

Investing Locally: 5 ZIP Codes in the Sacramento Region

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Flatiron School Data Science Boot Camp

Module 4 Project



Appendix

Box plots and violin plots

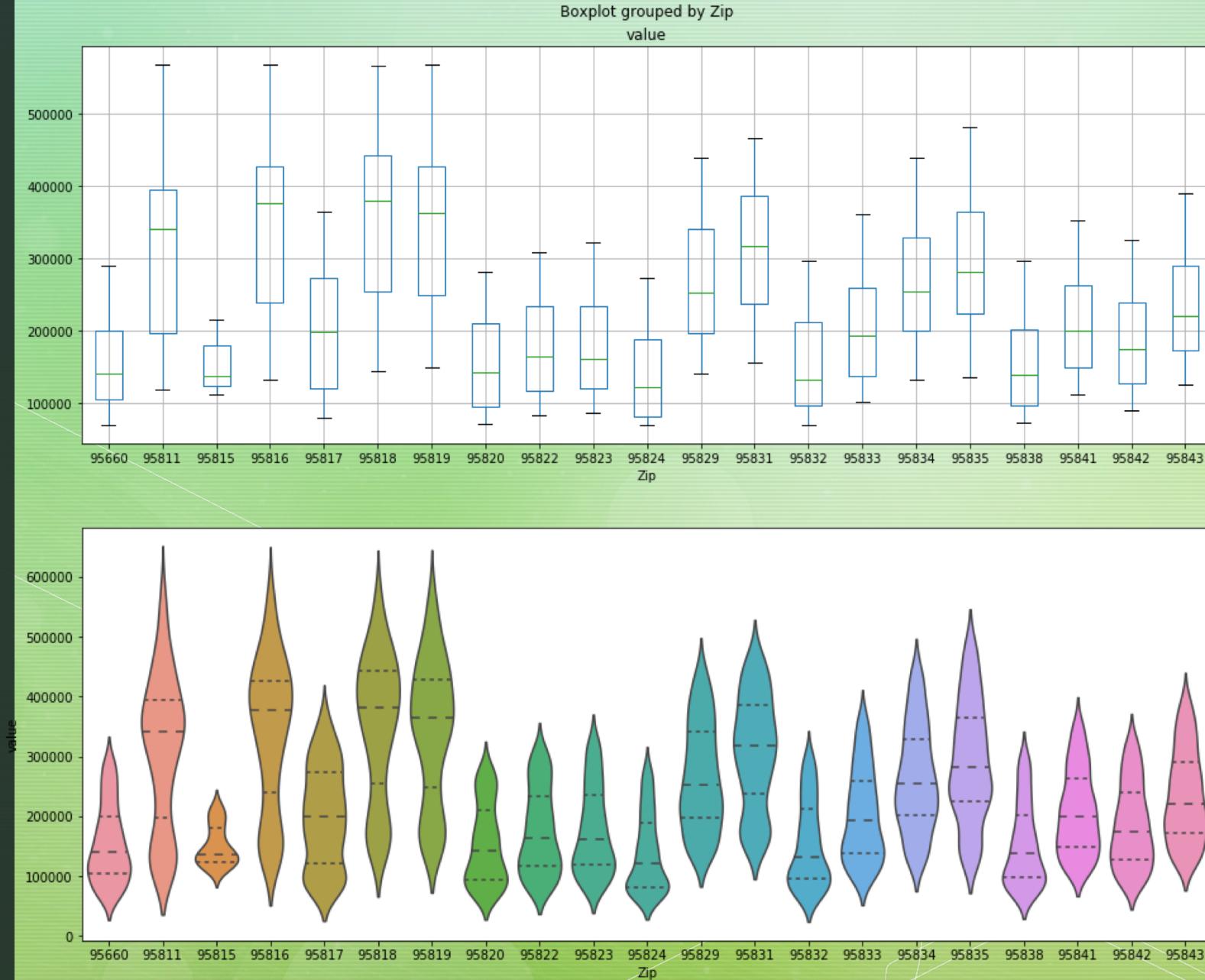
City of Sacramento

Plots show spread of values. Spread creates confidence intervals.

Plots also show the distributions of values around the median. One can see how prices move during various time frames of the housing market bubble build-up, collapse, and recovery.

Boxplots and violin plots show spread and distribution of home prices

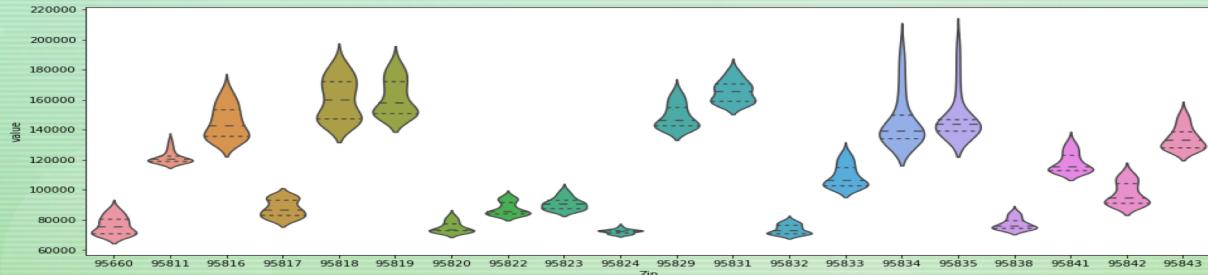
- ZIP codes in the City of Sacramento
 - Shown by boxplot and violin plot
 - Includes all values from 1996 to 2018
- Spread is correlated to forecast confidence intervals
 - Greater spread implies more uncertainty in forecasts



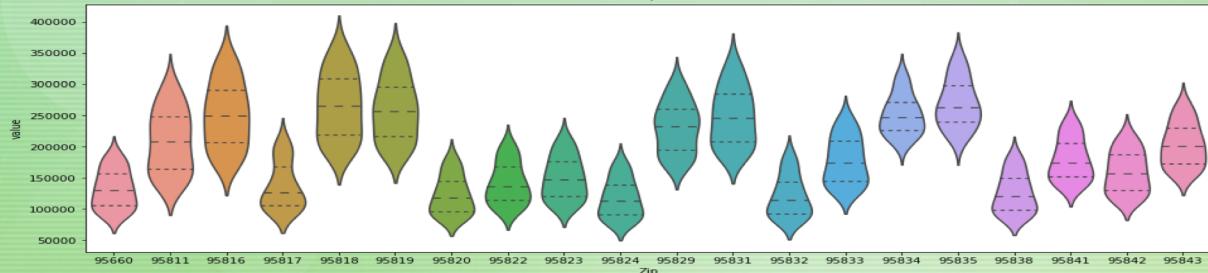
Violin plots of ZIP codes in the City of Sacramento during bubble stages

- Plot shapes reveal:
 - *Spread of values in each ZIP code*
 - *Distribution* during each time frame
- Observe the progression of the housing market bubble:
 - Build-up (2003-2006)
 - Crash (2007-2012)
 - Gradual recovery (2013-2018)

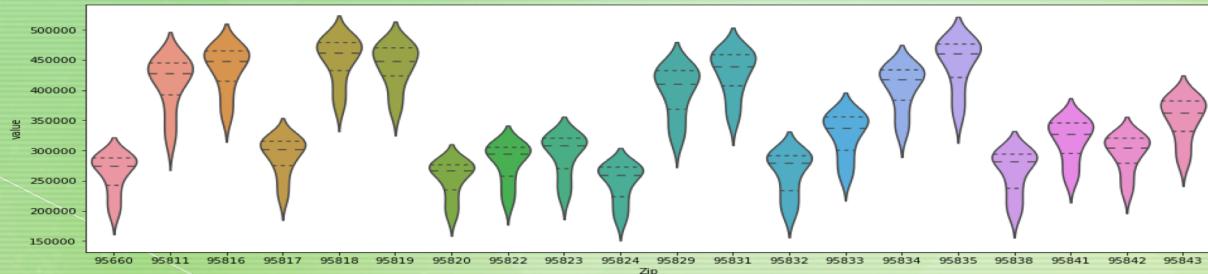
1996 – 1999
(housing value distribution skewed low)



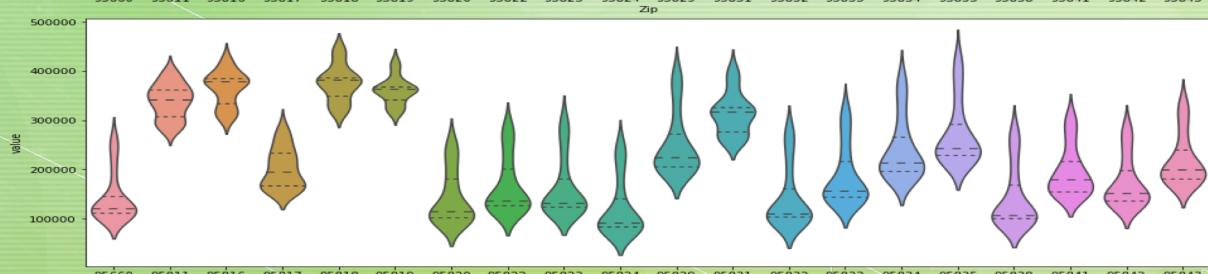
1999 – 2003
(housing value distribution balanced)



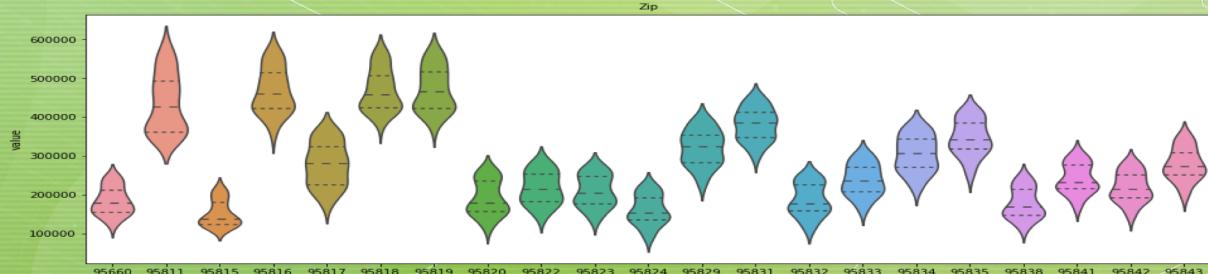
2003 – 2006
(housing value distribution skewed high)



2007 – 2012
(housing value distribution skewed low)



2013 – 2018
(housing value distribution becoming more balanced)



