INVESTMENT RECOMMENDATION TO SYRACUSE REAL ESTATE INVESTMENT TRUST (SREIT).

Tajudeen Abdulazeez

IST 736 Big Data Analytics Lab 3, Syracuse University

Abstract

Time series forecasting Using historical data from 1996 to 2018 housing values for each zip codes using prophet and mean square error is used to evaluate the model performance. The zip code codes with the lowest mean square error and the zip codes with the highest mean square error is evaluated to determine the patterned of trend and how volatile the values of the houses change for that zip codes.

The top 20 zip codes with the highest rate of annual return is also explored to understand the trend and the level of volatility in other to make the best recommendation based on the tolerance for risk.

The zip code that in a University town and the annual rate of return for real estate for each zip code is considered in making informative recommendation to SREIT. The trend and the level of volatility is also considered and how tolerance to recession in making appropriate recommendations, taken into consideration the risk factors.

The top three zip codes for real estate investment is recommended to SREIT and the details analysis and justification is included in this report.

Introduction

Real estate investment trust was established by the congress in 1960 as an amendment to Cigar Excise Tax Extension of 1960. This provision allows individual investors to buy shares in commercial real estate portfolio that receive income from varieties of properties. The property includes in real Estate Investment Trues portfolio may include apartment complexes, data centers, healthcare facilities, hotels, infrastructure in the form of fiber cables, cell towers and energy pipeline, Office buildings, retails centers, self-storage, timberland and warehouses.

There are several types of REITs as described below and for more details you can click on this link https://www.investopedia.com/terms/r/reit.asp

Equity REITs is the most common form of enterprise. These entities buy, own and manage income-producing real estate. Revenues come primarily through rents and not from the reselling of the portfolio properties.

Mortgage REITs, also known as mREITs, lend money to real estate owners and operators. The lending may be either directly through mortgages and loans or indirectly through the acquisition of mortgage-backed securities (MBS). MBS are investments holding pools of mortgages issued by government-sponsored enterprises (GSEs). Their earnings come primarily from the net interest margin—the spread between the interest they earn on mortgage loans and the cost of funding these loans. Due to the mortgage-centric focus of this REIT, they are potentially sensitive to interest rate increases.

Hybrid REITs enterprises hold both physical rental property and mortgage loans in their portfolios. Depending on the stated investing focus of the entity, they may weigh the portfolio to more property or more mortgage holdings.

Publicly Traded REITs offer shares of publicly traded REITs that list on a national securities exchange, where they are bought and sold by individual investors. They are regulated by the U.S. Securities and Exchange Commission (SEC).

Public Non-traded REITs also registered with the SEC, but don't trade on national securities exchanges. As a result, they are less liquid than publicly traded REITs but tend to be more stable because they're not subject to market fluctuations.

Private REITs are not registered with the SEC and don't trade on national securities exchanges. They work solely as private placements selling solely to a select list of investors.

According to an article published on Forbes website, the housing market records gains partly driven by

tighten inventories and exceedingly low mortgage rates. In some part of the country, the housing values rise by about 10% on average.

A survey from gobankingrates.com revealed that many cities with the most growth were inland, including: Buffalo, New York (34.6%), Atlanta, Georgia (24.54%) and Cincinnati, Ohio (20.6%).

Since our focused is to explore the possible investment opportunity and the risk factors and make a recommendation of the top three zip codes Syracuse Real Estate Investment Trust can invest.

> *"Real estate cannot be lost or stolen, nor can it be carried away. Purchased with common sense, paid for in full, and managed with reasonable care, it is about the safest investment in the world." - Franklin D. Roosevelt, U.S. president*

Analysis and Model

About the Data: The following datasets is used for this project:

1. files.zillowstatic.com/research/public/Zip/Zip_Zhvi_SingleFamilyResidence.csv
2. From the Wikipedia page on college towns is a list of university towns in the United States
3. From Bureau of Economic Analysis, US Department of Commerce, the GDP over time of the United States in current dollars (use the chained value in 2009 dollars), in quarterly intervals

The Zillow data sets has about 4,272,756 records with 10 columns listed below: RegionID, Zipcode(RegionName), City, State, Metro, CountyName, SizeRank, Date and Housing Values for each zip codes from 1996 to 2018.

The datasets are split into two, to create model to predict the housing values per zip codes using prophet. The data from 1996 to 2017 is used as a training set why the 2018 data is used to test the performance of the model using the mean square error.
15481 model is created and saved in a sqlite3 database with zip code as the model identifier. Th model can be loaded using pickle to make any future prediction for any zip codes in the database.

The model created using the log transformation of the housing values perform better in predicting future data compared the untransformed valued. The university town and the GDP is used to test an hypothesis that houses in a university town are less affected by recession. This hypothesis is tested using tttest from scipy packages. The lower p-value is lower than 0.05 which mean its statistically significant and the null hypothesis is rejected.
University town is better when there is recession.

USTODAY also published on there website the top 20 zip codes with the highest rate of annual return is shown in the table below. The trend for each of these zip codes will be explored to understand the volatility and risk level in other to examine its investment potentials.

