USING TIME SERIES FORECASTING TO ANALYZE HOME PRICES

BY ETHAN KUNIN

BUSINESS CASE

- An investment firm would like to deploy **$500,000** across **five** different zip codes in **single family homes**

- Analyze which **zip codes** are most suitable to invest in based on their **risk/return** profile

- Hold Period: 1 to 3 years

- Purchase Period: Immediate to near future

NARROWING THE SEARCH DOWN TO TEXAS

- Favorable **tax code** - no state income tax

- Strong in place industries – oil & gas
  - Home to HQ of 24 Fortune 500 companies

- Increasing popularity amongst legacy and new **technology** companies
  - Especially in Austin and other metros

- Impressive **migration** statistics
 - Over the pat 10 years, population has increased by 16%, 3rd largest out of all 50 states

ANALYZING THE TOP METRO AREAS

- Begin search by narrowing the state of Texas down to its **ten largest metropolitans** by population
    - **Primary Market:** Harris, Dallas, Tarrant, Bexar, Travis,
    - **Secondary Market**: Denton, Collin, El Paso, Montgomery, McLennan
- Investing in primary and secondary markets because they are both **high quality** but have slightly different make ups
    - Primary markets: Lower **capitalization rate** – more interest rate risk, stronger **migration** patterns, more **diverse economies**
    - Secondary markets: Higher **capitalization rate** – less interest rate risk, lower **migration** statistics, more **concentrated economies**
- Next Steps: Observe **economic resiliency** and **growth characteristics**

ECONOMIC RESILIENCY

- Use the strength of each zip code's recovery to the 2008 housing crisis as a proxy for economic resiliency

- Seeking zip codes that were **minimally impacted** and recovered quickly

- Ensure there will be an opportune time to **sell within one to three years** even if the housing market declines

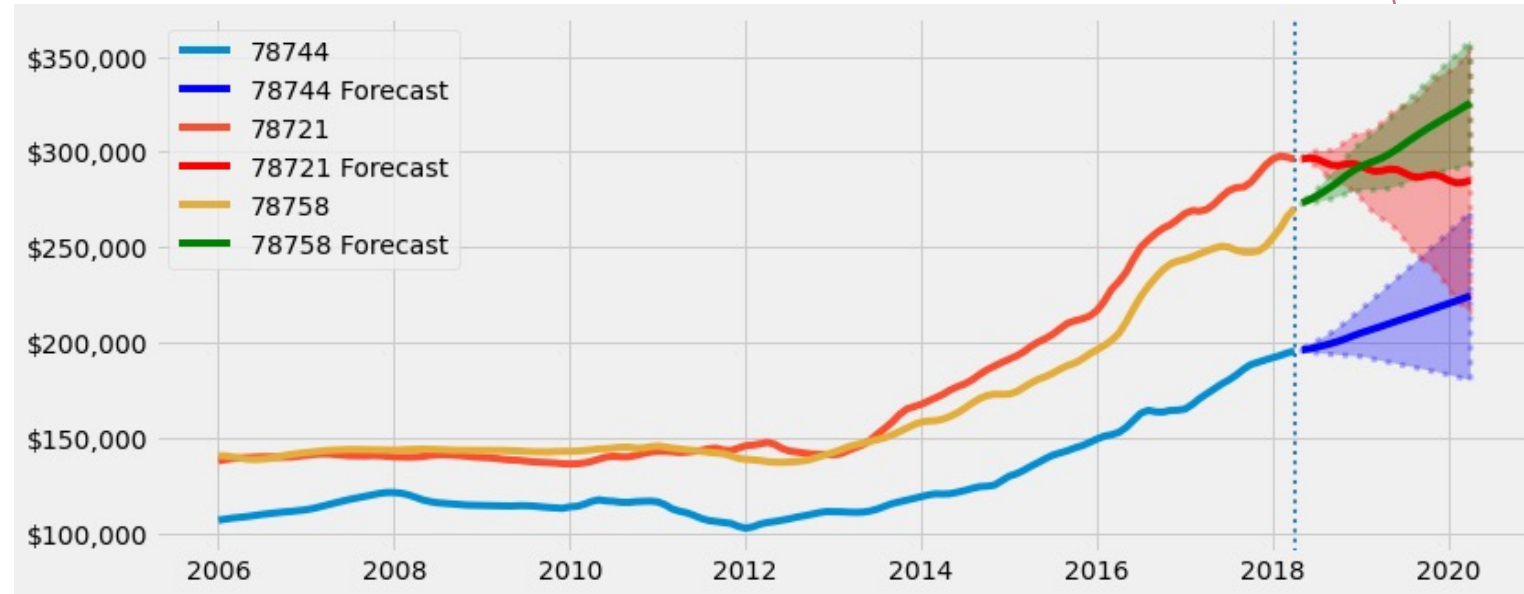- Move forward with: Travis, Harris, Bexar, El Paso, Collin, Denton