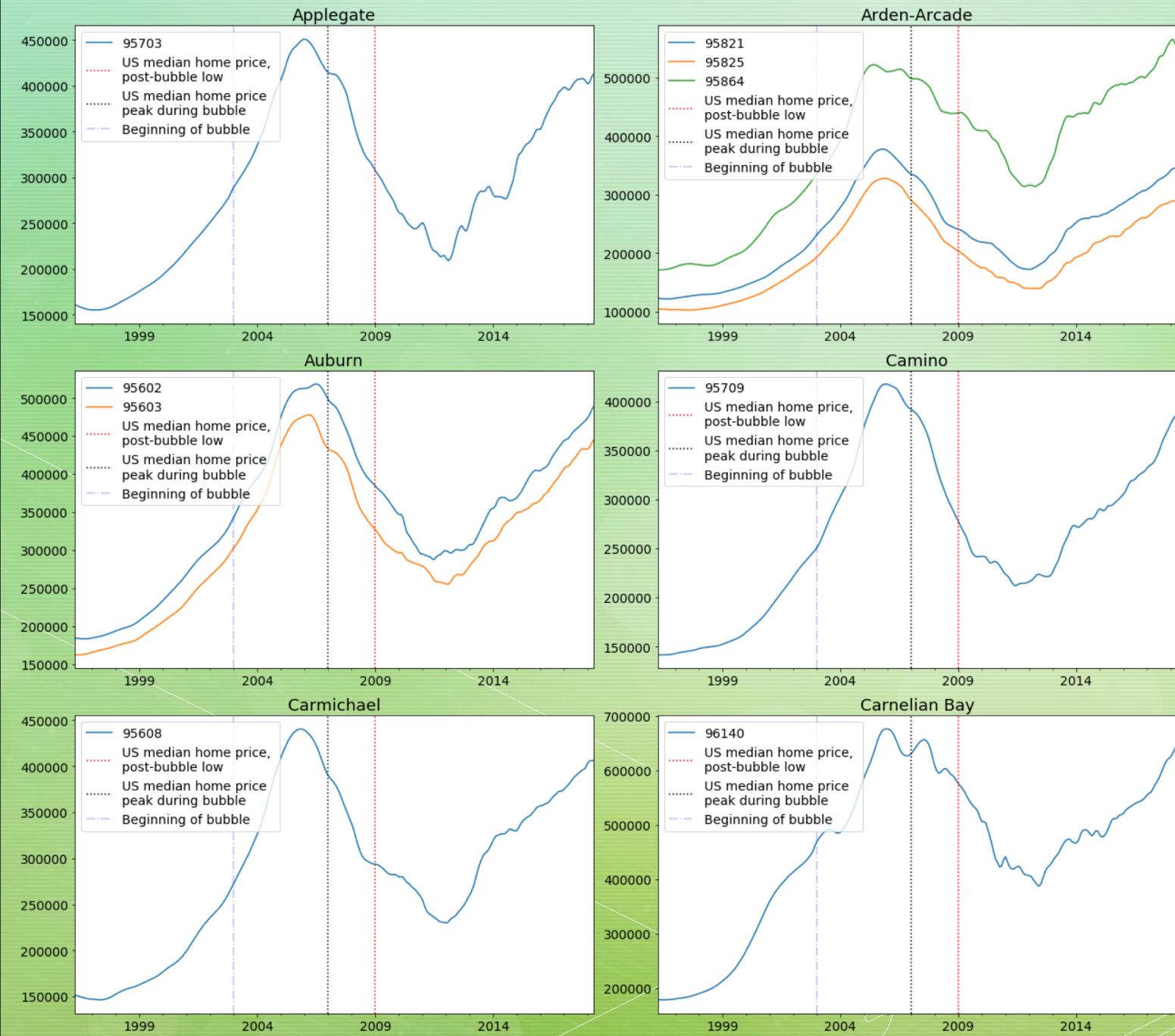
Plots of historical values by city: Sacramento metro region

Looking at ZIP code plots shows patterns that can be used to inform ZIP code selection.

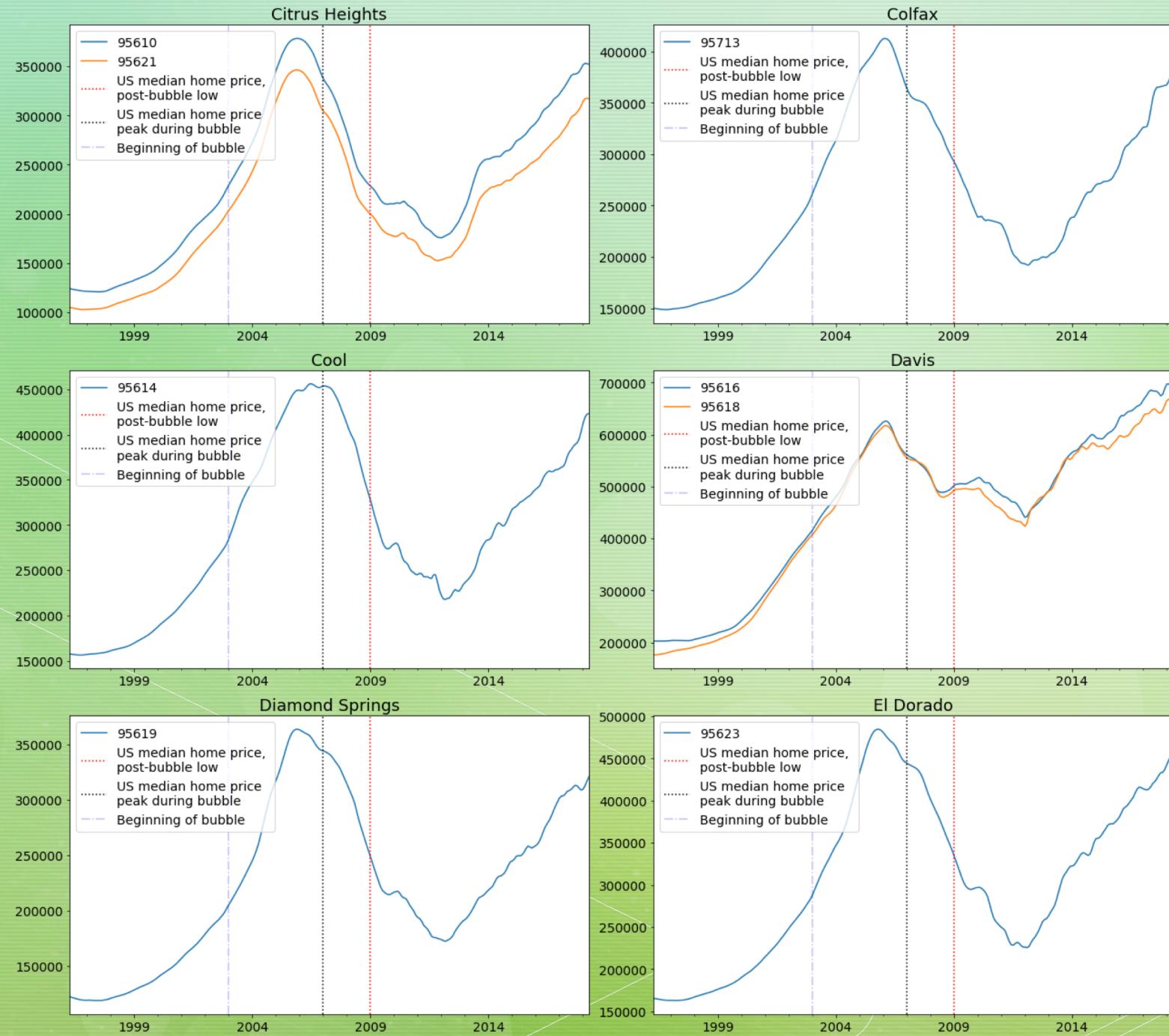
Several pattern elements can be identified, including:

- Volatility (how large was run-up and subsequent drop of housing values)
- Remaining upside potential after market recovery
- Momentum (likelihood of increased or decreased values based on shape of curve in the last time periods for which data is available)

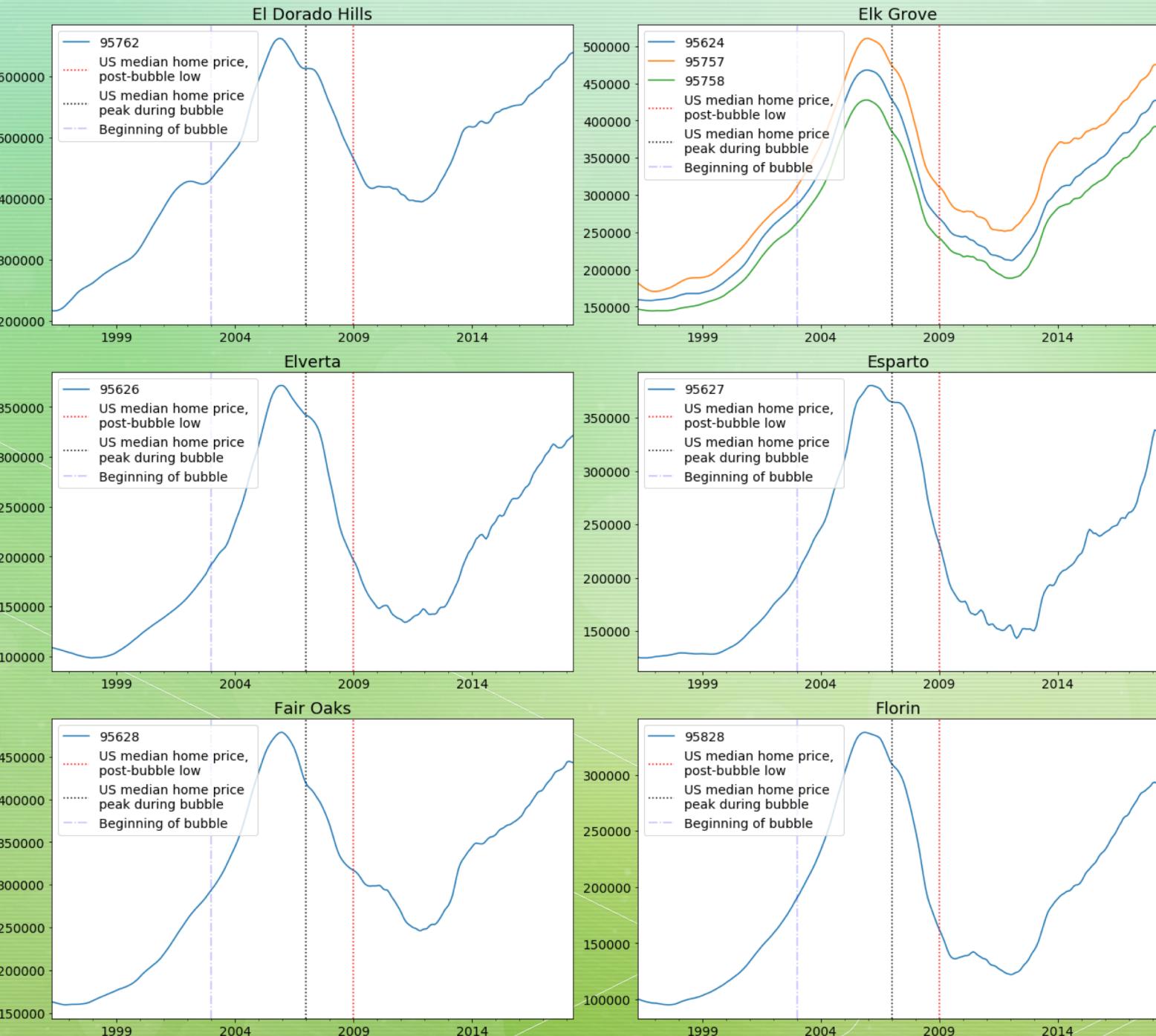
Sacramento Metro Area:
Plots by city
(First group of six plots)