Zip Code	Annual Rate of Return
33434	8.1%
19035	6.9%
48322	6.9%
33158	6.8%
33327	6.6%
37062	6.5%
66223	6.2%
60016	6.0%
45255	5.9%
30078	5.8%
97224	5.8%
34677	5.7%
44023	5.6%
75022	5.6%
77059	5.6%
85259	5.5%
63043	5.5%
73003	5.4%
91602	5.4%
46280	5.4%

Table 1: Top 20 zip codes with the highest annual rate of return in real estate investment.
Source: https://www.usatoday.com/story/money/personalfinance/2017/07/31/20-zip-codes-highest-real-estate-returns/516281001/

The trend for the housing values for the top 20 zip codes with the highest rate of annual return is explored below one by one:
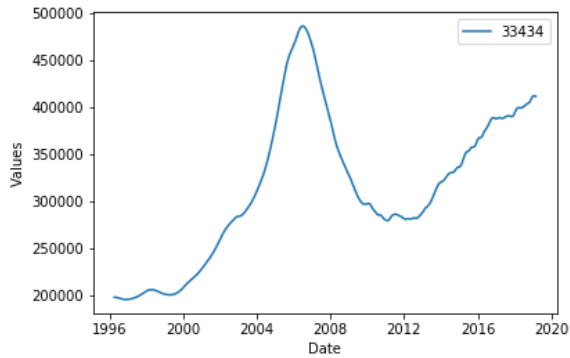
Figure 1: Zip 33434 with annual rate of return of 8.1%.

From the trend, we can observe the high volatility of the house values and the rate at which it crashed between 2008 and 2012 before its continued it up tends. The impact of recession is very high on this particular zip code based on the historical trend. The risk level in investing in this zip codes will be classified as very high.
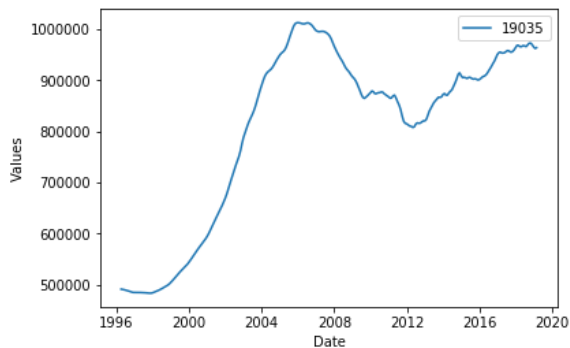

Figure 2: Zip code 19035 with annual rate of return of 6.9%. There is a sharp increase in values from 2000 to 2007 before crashing around 2008 which can be attributed to the effect of recession. The volatility is also high, and the trend is also an uptrend but with little meandering. There is an increase in noise after the recession compared to before recession.
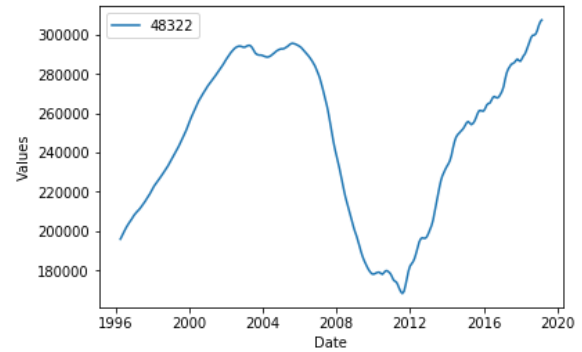
Figure 3: zip 48322 with annual rate of return of 6.9%.