Days Until Median Home Price Reached Pre '08 Home Price
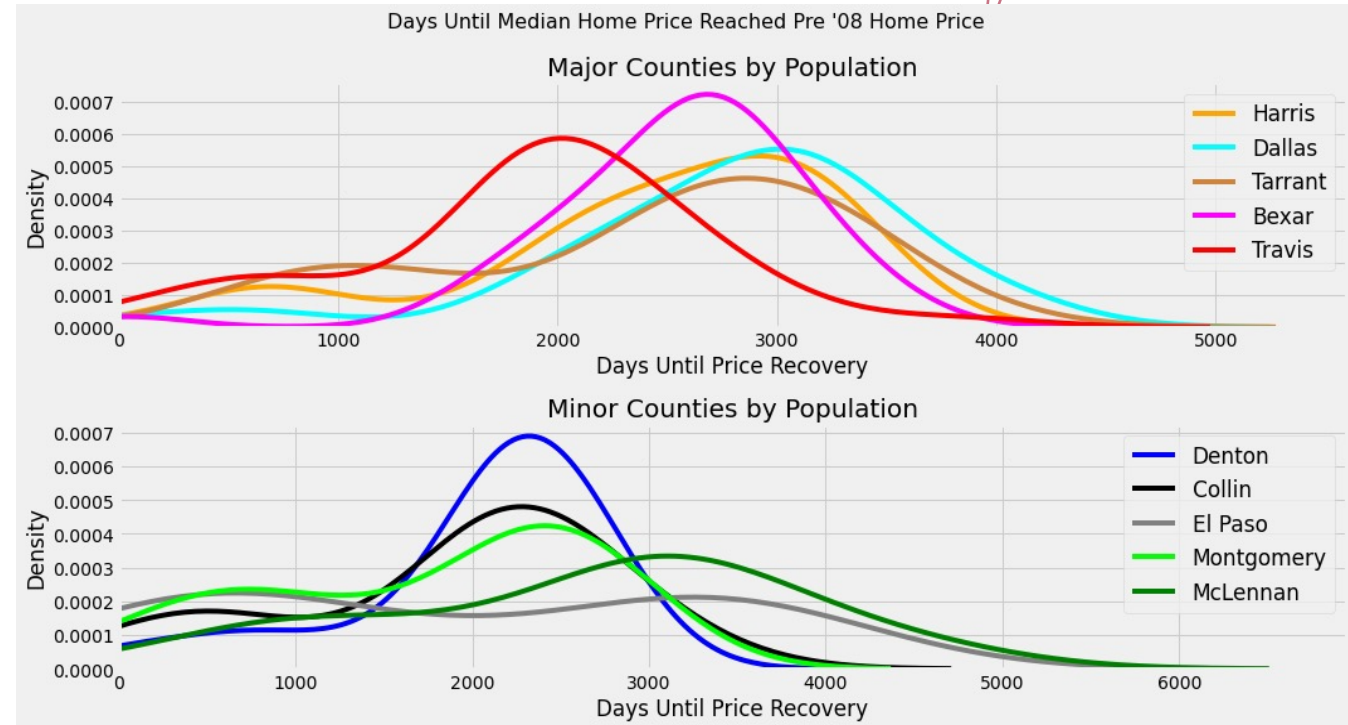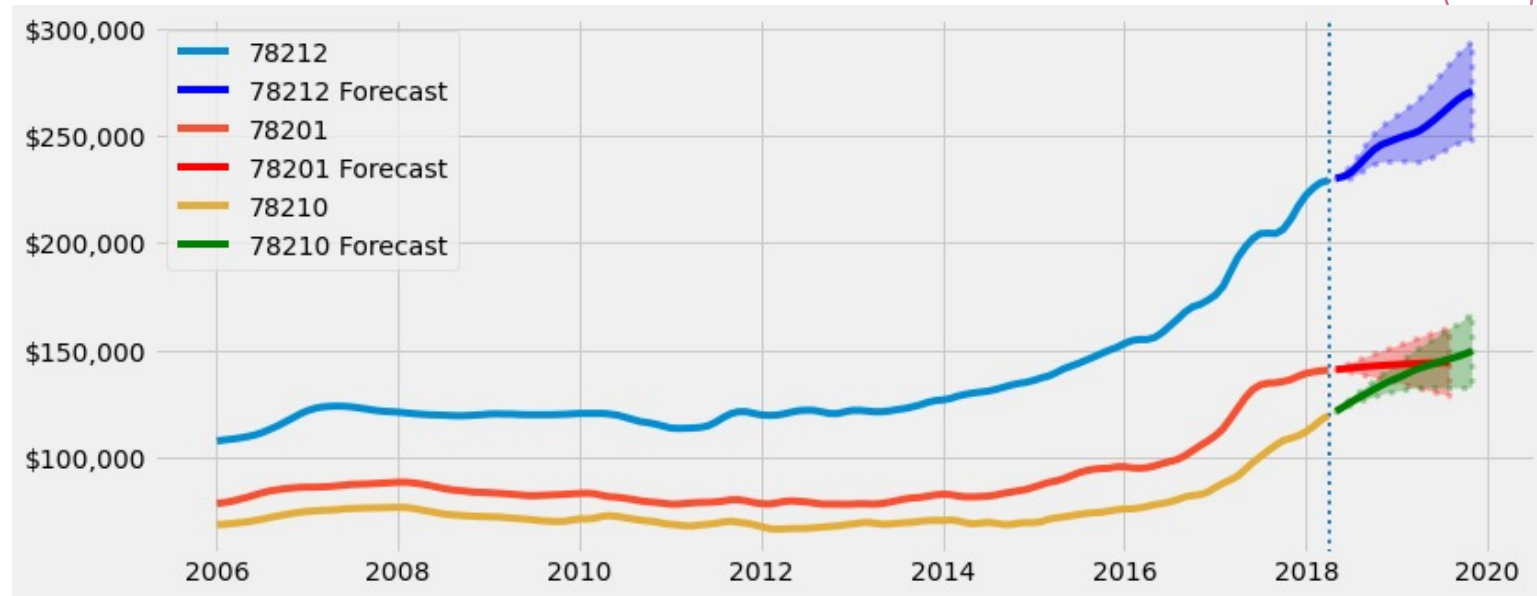
TOP GROWTH PROSPECTS
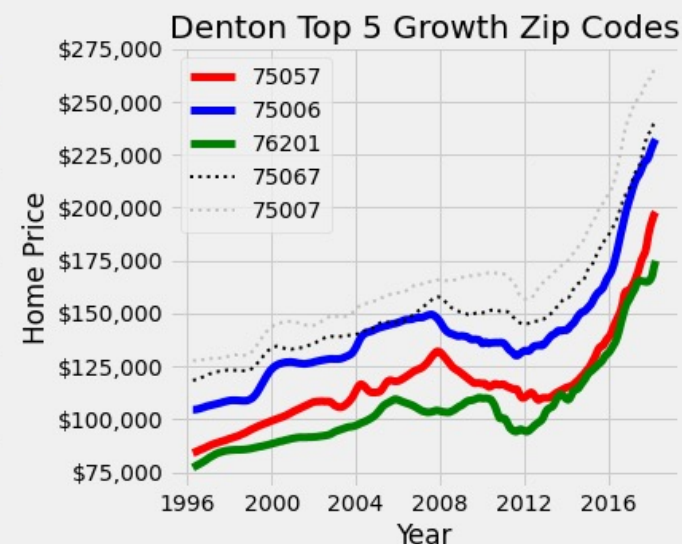