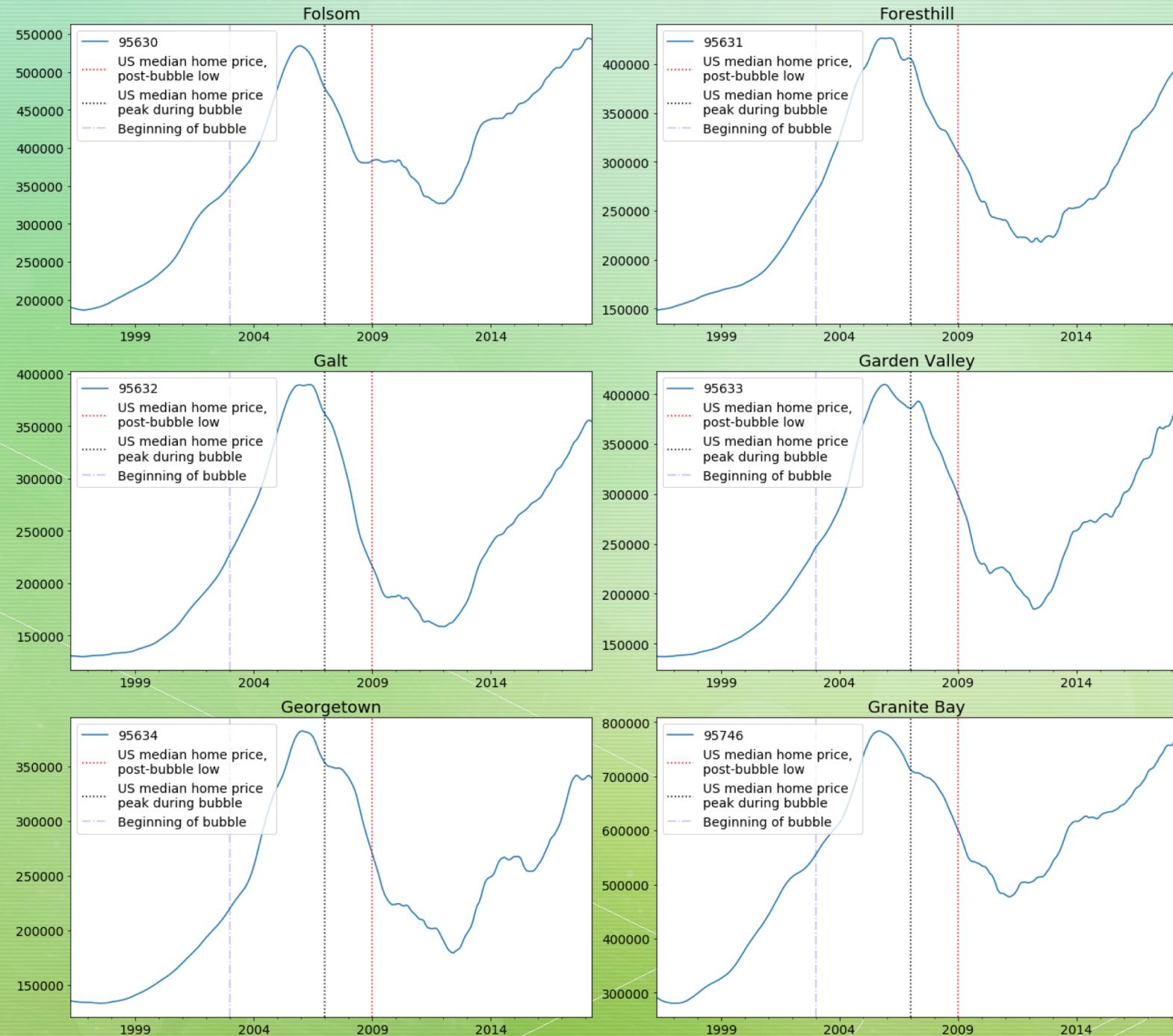
Sacramento Metro Area:
Plots by city
(Second group of six plots)



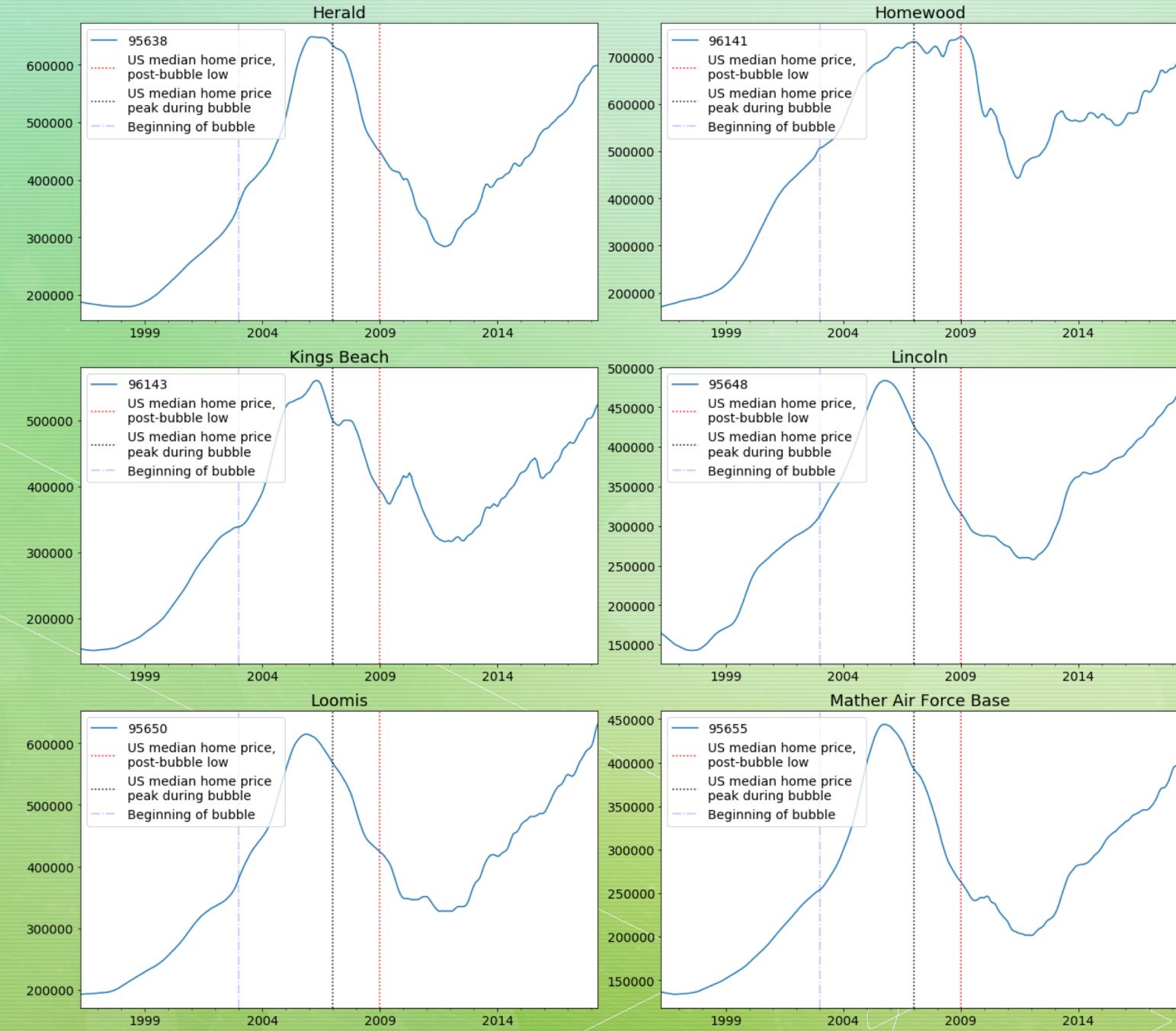
Sacramento Metro Area:
Plots by city
(Third group of six plots)