The volatility is very high, the rate at which it crashes from around 2007 to 2012 is very high. It attains a new low in 2012 after the crashed and continued an uptrend. We can classify the risk level of this zip code to be very high.
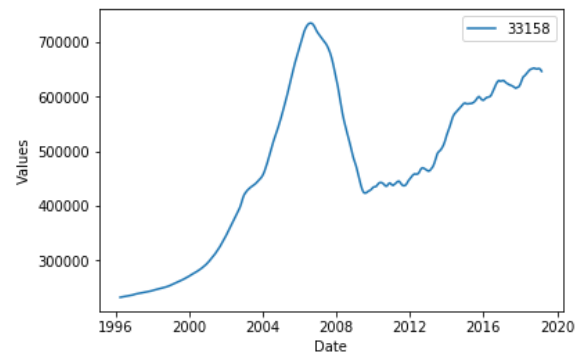
Figure 4: Zip code 33158 with annual rate of return of 6.8%.
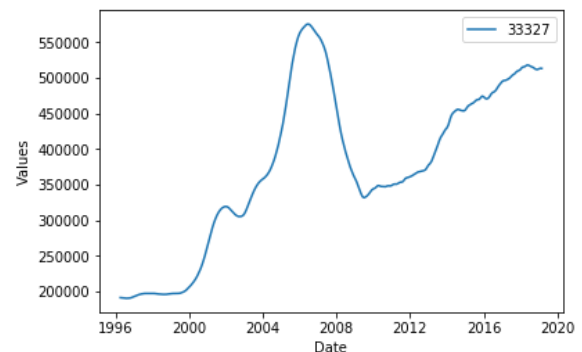
Figure 5: Zip code 33327 with annual rate of return of 6.6%.
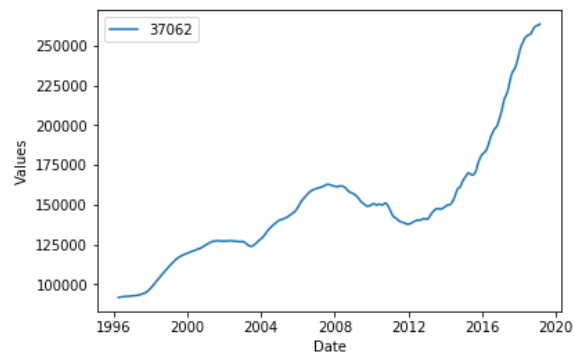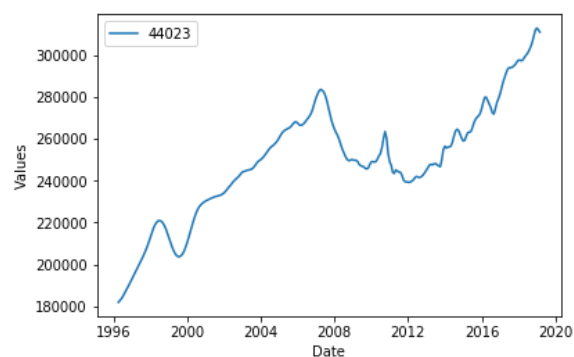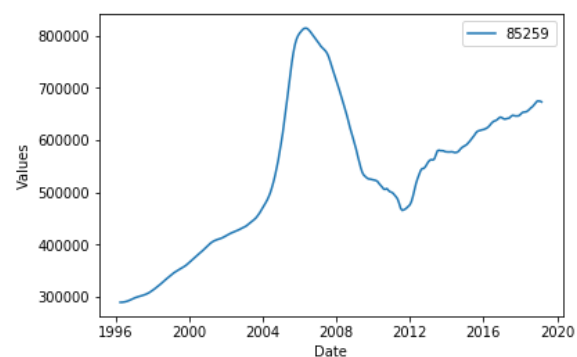
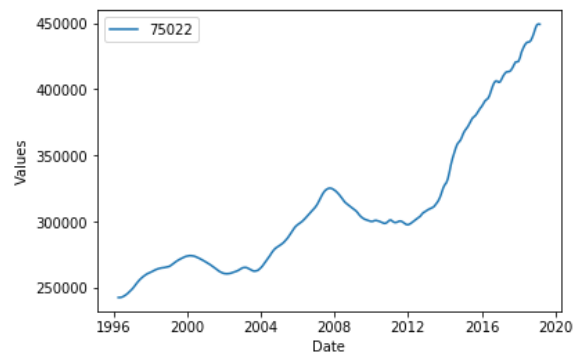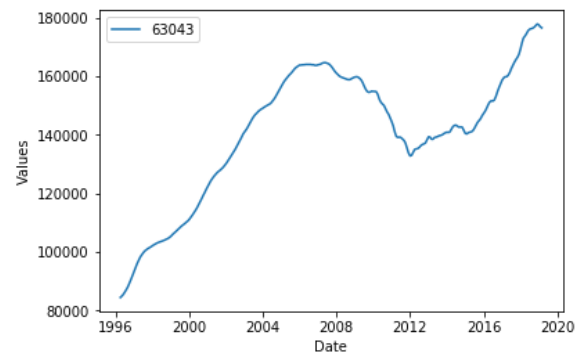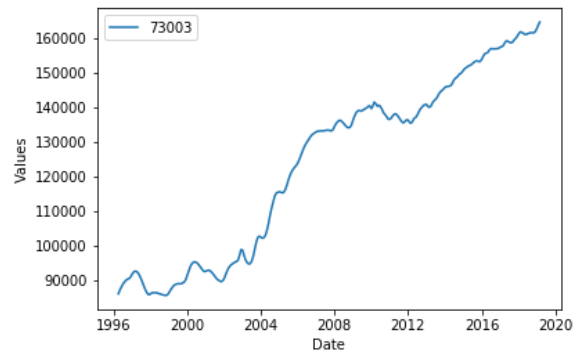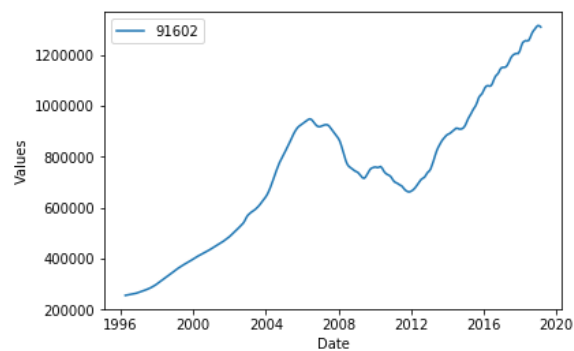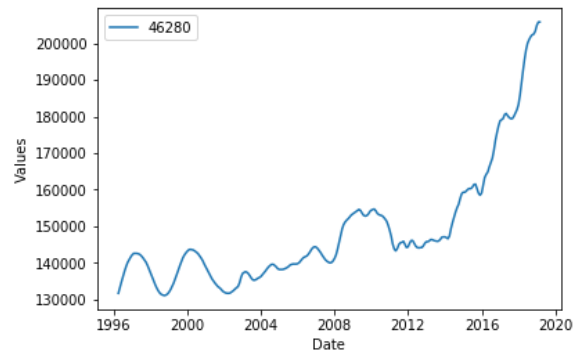Figure 6: Zip code 37062 with annual rate of return of 6.5%.

