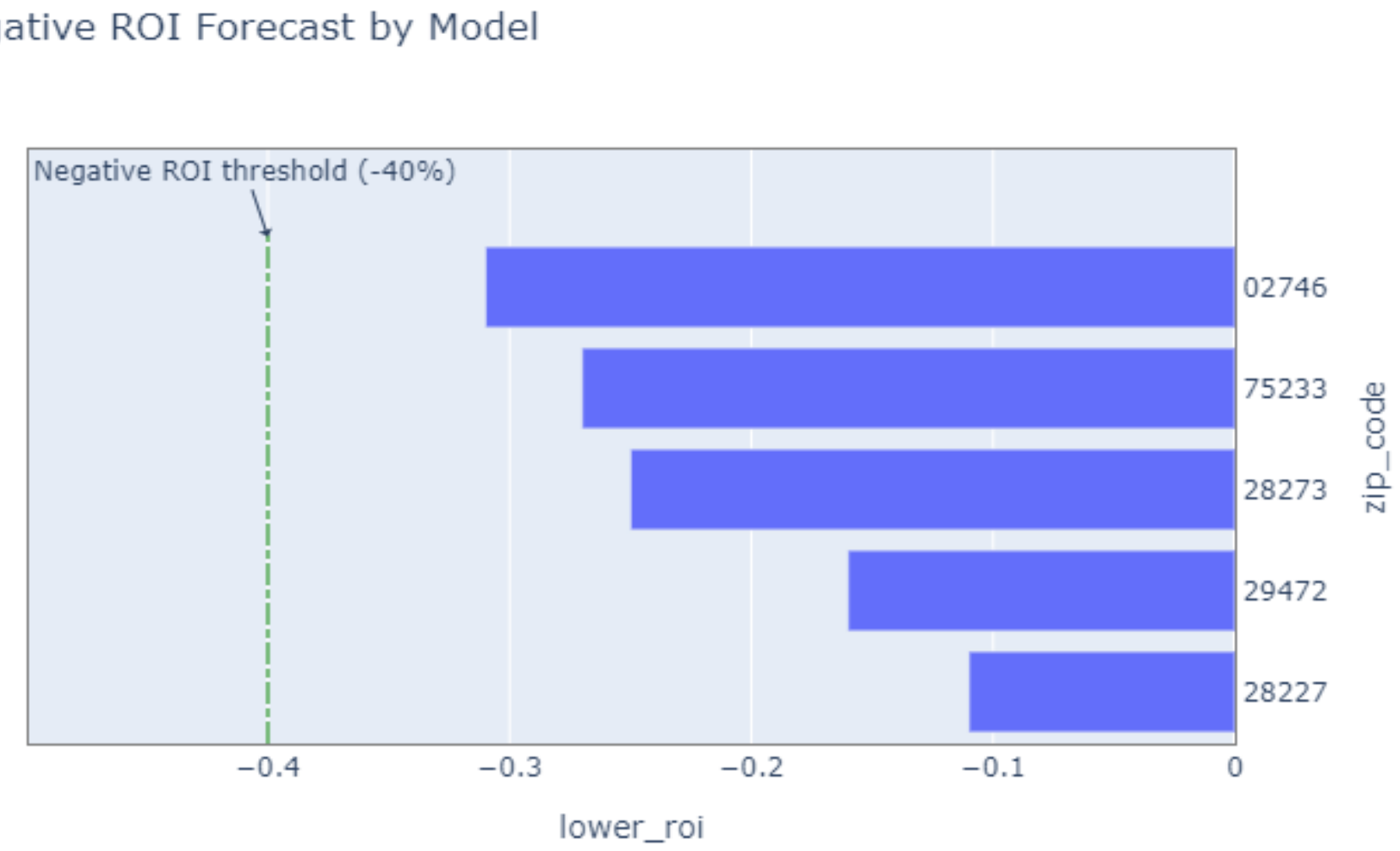
All five zip codes exceed the minimum ROI requirement



MODEL FORECAST LOWEST ROI

Lowest ROI by Zip Codes

All five zip codes are within the minimum ROI requirement



CONCLUSION

Investment Strategies Recap

- ROI > 10%
- PTR > 11 < 25
- COC > 8%
- RISD between 30th and 60th quantile
- Forecast ROI > 10%
- Forecast Lowest ROI < -40%

Recommendations

Following zip codes have the highest forecast ROI and lowest ROI

- 75233, Dallas, TX
- 28227, Mint Hill, NC
- 29472, Ridgeville, SC
- 28273, Charlotte, NC
- 02746, New Bedford, MA

FUTURE WORK

Without Data Filter	Parameterize Investment criteria	Different Forecast Method
Fit the model without subset the data based on requirements	Parameterize investment requirements to generate data set on-the-fly	Deploy Facebook Prophet time series forecasting

CHANGE THINGS

AT FLATIRON SCHOOL YOU LEARN HOW THE FUTURE IS BEING BUILT, SO YOU CAN CHANGE ANYTHING, STARTING WITH A NEW CAREER IN CODE, DATA SCIENCE, OR CYBERSECURITY.

Thank You

Collin Loo

collinloo@yahoo.com

Flatiron School

APPENDIX

ROI

(sp – (cc(pp) + gr + pp) / (cc(pp) + gr + pp)

- sp=sale price after 5 yrs
- cc=closing cost percentage, 0.035
- pp=purchase price
- gr=general repair, 20k

Price-to-Rent

sp / 12(zori)

- sp=sale price after 5 yrs
- zori=zillow rental index

Rental Standard Deviation

numpy.std(zori)

zori=zillow rental index

Cash-on-Cash

12(zori) – (mp+ins+va) / (dp + cc)

- zori=zillow rental index
- mp=mortgage payment, loan x ((Int rate/12) x (1+Int rate/12))sq(Mort. Term) / (1+Int rate/12))sq(Mort.Term)-1)
- loan=80% of purchase price
- int rate = 2.5%
- mort. term = 360
- ins=(purchase price/100K)(40)
- va=vacancy allowance, zori(10%)
- dp=down payment, 20%(purchase price)