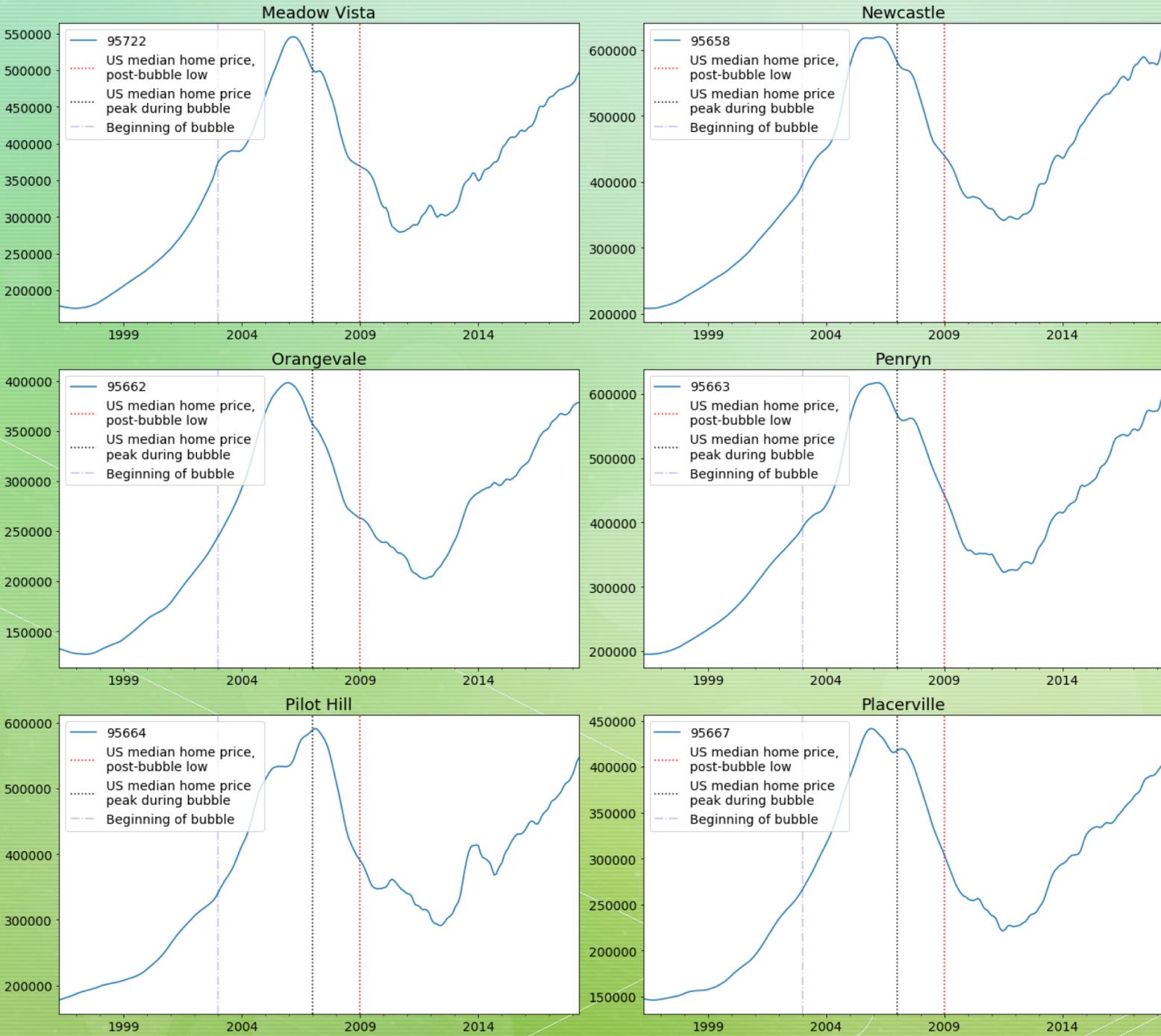
Sacramento Metro Area:
Plots by city
(Fourth group of six plots)



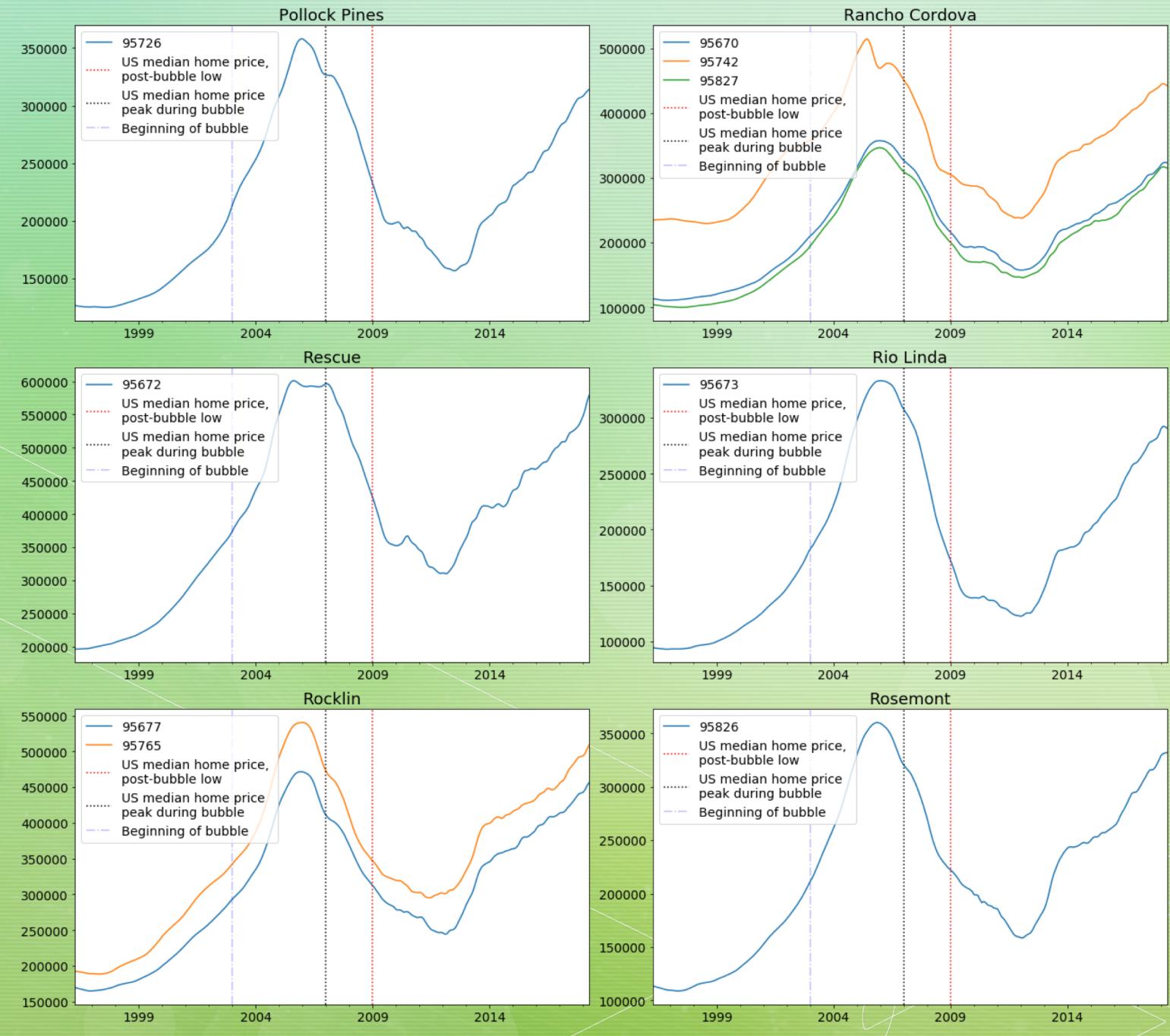
Sacramento Metro Area:
Plots by city
(Fifth group of six plots)



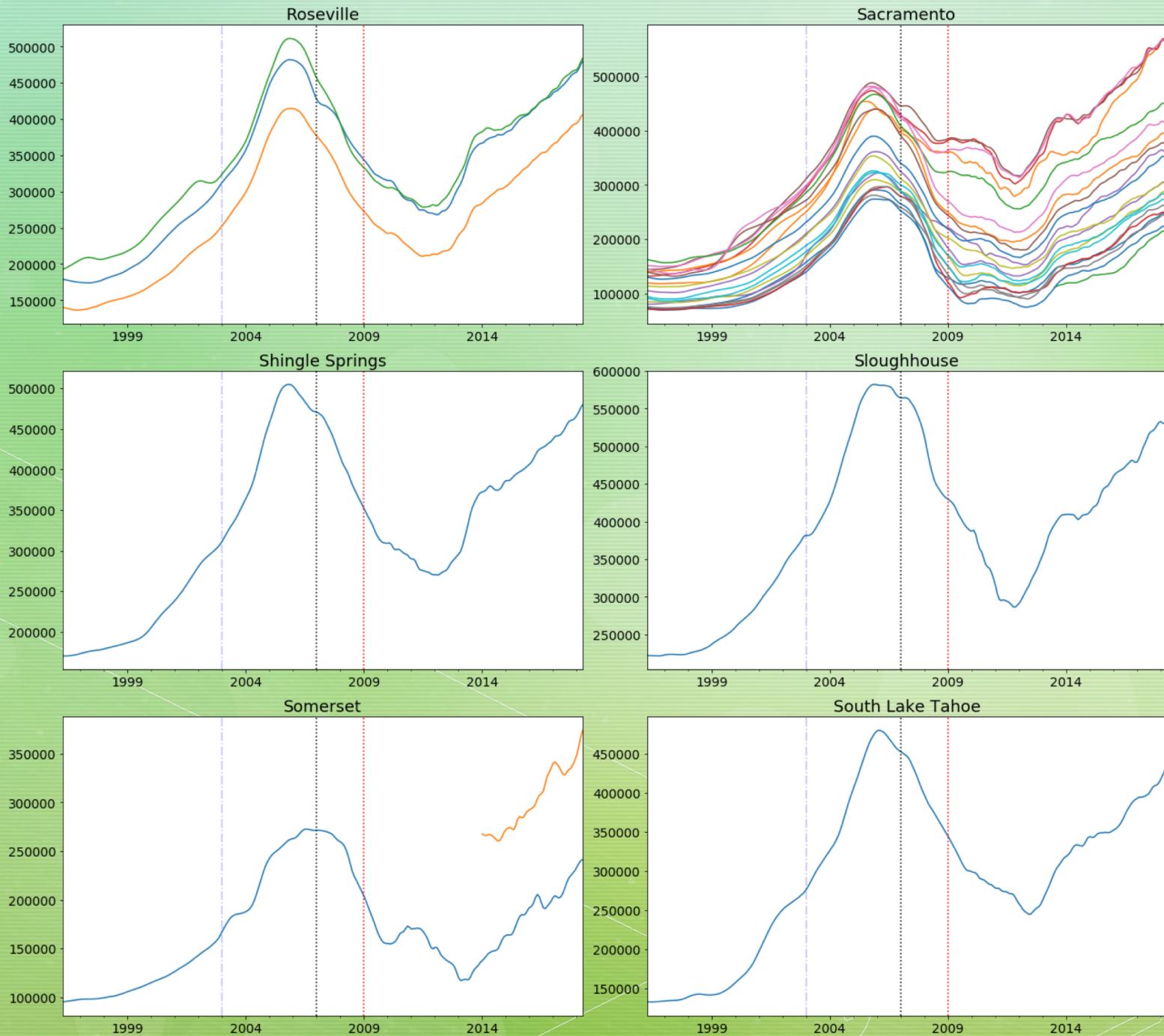
Sacramento Metro Area:
Plots by city
(Sixth group of six plots)