The effect of recession is not as volatile compared to the previous zip codes. There seams to be a consistent uptrend with little noise.
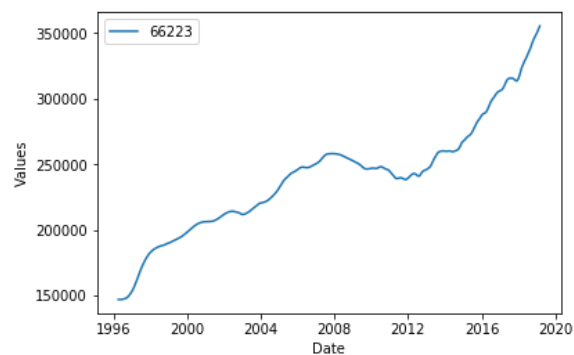
Figure 7: Zip codes 66223 with annual rate of return of 6.2%.
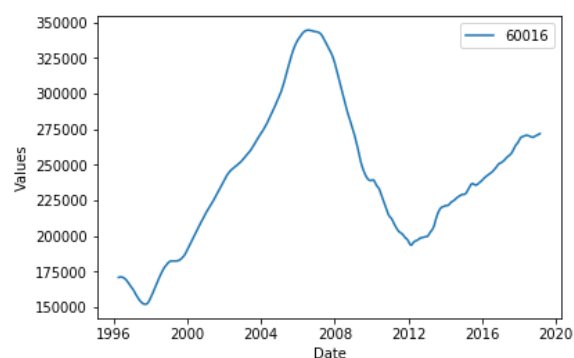
Figure 8: Zip code 60016 with annual rate of return of 6.0%
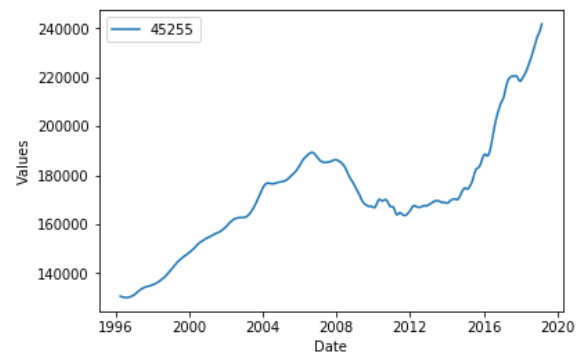
Figure 9: Zip code 45255 with annual rate of return of 5.9%.
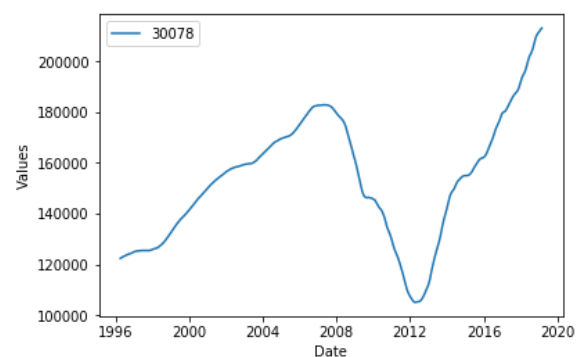
Figure 10: Zip code 30078 with annual rate of return of 5.8%.
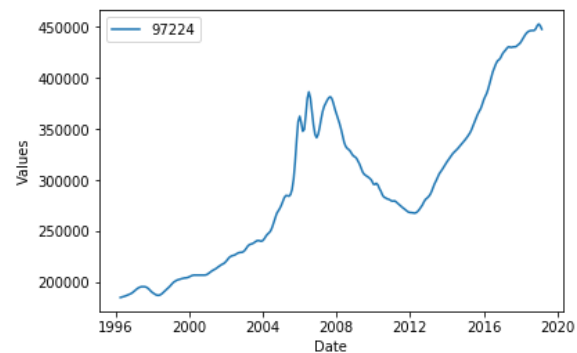
Figure 11: Zip code 97224 with annual rate of return of 5.8%.
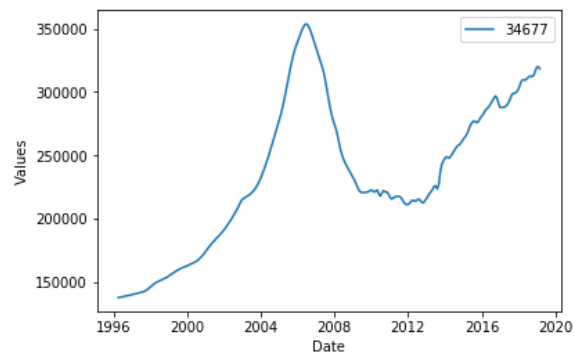
Figure 12: Zip code 34677 with annual rate of return of 5.7%.
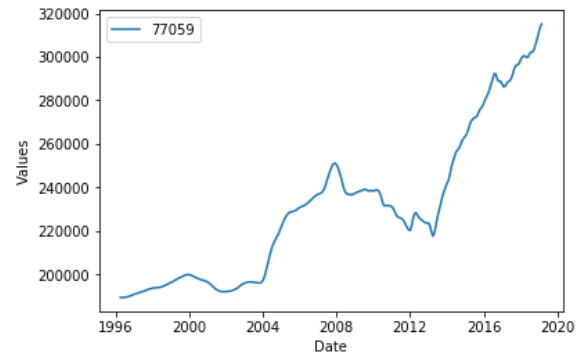
Figure 15: Zip code 77059 with annual rate of return of 5.6%.

