

## **San Jose Rent Forecast: Data-Driven Insights**

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### **INTRODUCTION**

This project aims to forecast the next three years of rent in San Jose using data from 2005-2021 by way of Holt's Trend Forecasting.

The housing market is an essential and substantial component of the economy, providing shelter to millions of people and serving as a significant driver of economic growth. It is a complex and dynamic system influenced by various factors, including interest rates, economic conditions, government policies, and demographic changes. In particular, the San Jose housing market has experienced a massive rise in rent, unlike anything seen before in the city, causing concerns about affordability for many residents.

The objective of this project is to use forecasting to understand the potential increase and provide estimated values for the next three years, then compare these estimates with the actual data from the years that have already passed. This comparison will help assess the accuracy of the predictions.

This project will employ Holt's linear trend forecasting to arrive at these conclusions. Ultimately, the results of this project will provide valuable insights for homeowners, investors, and policymakers to make informed decisions about the health and sustainability of the housing market.

### **PROBLEM STATEMENT**

There is ongoing discussion and speculation regarding whether the current San Jose rent prices will plateau, continue to rise, or plummet. However, by using linear trend forecasting, it is possible to predict the future direction of median rent prices in San Jose. This project aims to educate future tenants of San Jose and provide insights or recommendations to those in charge to help address rent prices.

### **OBJECTIVES**

The primary objective of the San Jose rent project is to develop a rent forecast model, which will enable the prediction of median rent prices for the years 2022, 2023, and 2024. By doing so, the project aims to develop appropriate solutions for pricing that can help landlords, property managers, and city planners make informed decisions. Furthermore, providing these insights will be beneficial for future San Jose residents, as

it will give them a clearer understanding of the housing market trends in the area and help them make better decisions when choosing a place to live.

## METHOD

### Data Collection

Our team collected data on San Jose annual median rent price from the American Community Survey, which is part of the U.S. census.

**Table 1:** Aggregated San Jose Annual Median Rent Data

Date	Rent in San Jose
2005	\$1,568.00
2006	\$1,553.00
2007	\$1,595.00
2008	\$1,700.00
2009	\$1,634.00
2010	\$1,618.00
2011	\$1,605.00
2012	\$1,684.00
2013	\$1,754.00
2014	\$1,884.00
2015	\$2,013.00
2016	\$2,103.00
2017	\$2,227.00
2018	\$2,275.00
2019	\$2,304.00
2020	\$2,390.00
2021	\$2,997.00

### Descriptive Statistics

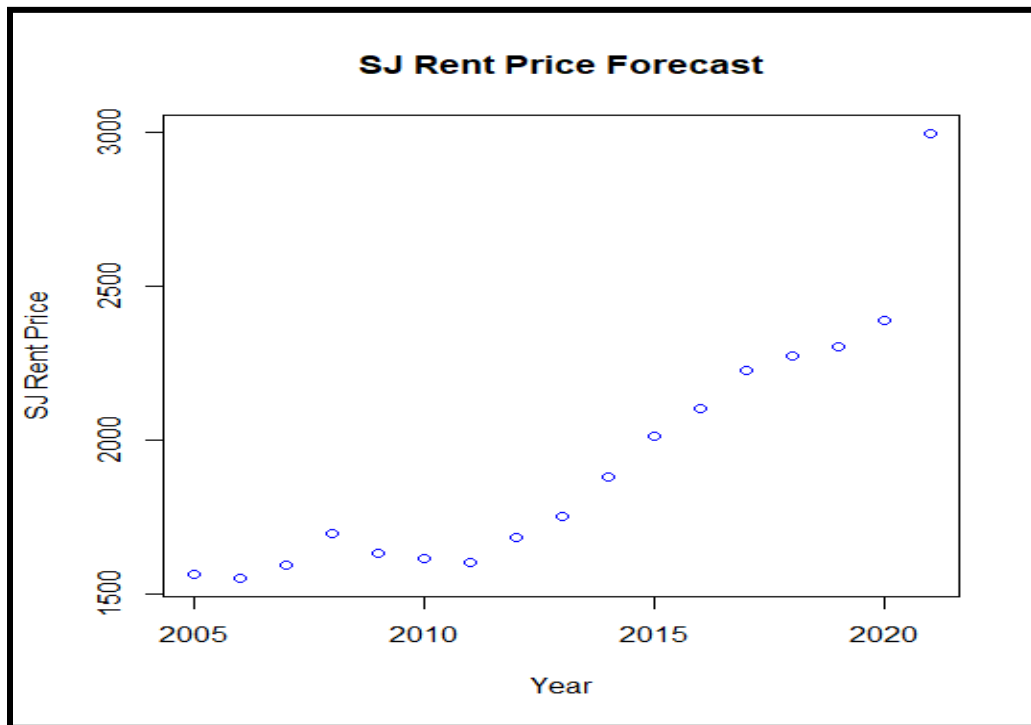
Year		Rent	
Min.	:2005	Min.	:1553
1st Qu.	:2009	1st Qu.	:1618
Median	:2013	Median	:1754
Mean	:2013	Mean	:1936
3rd Qu.	:2017	3rd Qu.	:2227
Max.	:2021	Max.	:2997