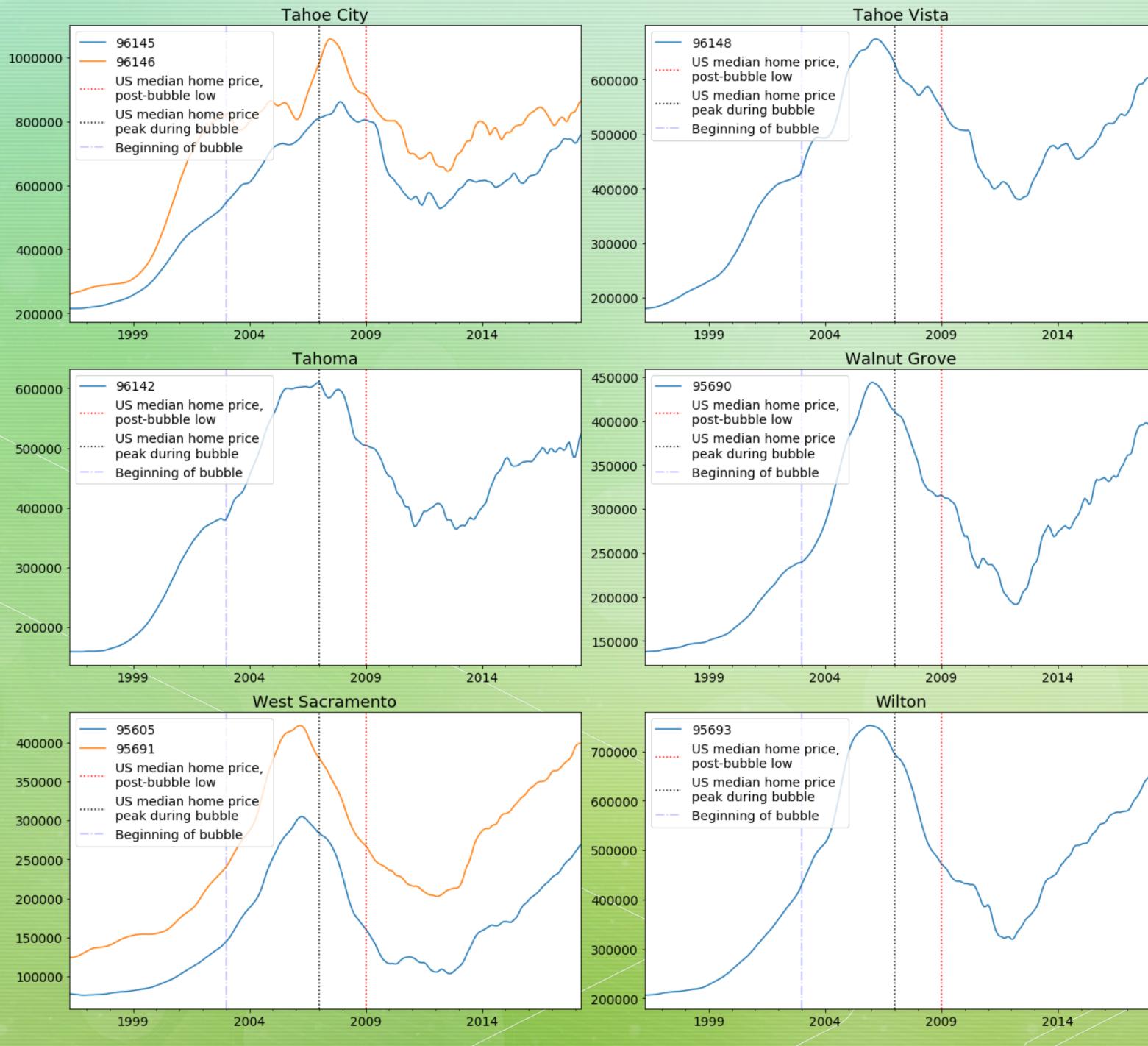
Sacramento Metro Area:
Plots by city
(Seventh group of six plots)



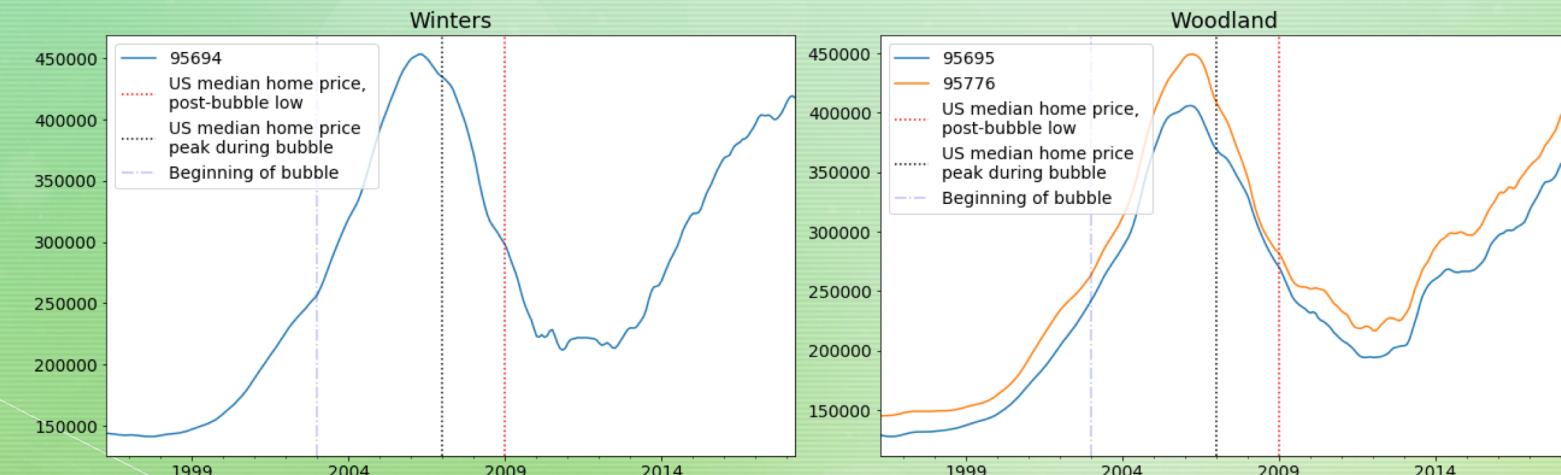
*Sacramento Metro Area:
Plots by city
(Eighth group of six plots)*



Sacramento Metro Area:
Plots by city
(Ninth group of six plots)



Sacramento Metro Area:
Plots by city
(Tenth group—two plots)



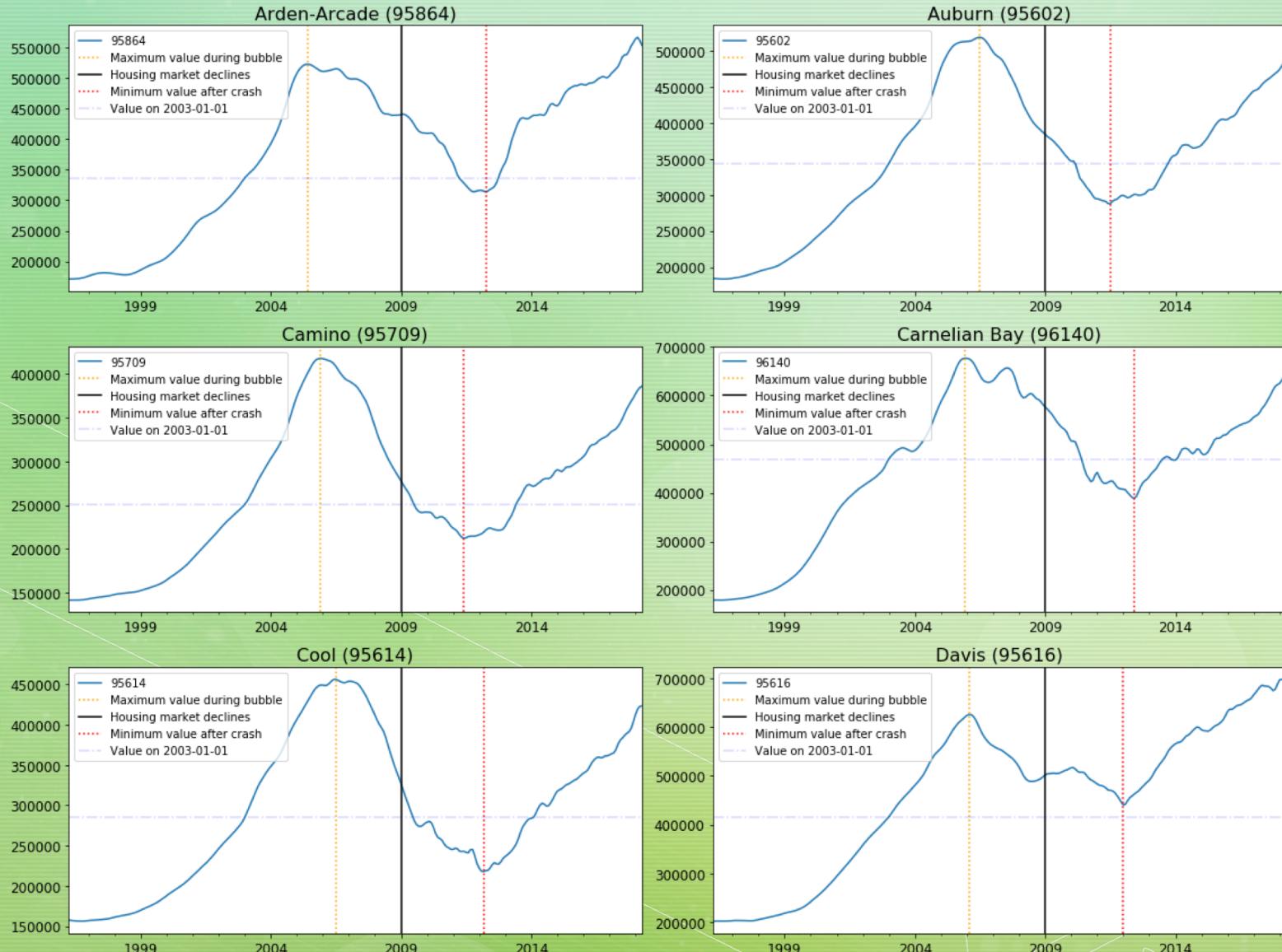
Plots of historical values: Semi-finalist ZIP codes—Sacramento metro

Looking at ZIP code plots shows patterns that can be used to inform ZIP code selection.