Figure 13: Zip code 44023 with annual rate of return of 5.6%.

Figure 16: Zip code 85259 with annual rate of return of 5.5%.

Figure 14: Zip code 75022 with annual rate of return of 5.6%.

Figure 17: Zip code 63043 with annual rate of return of 5.5%.

Figure 18: Zip code 73003 with annual rate of return of 5.4%.

Figure 19: Zip code 91602 with annual rate of return of 5.4%.

Figure 20: Zip code 46280 with annual rate of return of 5.4%.

Let's explore the trend of the following metro: Little Rock, Hot Springs, Searcy and Fayetteville metro.

Figure 21: Median house values of Little Rock, Hot Springs, Searcy and Fayetteville.

The house values in Searcy is low compared to Little rock, Hot springs and Fayetteville. The median values of Hot springs are lower to the median values of Fayetteville and little rock in 1996, but the median values have surpassed Fayetteville at the current market values.

The volatility of hot springs and little rock is very high but also have high rate of return. This can be classified high risk investment.

Let's explore the distinct metro where the top 20 zip codes with the highest rate of return in other to observe the housing trend and its volatility in other to make an informative guide in recommending the best zip code for SREIT to invest.
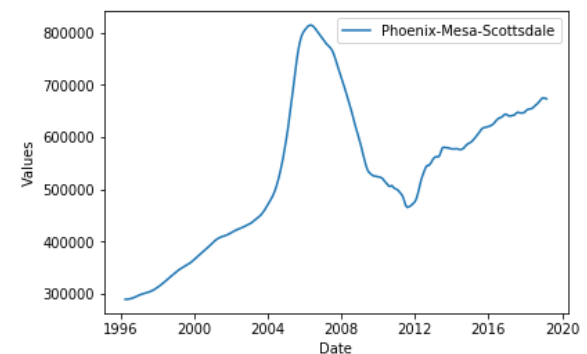
Figure 21: Phoenix-Mesa-Scottsdale Metro
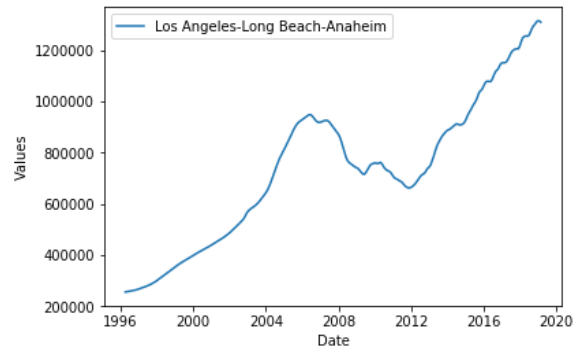
Figure 22: Los Angeles-Long Beach-Anaheim Metro

Figure 23: Miami-Fort Lauderdale-West Palm Beach Metro

Figure 24: Tampa-St. Petersburg-Clearwater Metro

Figure 25: Atlanta-Sandy Springs-Roswell Metro
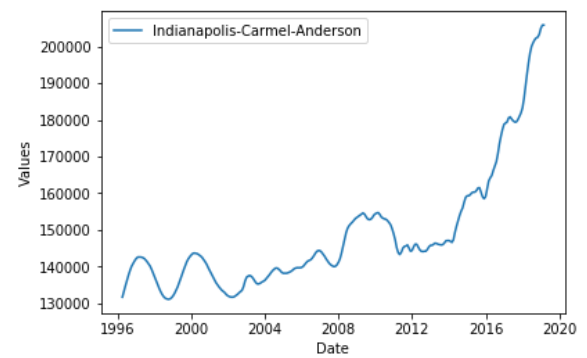