**Figure 1:** Descriptive Statistics of San Jose Annual Median Rent Data

A few notable insights can be drawn from the data and information presented in Table 1 and Figure 1. Firstly, the dataset spans from 2005 to 2021, providing 17 years of data

points for our analysis and forecasting. Concerning the annual median rental prices, the lowest price of \$1,568.00 occurs in 2005, which is the earliest data point, while the highest price of \$2,997.00 occurs in 2021, the most recent year. It is also important to highlight that the median value of the dataset is \$1,754.00 and occurs in 2013. The median is particularly interesting as it demonstrates that rent prices have increased at a faster pace after 2013; \$1,754.00 is much closer to the 2005 price of \$1,553.00 than the 2021 rent price of \$2,997.00.

## Data Visualization



**Figure 2:** Plot of Aggregated Data

As evident in Figure 2, there is a clear upward trend in rent prices over time, particularly after 2011. This trend is hypothesized to stem from San Jose's thriving job market, which drives up housing demand, and from investors purchasing properties following the significant sell-off during the 2009 financial and mortgage crisis. The notable spike in 2021 is potentially attributable to employers and educational institutions requesting employees and students to return to campus, thereby increasing the demand for housing and consequently raising prices. Finally, the substantial inflation experienced in recent years may also be a significant contributing factor.