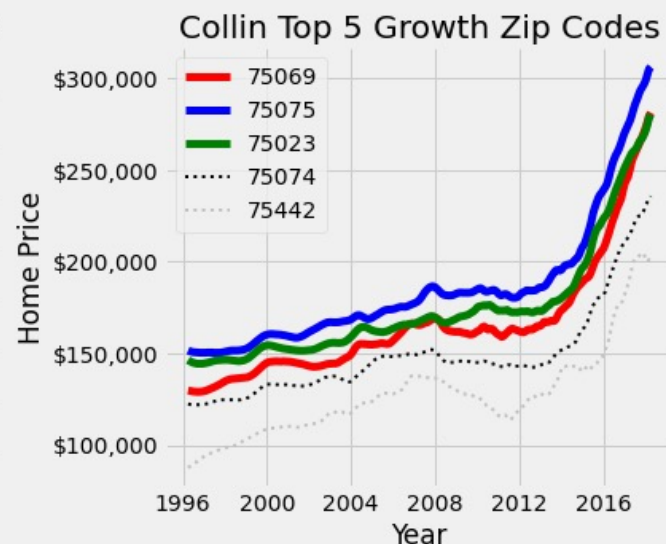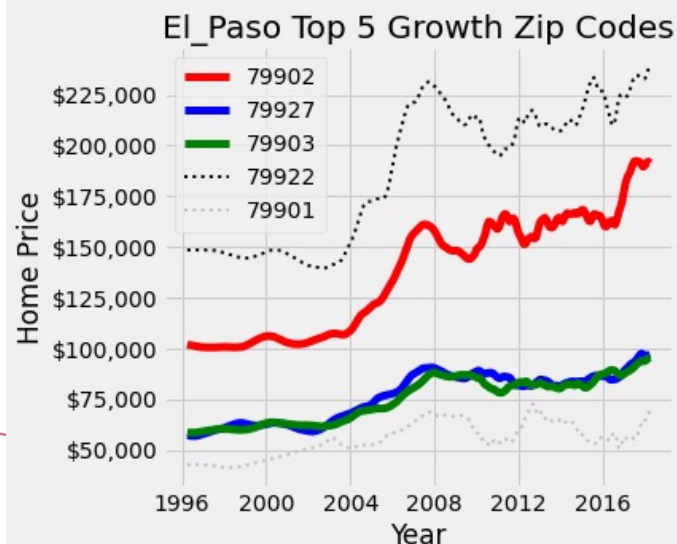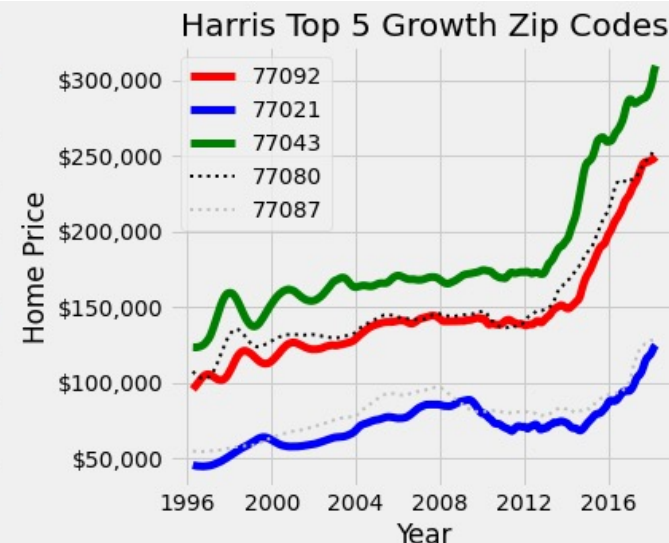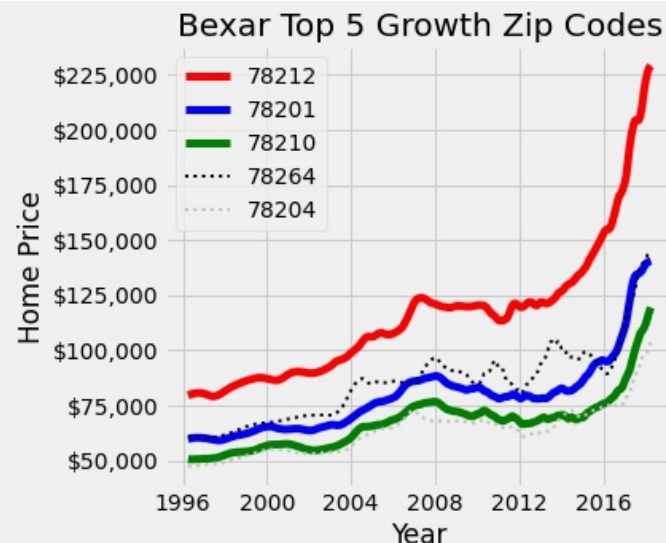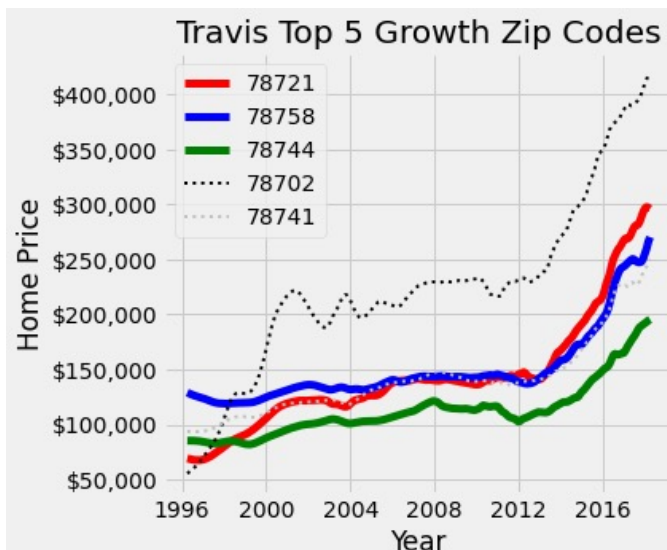
TRAVIS COUNTY