Figure 26: Chicago-Naperville-Elgin Metro

Figure 27: Indianapolis-Carmel-Anderson Metro
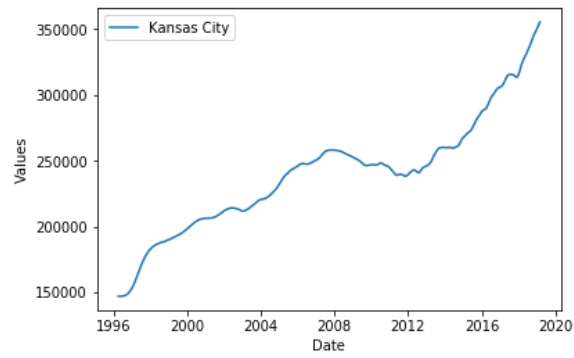
Figure 28: Kansas City

Figure 29: Detroit-Warren-Dearborn

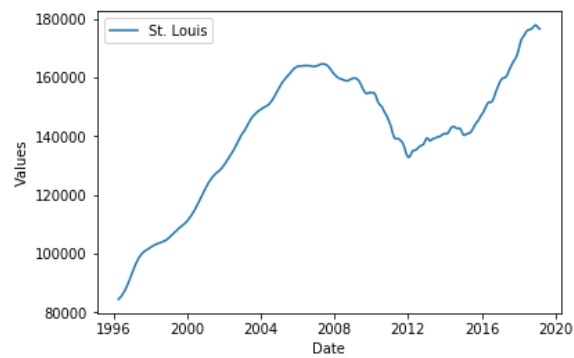
Figure 30: St. Louis

Figure 31: Cleveland-Elyria

Figure 32: Cincinnati
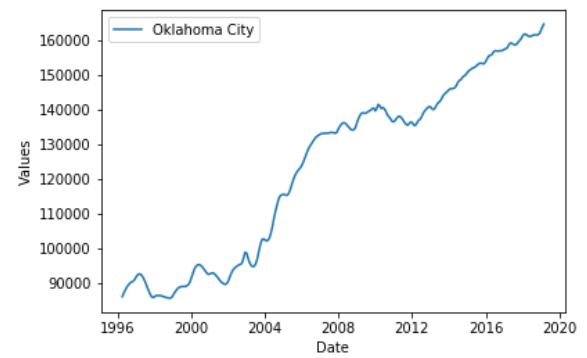
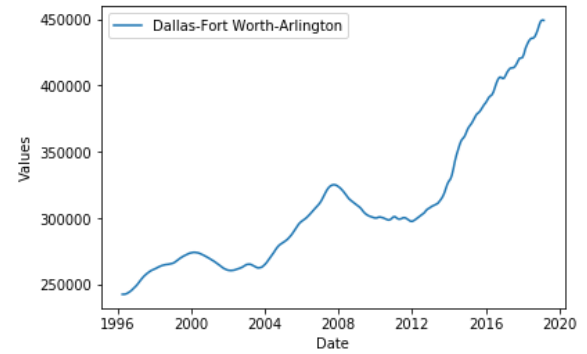Figure 33: Oklahoma City
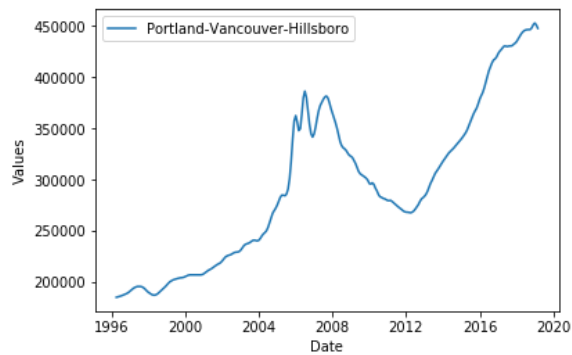
Figure 34: Portland-Vancouver-Hillshore

Figure 35: Philadelphia-Camden-Wilmington

Figure 36 : Nashville-Davidson-Murfreesboro-franklin

Figure 37: Dallas-Fort Worth-Arlington

Figure 38: Houston-The Woodlands-Sugar land

The following metro is noted for further exploration of a potential metro for good investment due to low level of volatility and consistent growth. They are also less affected by the recession which make it a potential location to further look into before making the final recommendation.

1. Kansas City
2. Oklahoma City
3. Nashville-Davidson--Murfreesboro--Franklin
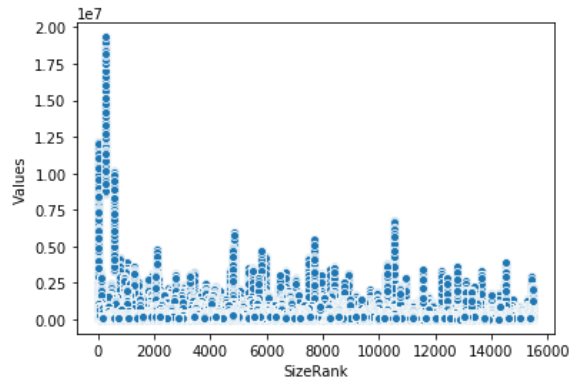4. Searcy
5. Fayetteville
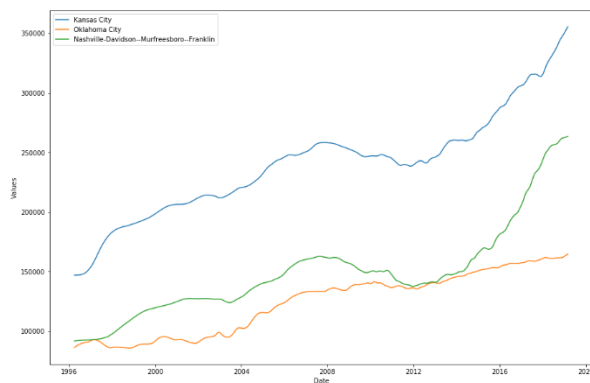
Figure 37: Housing values by SizeRank.