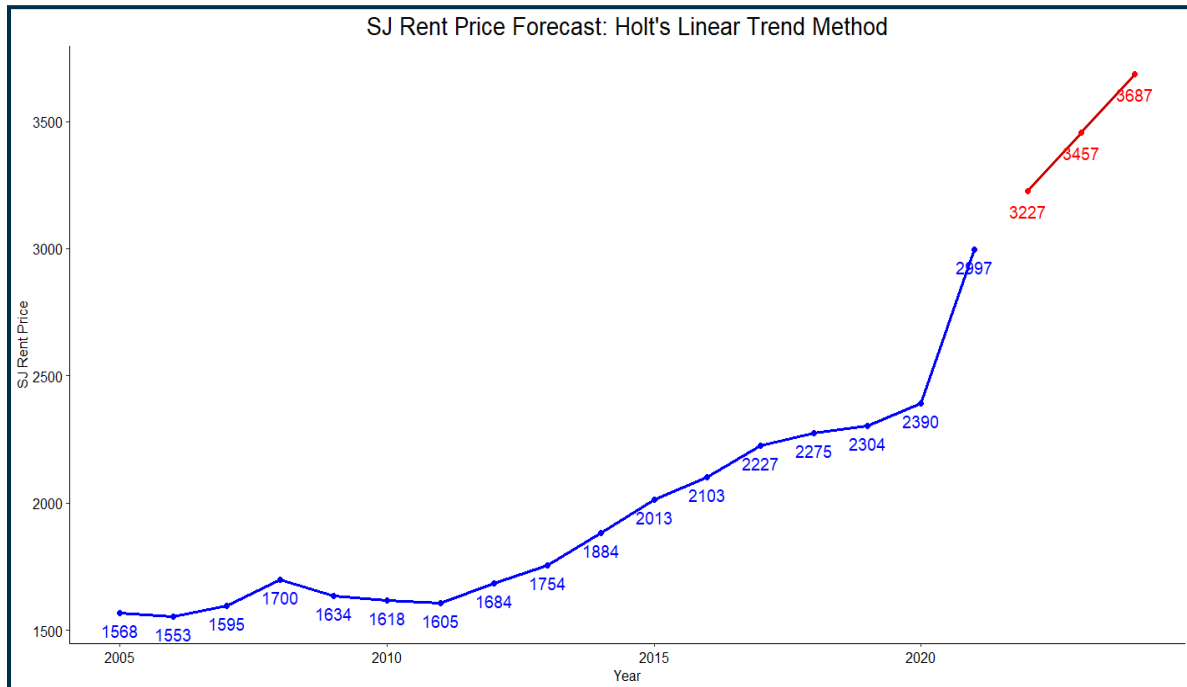
## Data Analysis - Forecasting

Linear time regression, specifically Holt's linear trend model, was employed to forecast the median rent prices in San Jose for the years 2022, 2023, and 2024. Among various

time regression models, Holt's linear trend model was chosen because it was suitable for the available data and aligned with the assumptions regarding the dataset. These assumptions include the data being non-seasonal and more recent data points being given greater weight compared to older ones.

Holt's linear trend forecast model follows the equation  $\hat{y}_{t+h} = \ell_t + hbt$ , where  $\ell_t$  represents the smoothed level at time  $t$ ,  $bt$  represents the smoothed trend at time  $t$ , and  $h$  denotes the number of time steps ahead for the forecast.

### Results:



**Figure 3:** Plot of San Jose Median Rent Price Forecast

Utilizing Holt's linear trend forecast model, the following prices were predicted with a MAPE error of 7.68%: \$3,227.08 in 2022, \$3,457.21 in 2023, and \$3,687.35 in 2024. Since 2022 has passed and actual data was available on the U.S. Census Bureau website, it is possible to compare the predicted value of \$3,227.08 in 2022 to the actual value of \$3,085.00. Although the actual 2022 figure is slightly lower, it falls just within the 7.68% MAPE error, indicating that the predictions are not perfect but reasonably accurate.

## **CONCLUSION & RECOMMENDATIONS**

Based on median rent prices from past years, along with Holt's Linear Trend Forecast, we conclude that rent prices will face a rapid increase over the next few years. We are fairly confident in our model which reveals the forecast for the next three years within a 7.68% MAPE error.

### **Recommendation #1**

One of the main reasons behind an increase in rent price is the cost of construction. As such, if the cost of construction is lowered, then the rent price will decrease. Strict zoning laws increase construction cost by imposing infrastructure requirements, requiring expensive permits through a lengthy process, and creating other restrictions which delay construction. It is recommended that the local government loosen or improve zoning laws in order to lower the cost of construction, which in turn will lower the cost of housing.

### **Recommendation #2**

Financial incentives from the government and banks may help reduce the pressure on low income individuals that are struggling with rent. Financial assistance, like rent subsidiaries, will make housing more affordable by allowing renters to pay less out of pocket.

### **Recommendation #3**

It is recommended that the local government increase or strengthen rent control policies as they protect tenants from sharp increases in rent. Such policies will keep rent prices stable and make housing affordable for renters.

### **Recommendation #4**

The local government should invest in public transportation to lower rent prices. Public transportation can increase accessibility to work, reduce demand for parking, and stimulate the economy. An increased availability in public transportation will make it easier for renters to get to work and other places, allowing them to save on transportation costs.

### **Data Source:**

<https://www.deptofnumbers.com/rent/california/san-jose/>