FORECASTING REAL ESTATE PRICES USING TIME SERIES MODEL

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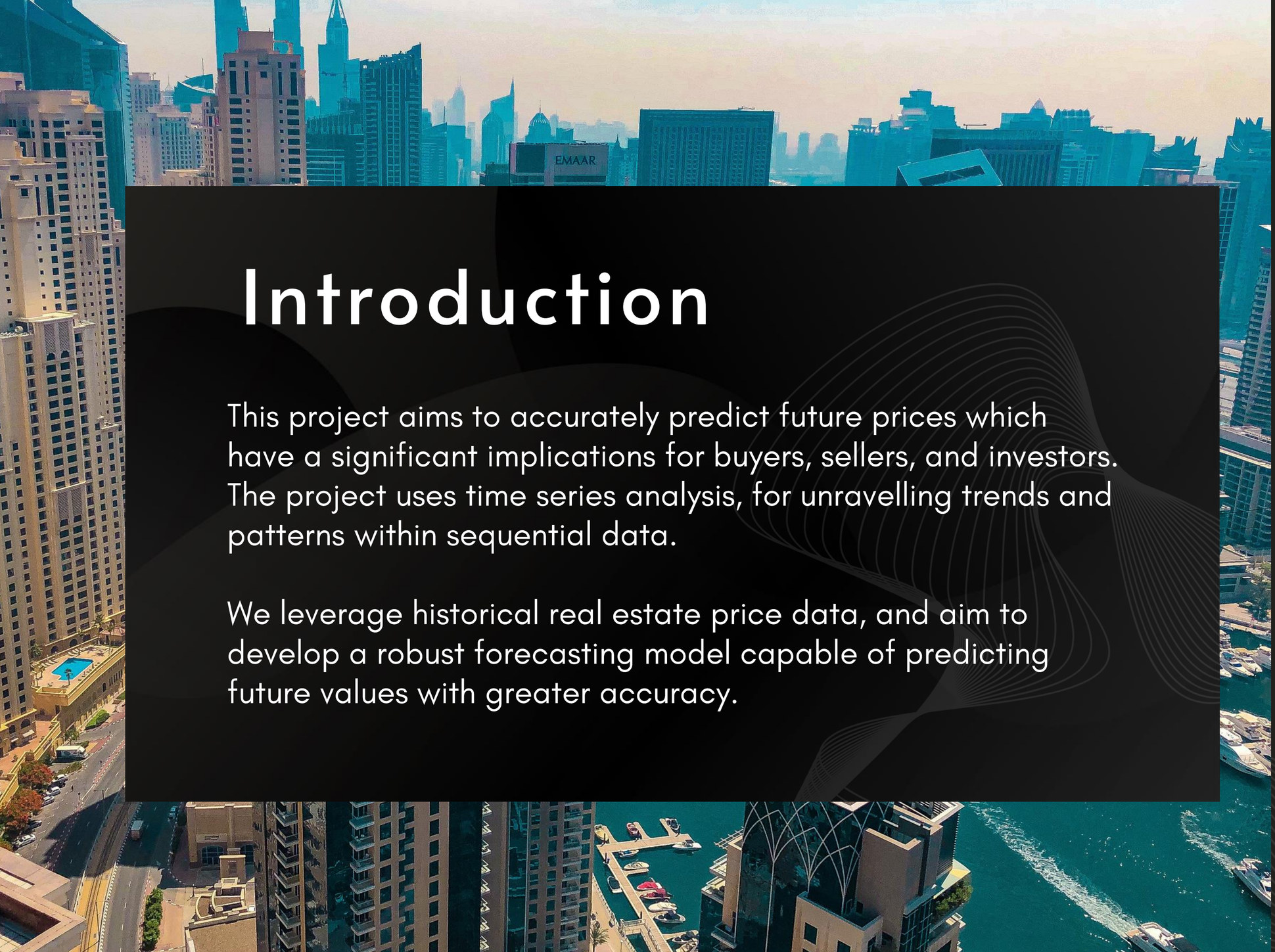


Introduction

This project aims to accurately predict future prices which have a significant implications for buyers, sellers, and investors. The project uses time series analysis, for unravelling trends and patterns within sequential data.

We leverage historical real estate price data, and aim to develop a robust forecasting model capable of predicting future values with greater accuracy.