Figure 38: Metro with low level of noise and are less affected by recession.

The following are the three zip codes that are in top 20 zip codes with the highest annual rate of return and also in the metro of interest which are less affected by recession and a consistent uptrend with minimal noise.

1. 66223
2. 73003
3. 37062

Model

Prophet is a procedure for forecasting time series data based on an additive model where non-linear trends are fit with yearly, weekly, and daily seasonality, plus holiday effects. It works best with time series that have strong seasonal effects and several seasons of historical data. Prophet is robust to missing data and shifts in the trend, and typically handles outliers well.

Because of its robust in handling missing values and outlier, and its computational speed faster compared to ARIMA, Prophet is used to create model for each zip codes, total of 15481 models. The mean square error of the log values of the test set (2018 data) is shown below.
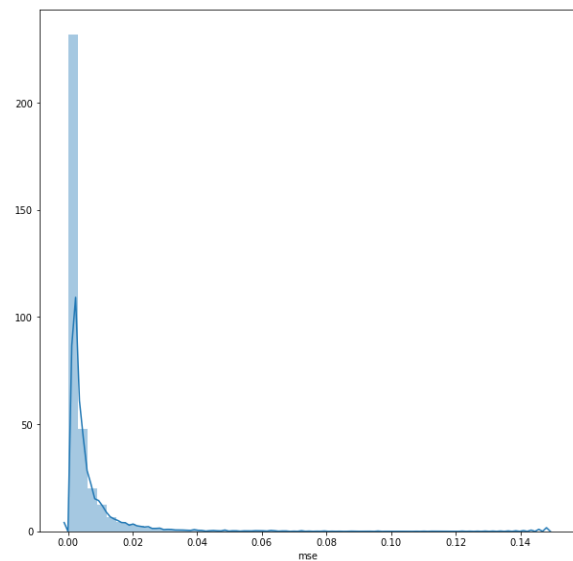

Figure 39: The mean square error for predicting the 2018 data as the test set to evaluate the model performance.

The distribution is skewed to the right.

Let's examined the distribution of the housing values of the zip codes by ranks.

Observing the error distribution and the housing values, they follow the same pattern. House with lower values has lower error rate while houses with higher values has more error rate.

Overall, the model performance on the new data, it has never seen before is very good. The model performs very well in predicting the 2018 housing values for each zip codes.
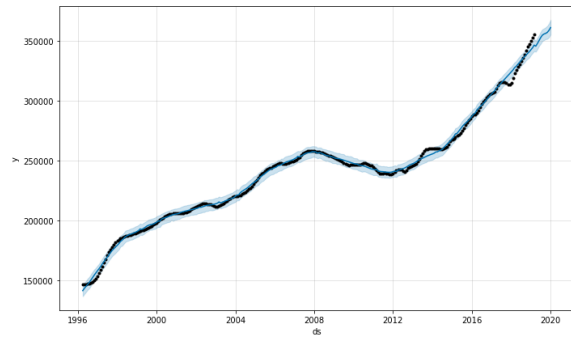
Zip Code: 66223

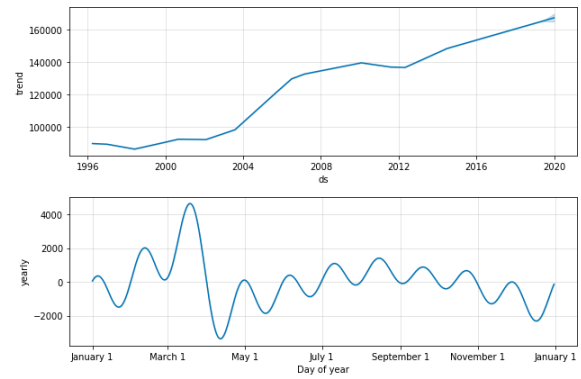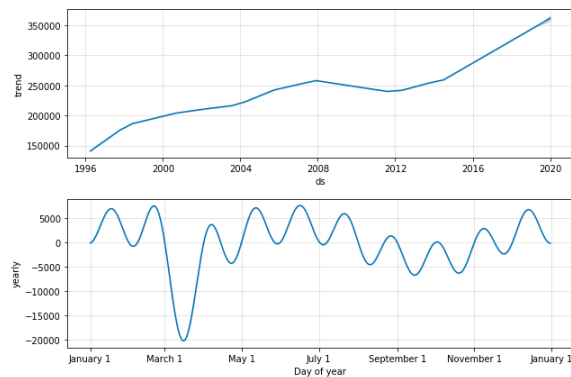Figure 40: The general trend of 66223 is up with tight variability.