- Based on the downside risk, upside return, and mean predicted value, **78758** is the superior zip code

- Predictable return profile and highest predicted forecast

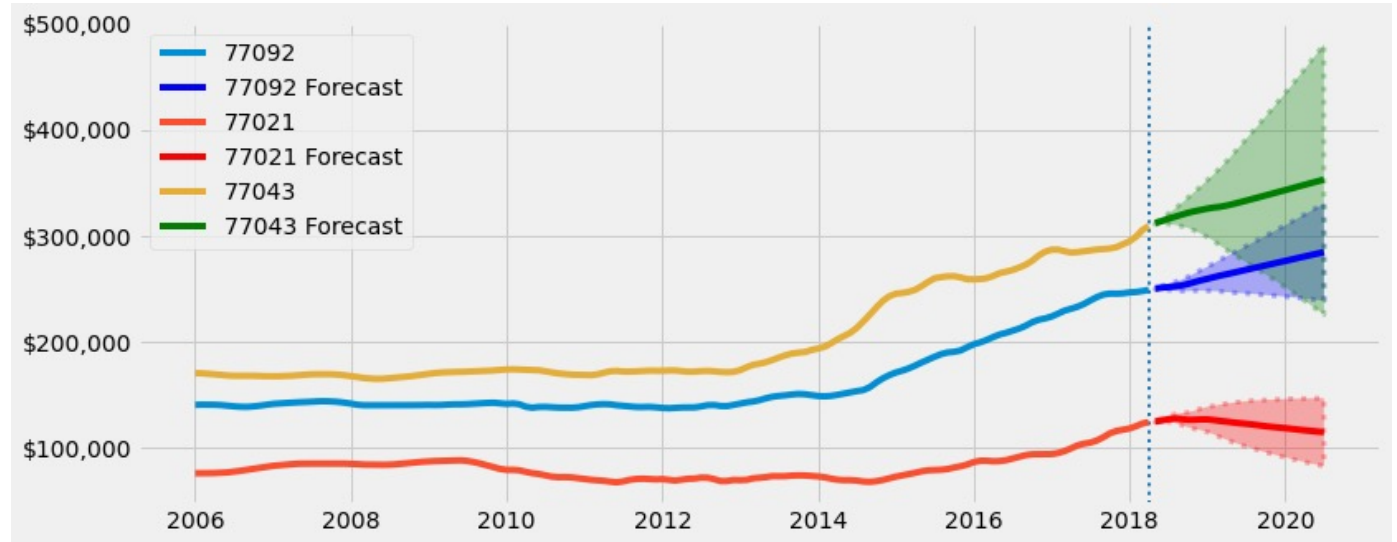- - **78721** has the worst metrics across the board

BEXAR COUNTY

- Based on the downside risk, upside return, and mean predicted value, **78210** is the superior zip code
  - It has the highest upside, the highest predictions
- 78212 has promising predictions but it does not have as much upside, however it does have a more predictable
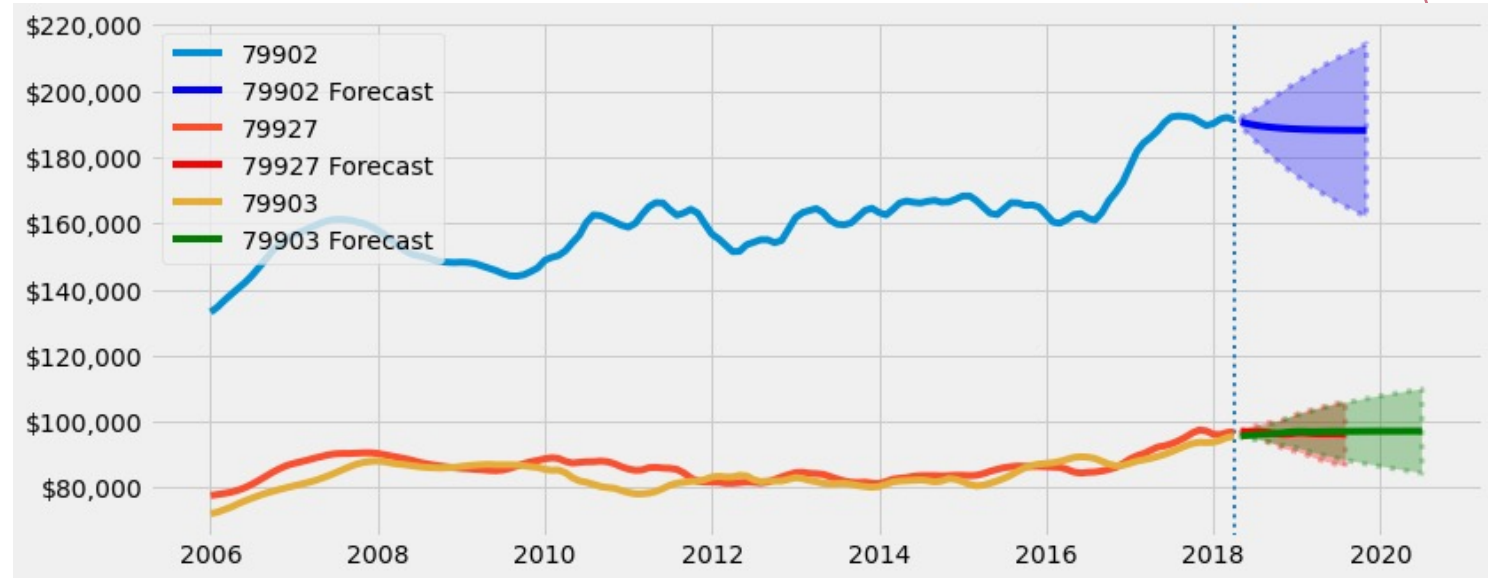
HARRIS COUNTY