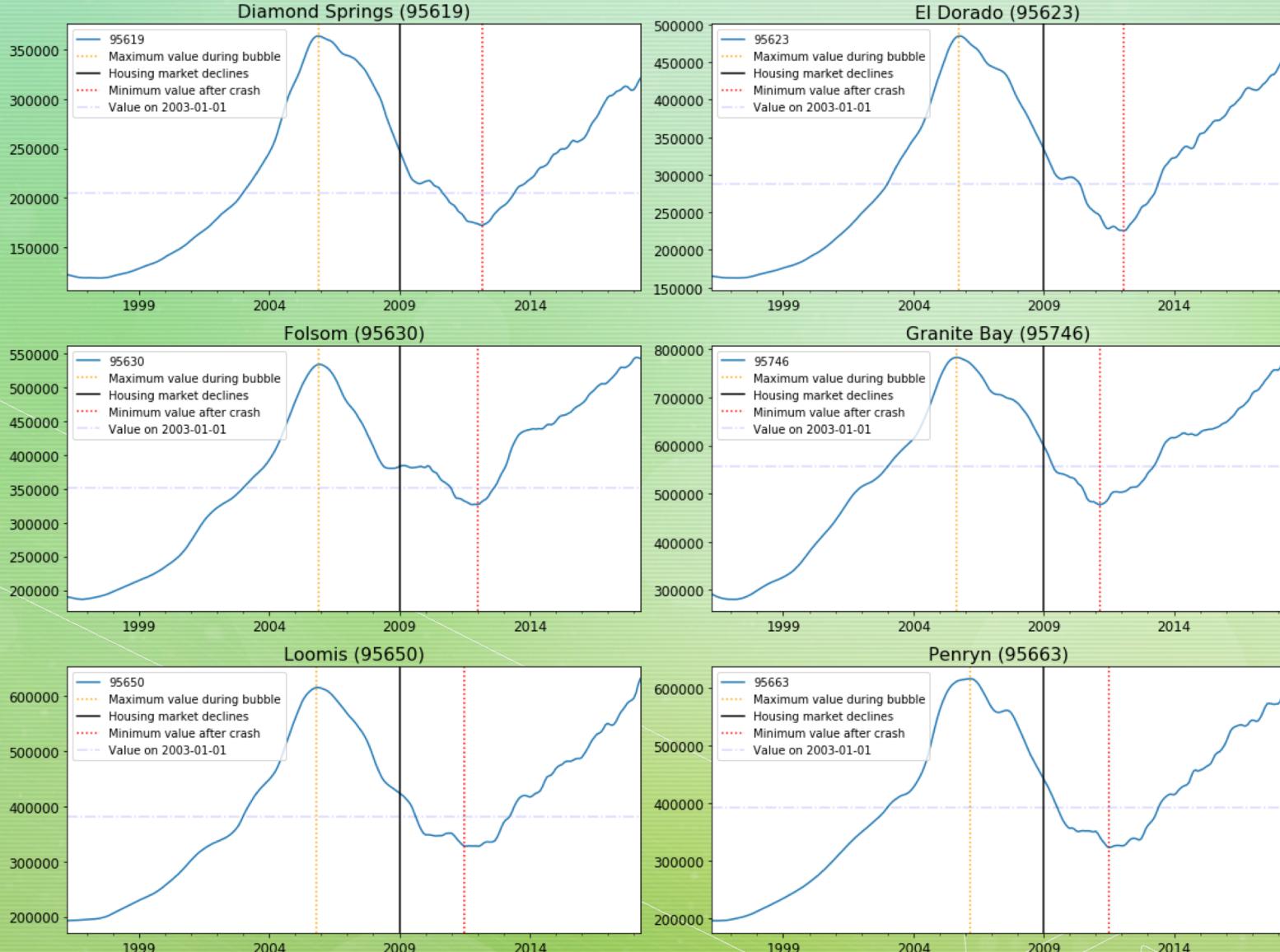
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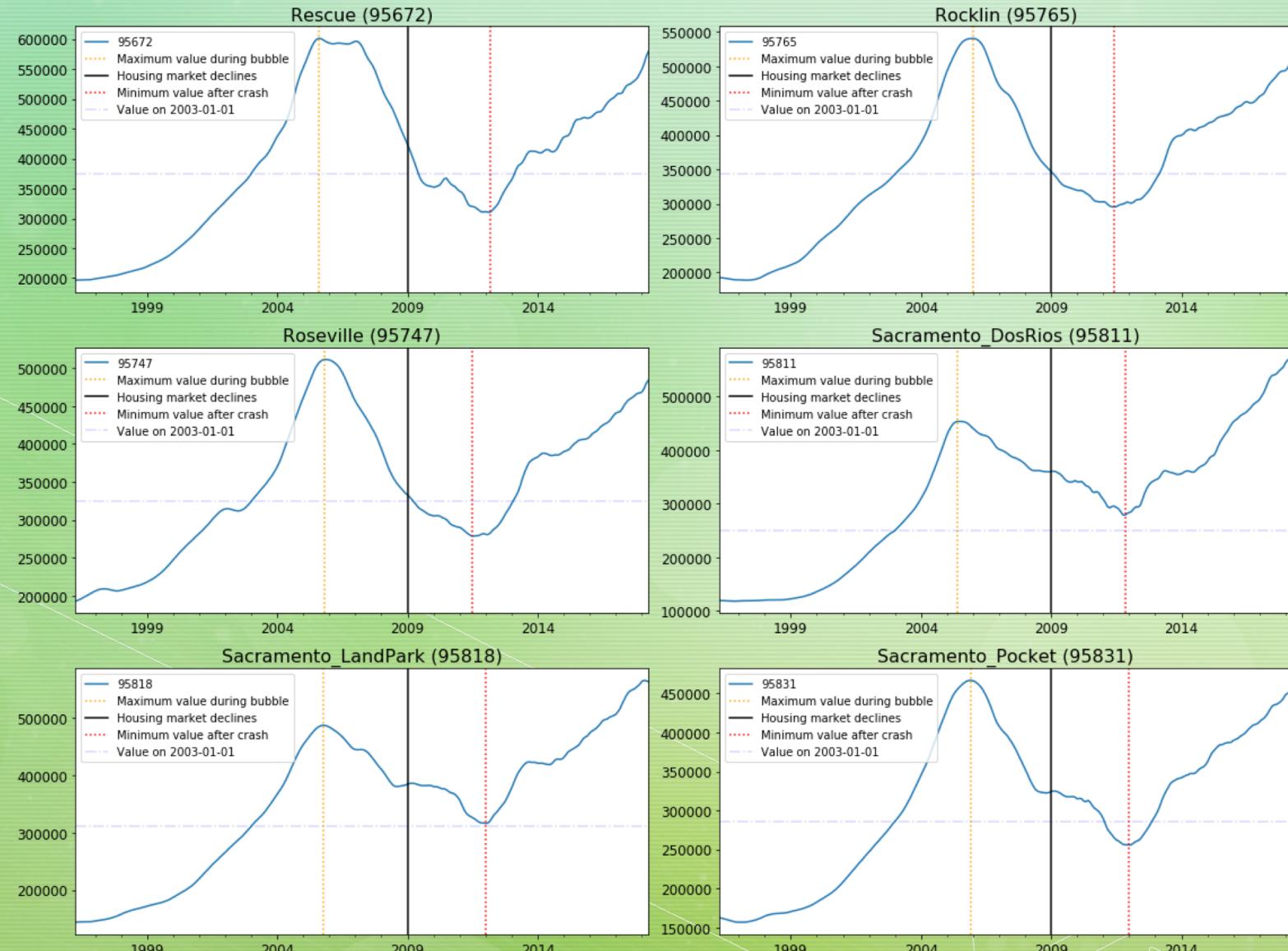
Semi-finalist ZIP codes: Sacramento Metro Area (First group of six)



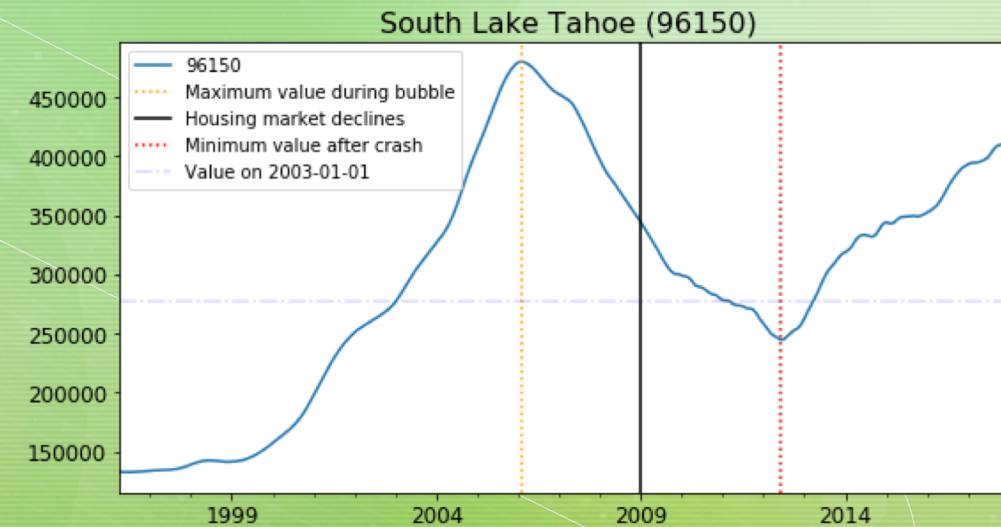
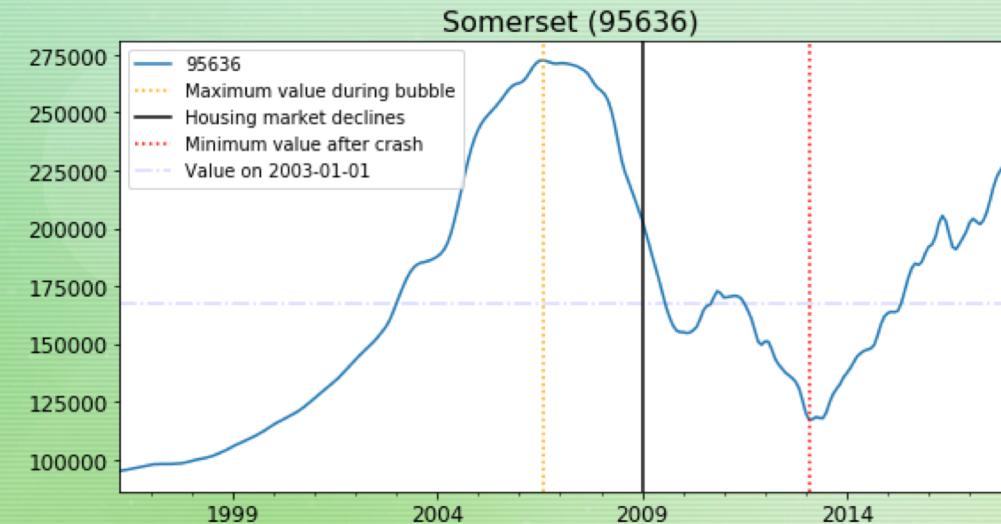
*Semi-finalist ZIP codes:
Sacramento Metro Area
(Second group of six)*