Figure 41: Zip 66223 is in an uptrend with little noise.

Zip Code: 73003

Figure 42: Zip 73003 forecast is an uptrend. The level of fluctuation is tight.

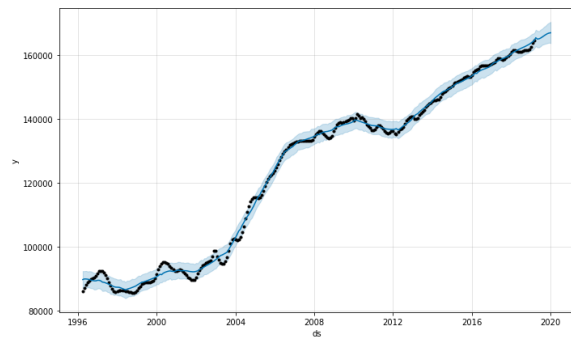Figure 43: Zip 73003 forecast is in an uptrend with tight fluctuation.
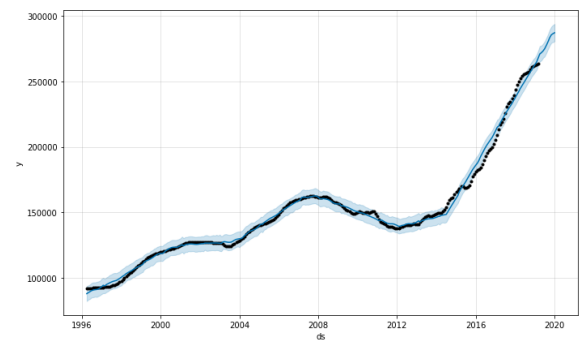
Zip code: 37062

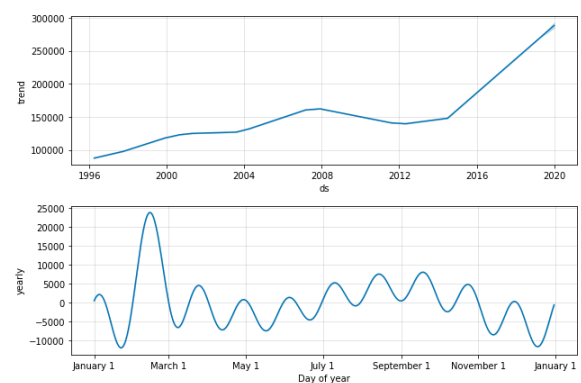Figure 44: 37062 forecasts is in an uptrend.

Figure 45: Zip 37062 forecasts is an uptrend with low fluctuation and tighter margin.

Zip code	Annual rate of Return	Metro	Mse of the 2018 prediction
66223	6.2%	Kansas City	0.000297
73003	5.4%	Oklahoma City	0.000269
37062	6.5%	Nashville-Davidson-Murfreesboro-Franklin	0.001786

Table 2: The top three zip codes among the top 20 zip codes of higher annual rate of return with low fluctuation and they also shows least effect on recession with a consistent and strong uptrend.
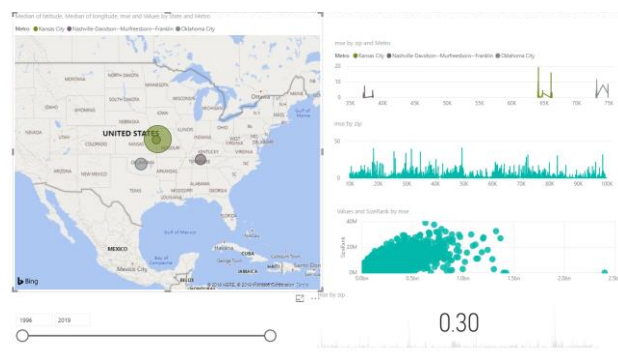

Figure 46: Geographical location of the selected metro and the mean square error of the model on 2018 housing values for each zip.

Conclusion

Based on the historical performance of the housing values for different zip codes and the level of accuracy of the predictive model and a careful extermination of the top 20 zip codes with the highest rate of return, 66223,73003 and 37062 are recommended for real estate investment for SREIT based on the following reasons:

1. They are among the top 20 zips with the highest rate of annual return
2. The draw down or noise is minimal
3. They are less affected by recession
4. **They are in a strong uptrend**
5. **The volatility is very low and with a consistent increase in values**

6. The Upper and lower margin for the future forecast is very tight with high level of accuracy.

Code: https://github.com/toraaglobal/SREIT

Power BI:
https://app.powerbi.com/view?r=eyJrIjoiZGY2MWVmNzMtN2M5YS00OGUyLThjZmYtYzNiMjNmYTM2NTRjIiwidCI6IjQyNzhhNDAyLTFhOWUtNGViOS04NDE0LWZmYjU1YTVmY2YxZSIsImMiOjN9

Ref:
https://www.investopedia.com/terms/r/reit.asp