- Based on the downside risk, upside return, and mean predicted value, 77092 is the superior zip code
    - It has the second highest upside, the highest predicted mean
- - 77021 has a lower predicted mean forecast and a tight spread meaning minimal potential upside
- - 77043 has too large a standard deviation, more risk than 77092 with a lower predicted return
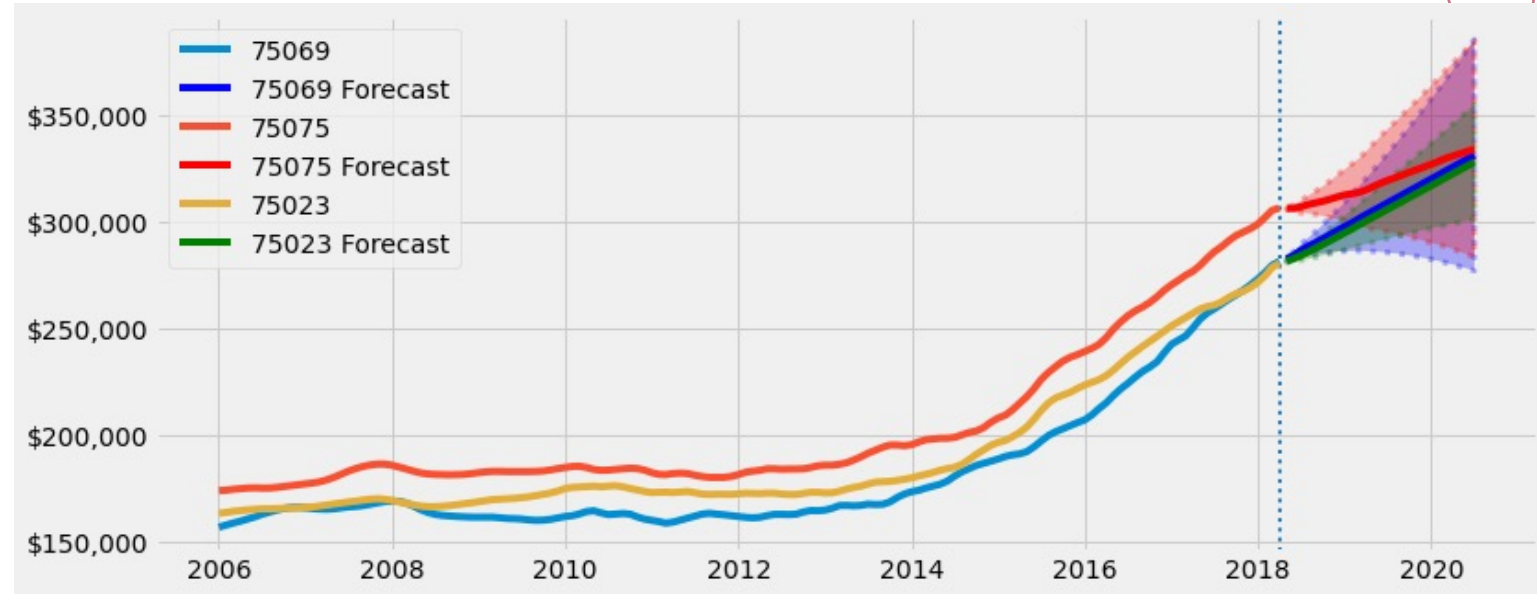
EL PASO COUNTY

- Based on the downside risk, upside return, and mean predicted value, 79903 is the superior zip code
  - It has the second highest upside, highest predicted mean, and second lowest downside risk
- 79927 has a very similar risk return profile
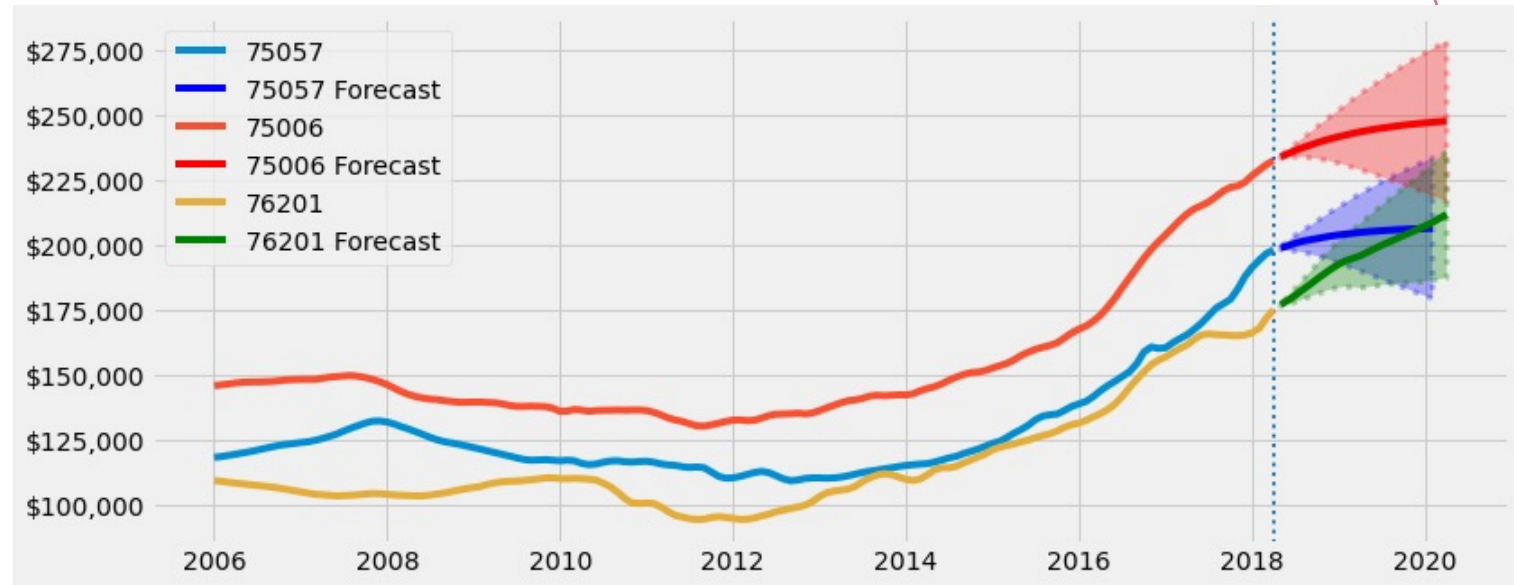- 79902 has more downside risk