*Semi-finalist ZIP codes:
Sacramento Metro Area
(Third group of six)*



*Semi-finalist ZIP codes:
Sacramento Metro Area
(Fourth group—last
two ZIP codes)*

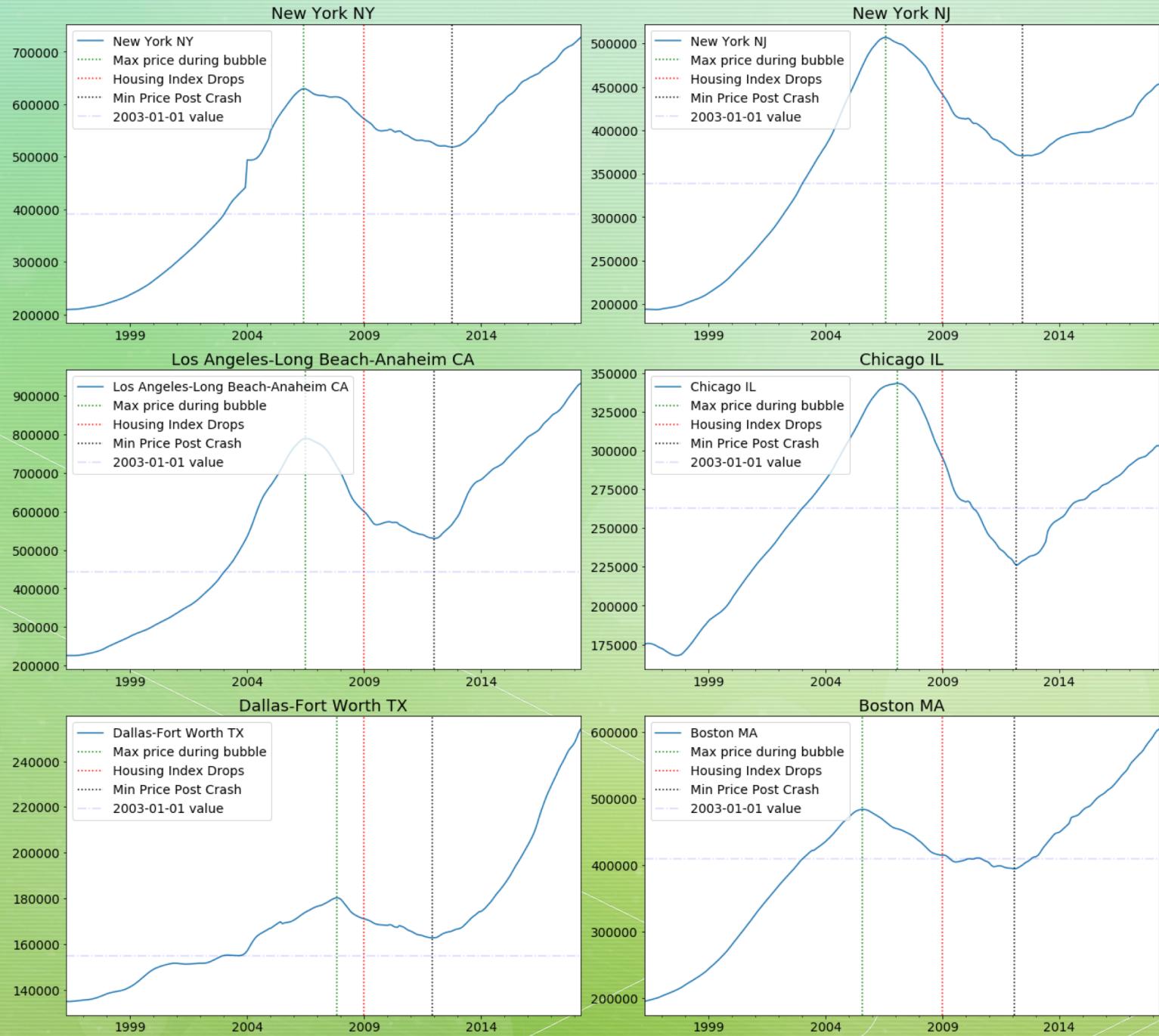


Historical housing market values: Top 30 U.S. metro areas

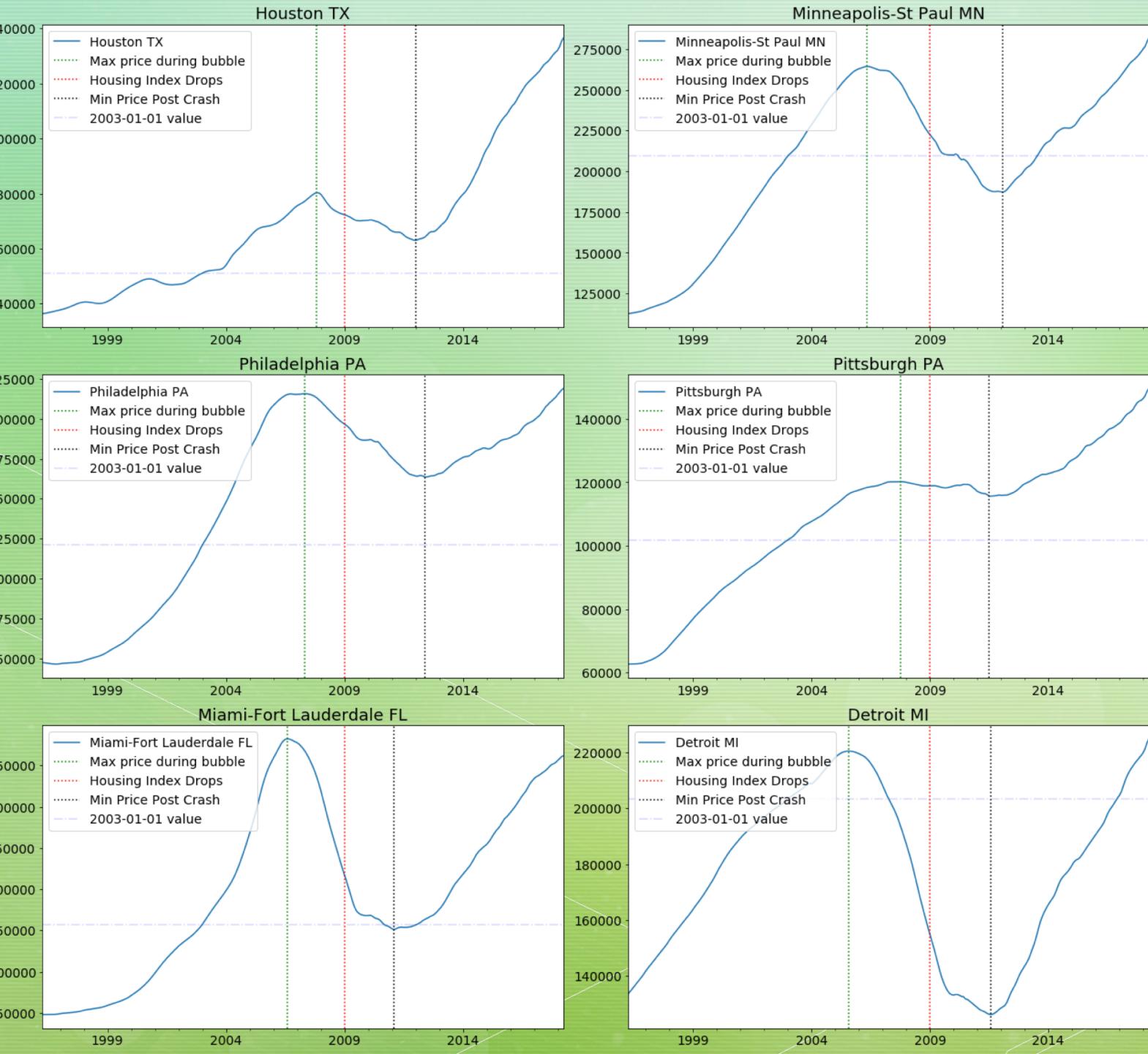
Plots aggregated at the metro area can reveal which metro areas might hold the greatest promise for investment.

Using the same dataframe construction, dictionary creation, and plotting functions that were demonstrated in the Sacramento metro area analysis, we can see which metro areas were most volatile during the crisis, and which ones might contain ZIP codes that still have upside potential after gains during the economic recovery.