COLLIN COUNTY

- Based on the downside risk, upside return, and mean predicted value, 75023 is the superior zip code
  - It has the second highest upside, second highest predicted mean, and lowest downside risk
- 75069 has a similar risk profile but more downside risk
- 75075 is the least desirable
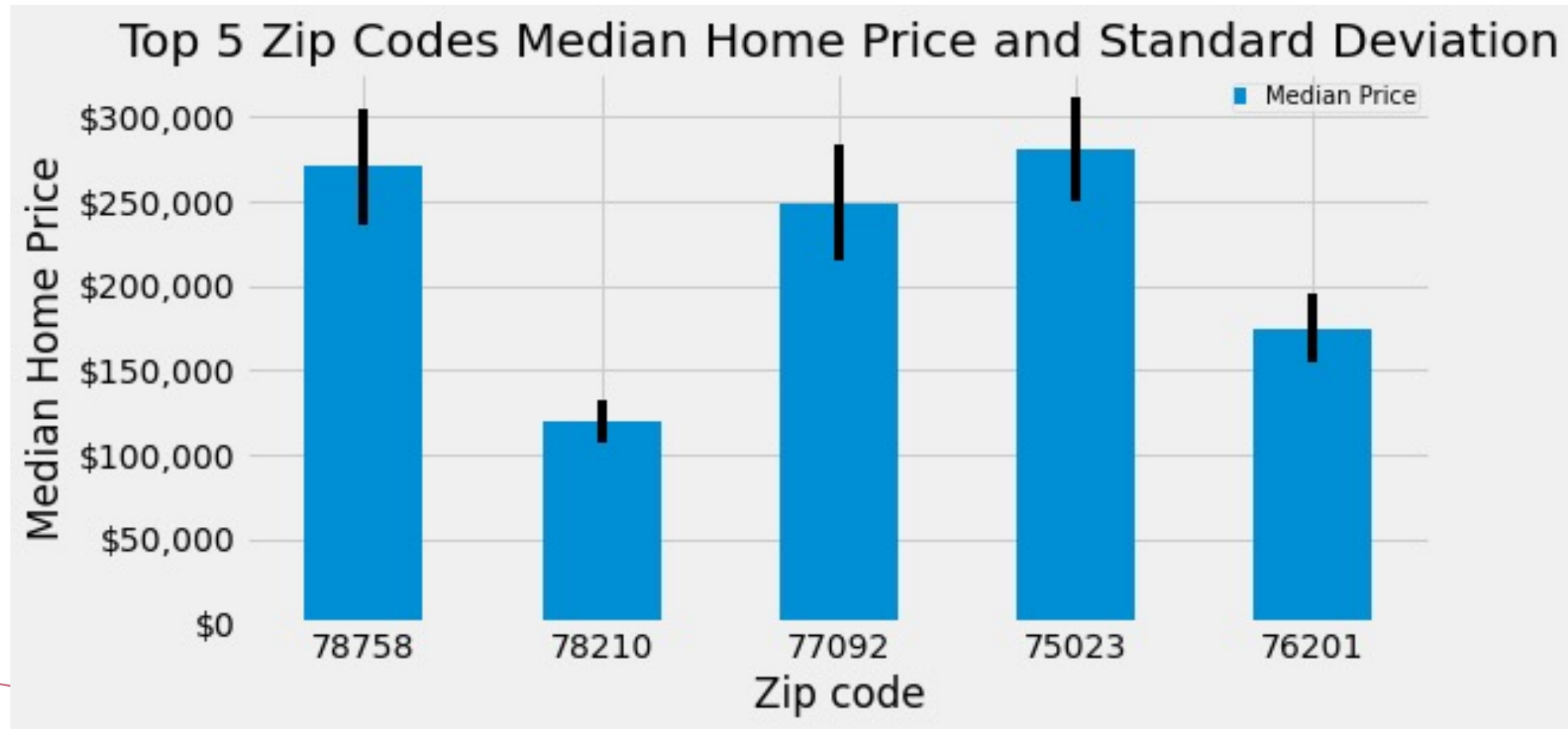
DENTON COUNTY

- Based on the downside risk, upside return, and mean predicted value, **76201** is the superior zip code
  - It has the highest upside, highest predicted mean, and lowest downside risk
- 75057 and 75006 are very similar

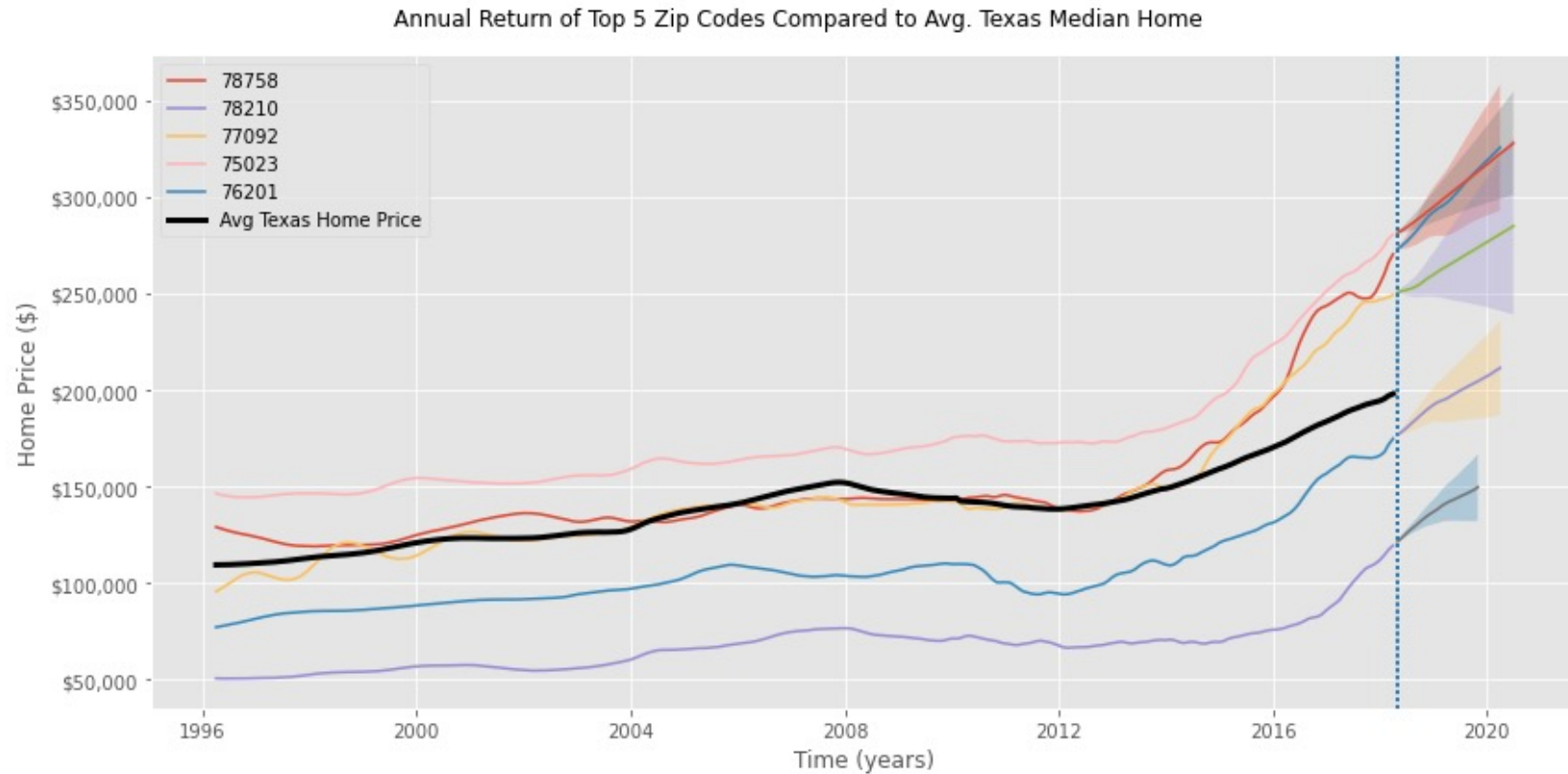# PRICE OF THE TOP ZIP CODES TODAY

Top 5 Zip Codes Median Home Price and Standard Deviation

Median Home Price (y-axis): $0, $50,000, $100,000, $150,000, $200,000, $250,000, $300,000

Zip code (x-axis): 78758, 78210, 77092, 75023, 76201
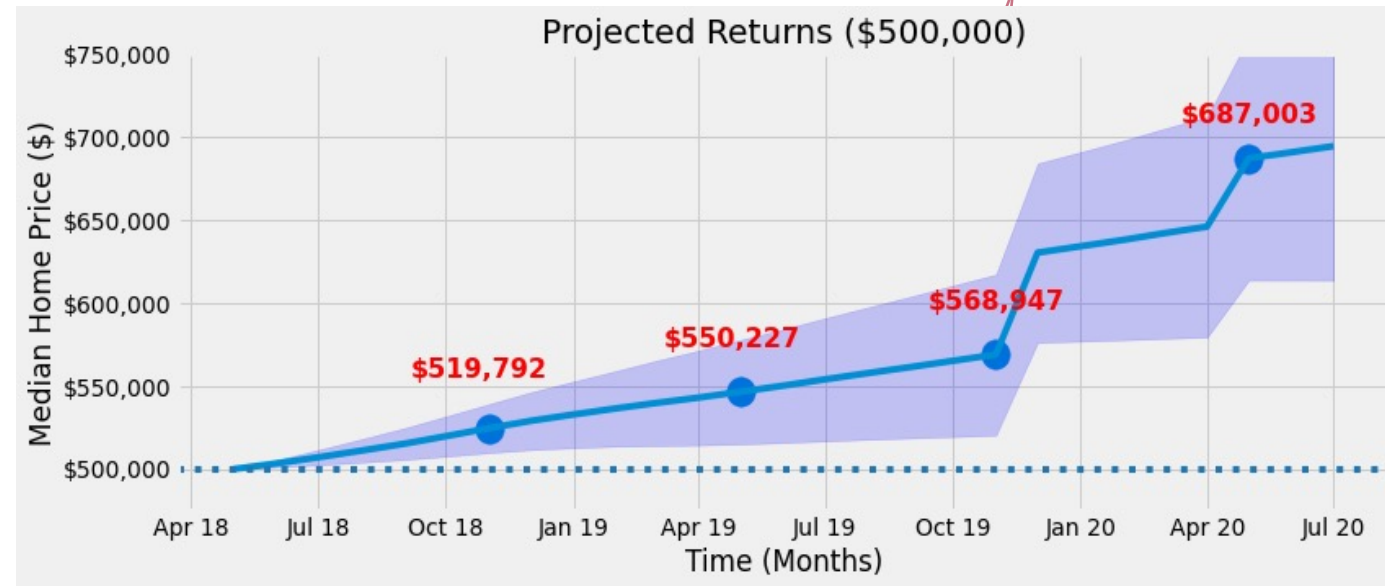
Legend: Median Price