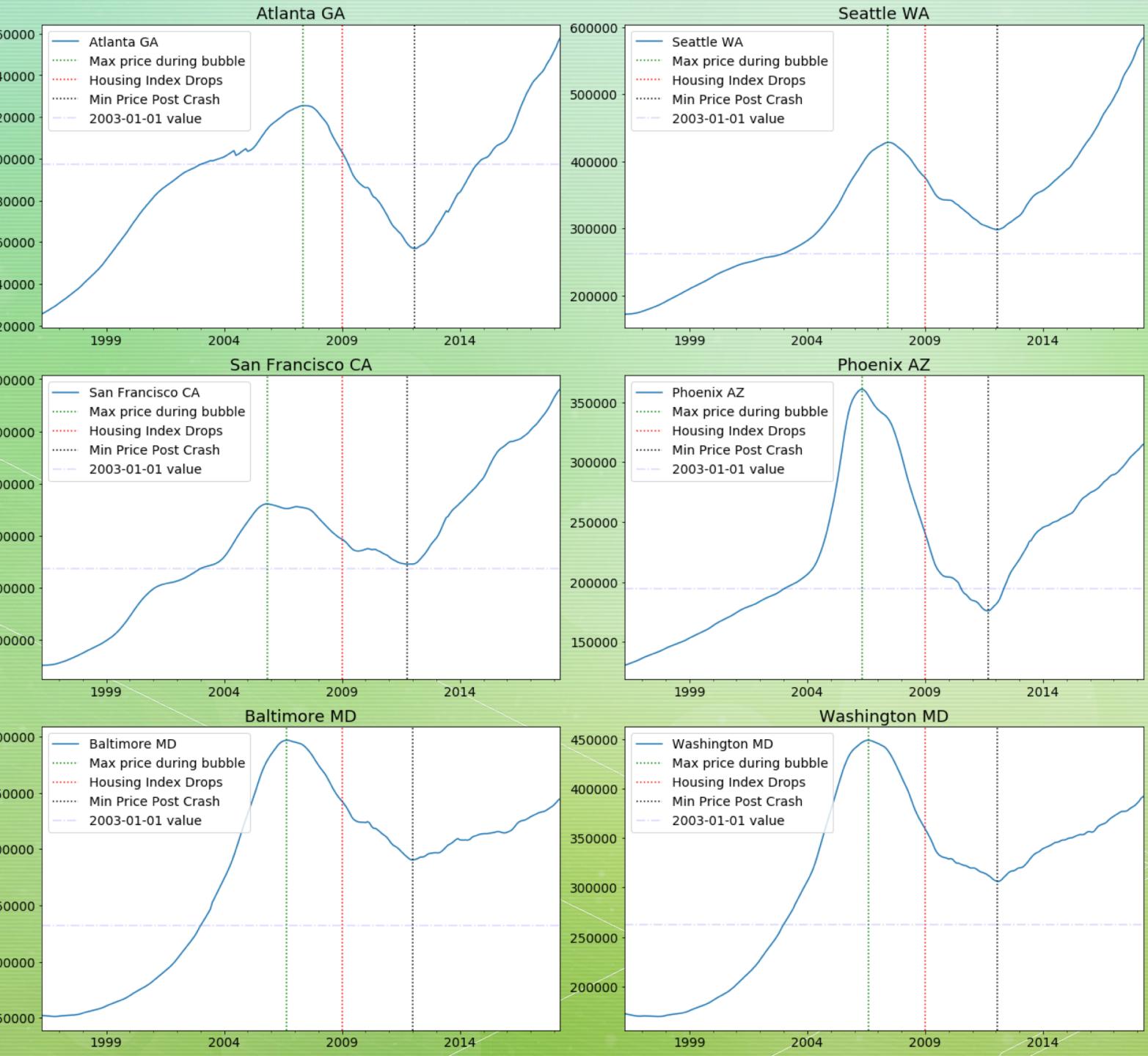
*Top 30 US metro areas
(First group of six)*



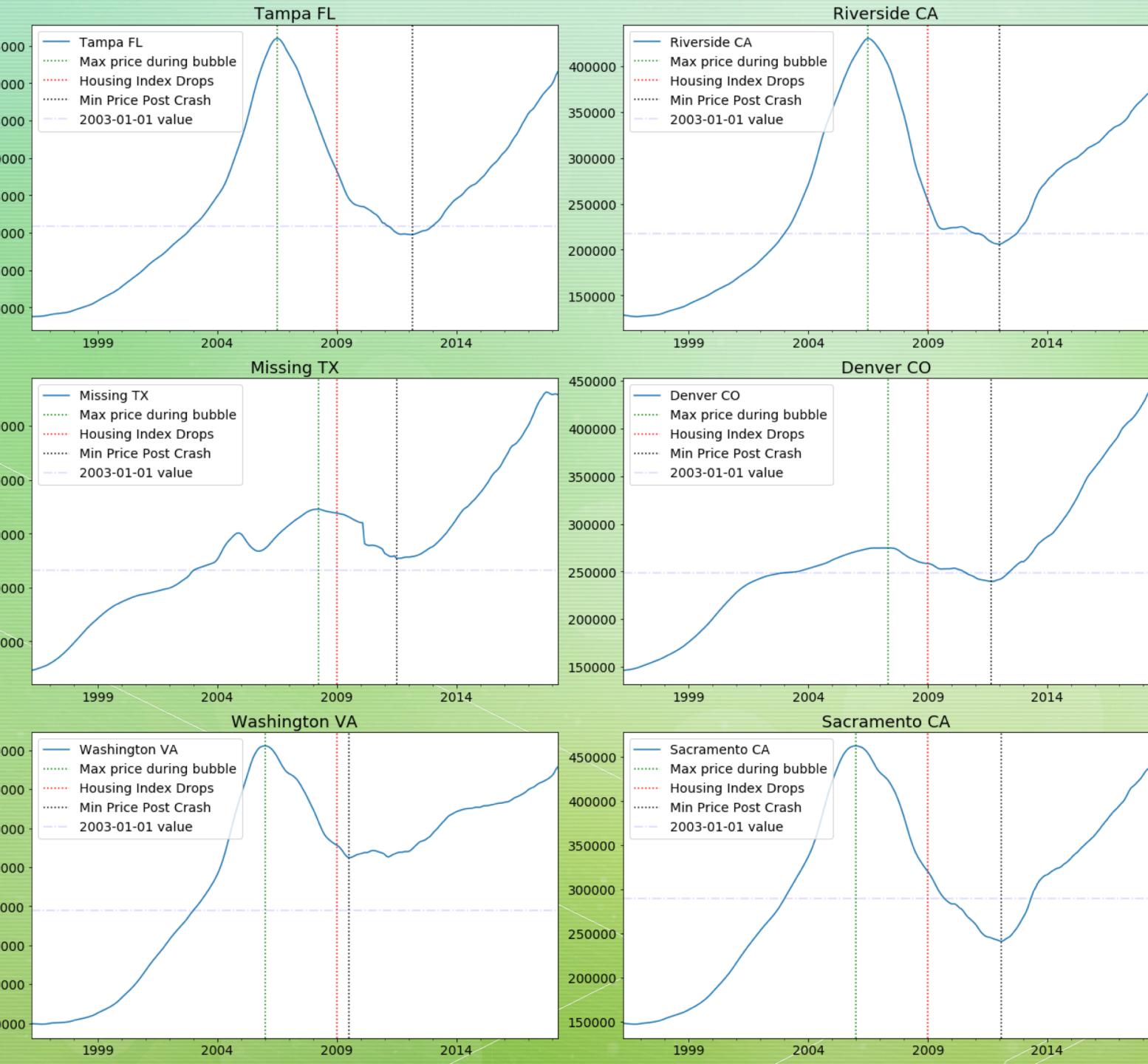
Top 30 US metro areas (Second group of six)



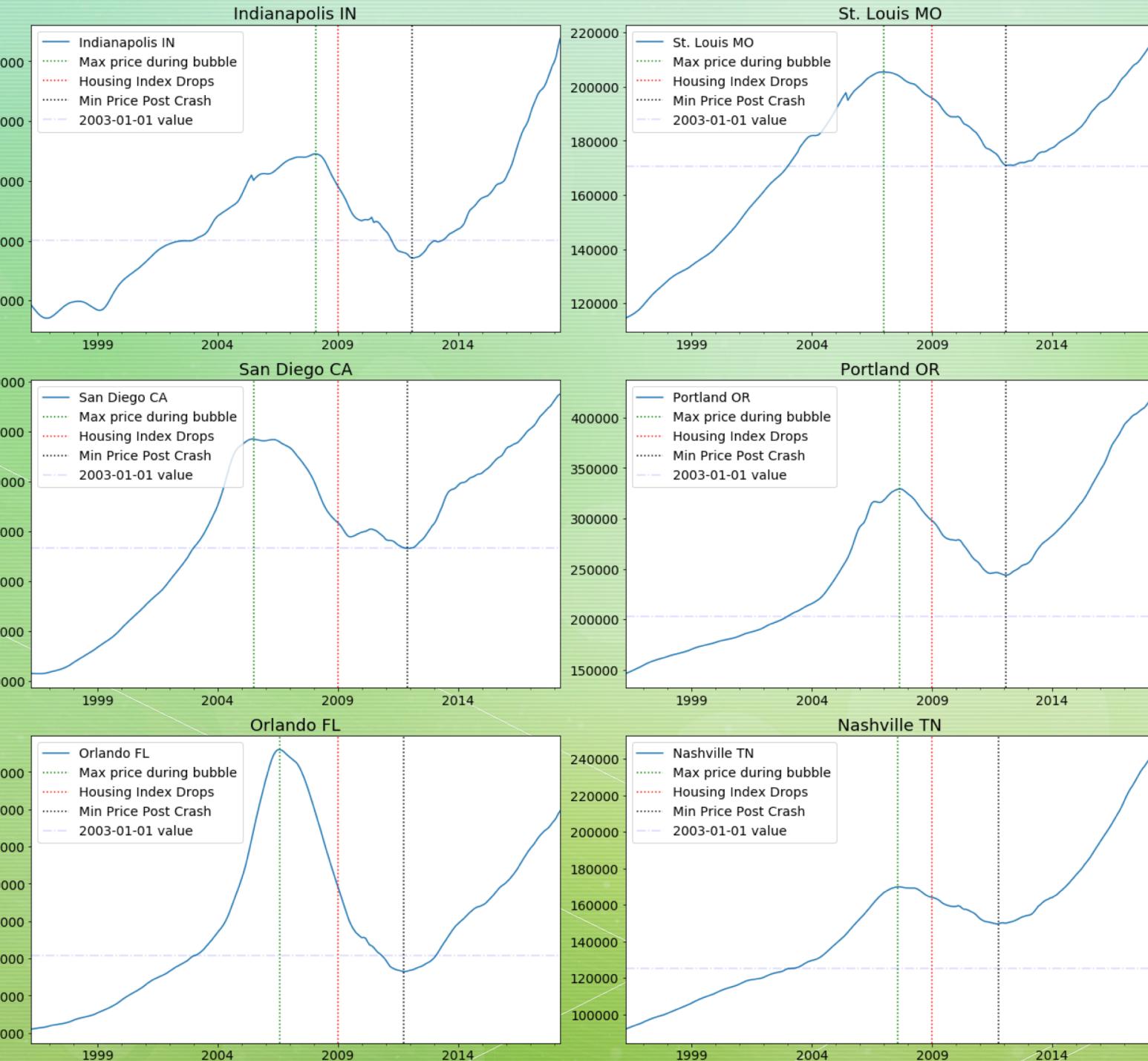
Top 30 US metro areas (Third group of six)



*Top 30 US metro areas
(Fourth group of six)*



*Top 30 US metro areas
(Fifth group of six)*



Historical and forecast plots: Dallas-Ft Worth TX

ARIMA modeling suggests that this area has excellent investment potential.

Dallas-Ft Worth TX metro area graphs