TOP ZIP CODES' PROJECTED RETURNS

- Observe the growth rate of the top five zip codes

- Black bar represents the growth of the average zip code in Texas

- Focused on percent change as opposed to absolute increase in dollar amount

Annual Return of Top 5 Zip Codes Compared to Avg. Texas Median Home

Legend:
- 78758
- 78210
- 77092
- 75023
- 76201
- Avg Texas Home Price

Y-axis: Home Price ($) — $50,000 to $350,000

X-axis: Time (years) — 1996 to 2020

ESTIMATED RETURNS

- Hold Period

- Holding until at least May makes a significant difference on overall return

  - Highest marginal return in Nov 2019 and Apr 2020

- $500,000 invested in May 2018 has a project value of $687,000 in May 2020

  - 1 year hold - 15% return (15% Annualized RoR)

  - 2 year hold - 37% return (18.5% Annualized RoR)

Projected Returns ($500,000)

$687,003

$568,947

$550,227

$519,792

Median Home Price ($): $500,000 — $750,000

Time (Months): Apr 18, Jul 18, Oct 18, Jan 19, Apr 19, Jul 19, Oct 19, Jan 20, Apr 20, Jul 20

Based on a $500,000 initial investment spread across five different homes and zip codes

SEASONALITY – TIMING IS ESSENTIAL

- ## Zip Codes
  - 78210: Buy in April, sell in December
  - 78758: Buy in July, sell in November
  - 77092: Buy in July, sell in October
  - 76201: Buy in April, sell in January
  - 75023: Buy in April, sell in July
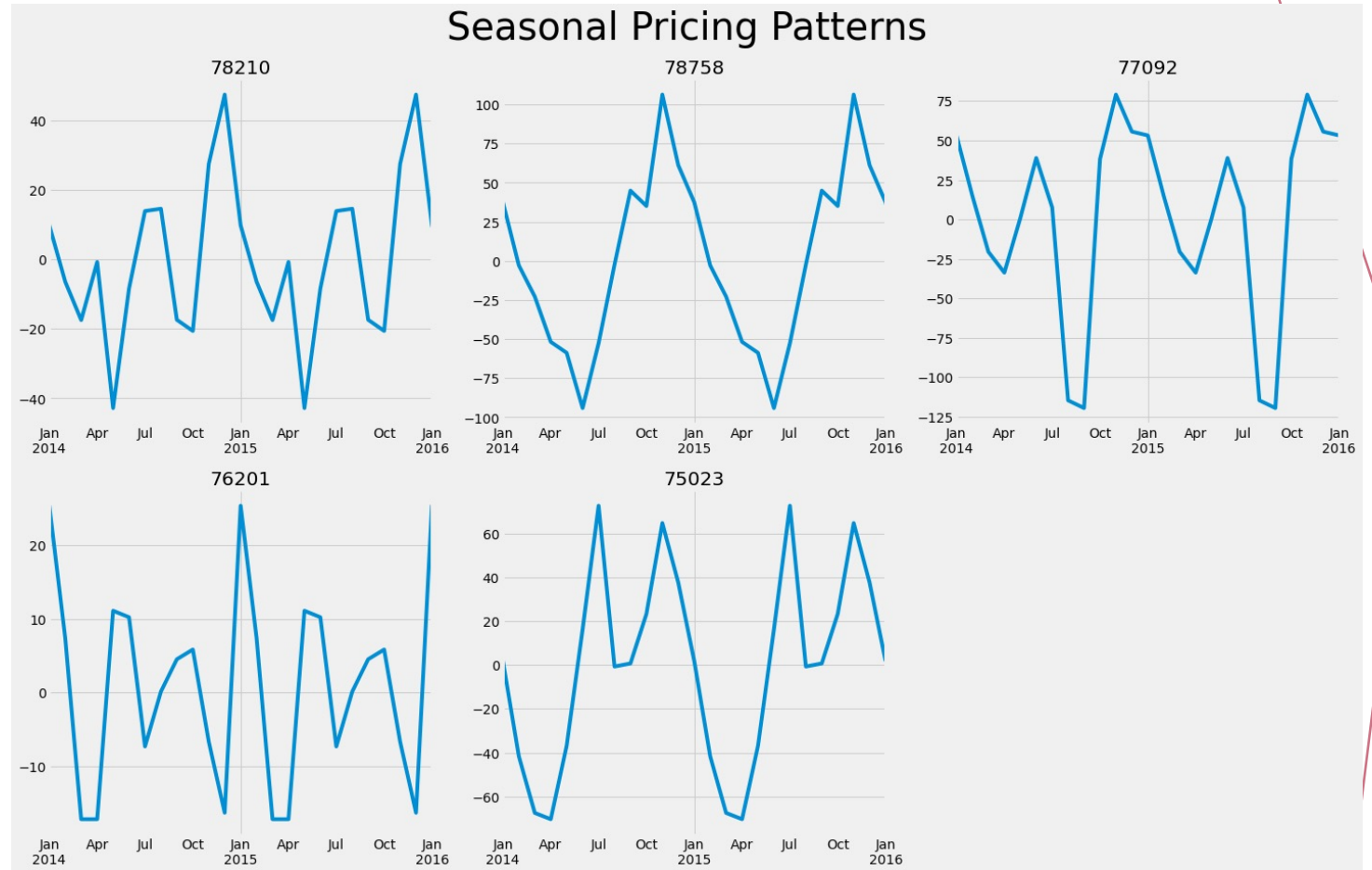
Seasonal Pricing Patterns

THANK YOU FOR YOUR TIME

Are there any questions or comments?