Business Understanding and Problem Statement

The real estate market is complex and influenced by numerous factors, making the identification of prime investment locations a significant challenge. Traditional methods often rely on limited data and subjective expertise, leading to inconsistencies and reduced decision-making power.

This project aims to develop a robust and data-driven model to identify the top 5 best zip codes for real estate investment. The model will leverage advanced analytics and machine learning techniques to analyze historical data on property characteristics, market trends, and economic indicators, providing clear and actionable insights for strategic investment decisions.

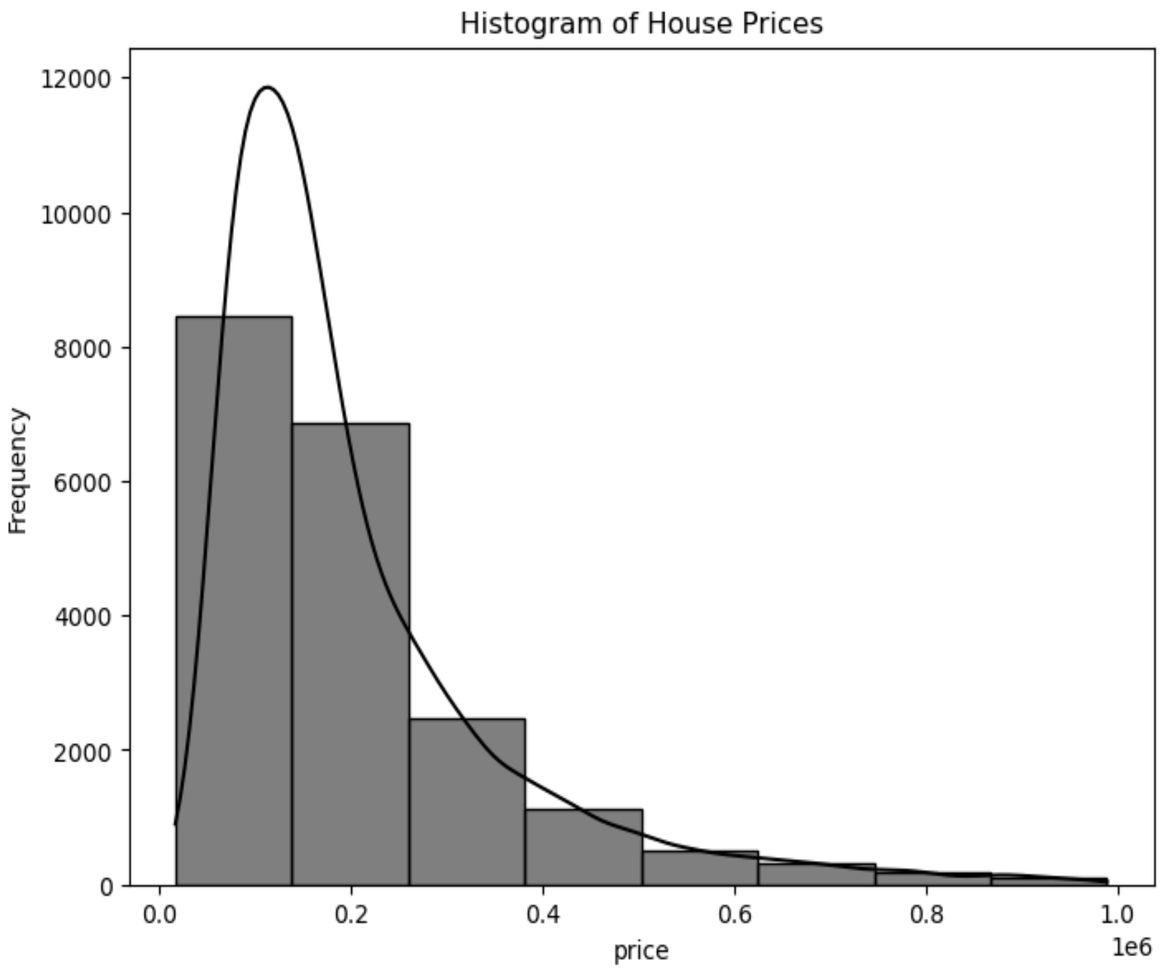
Objectives

1. Provide a valuable and accurate predictive time series model with improved accuracy for stakeholders in the real estate industry.
2. Identify the most significant factors influencing property values in real Estate.
3. To achieve stationarity in the real estate price data which is crucial for many forecasting models.
4. To identify and account for potential trends in the real estate market:

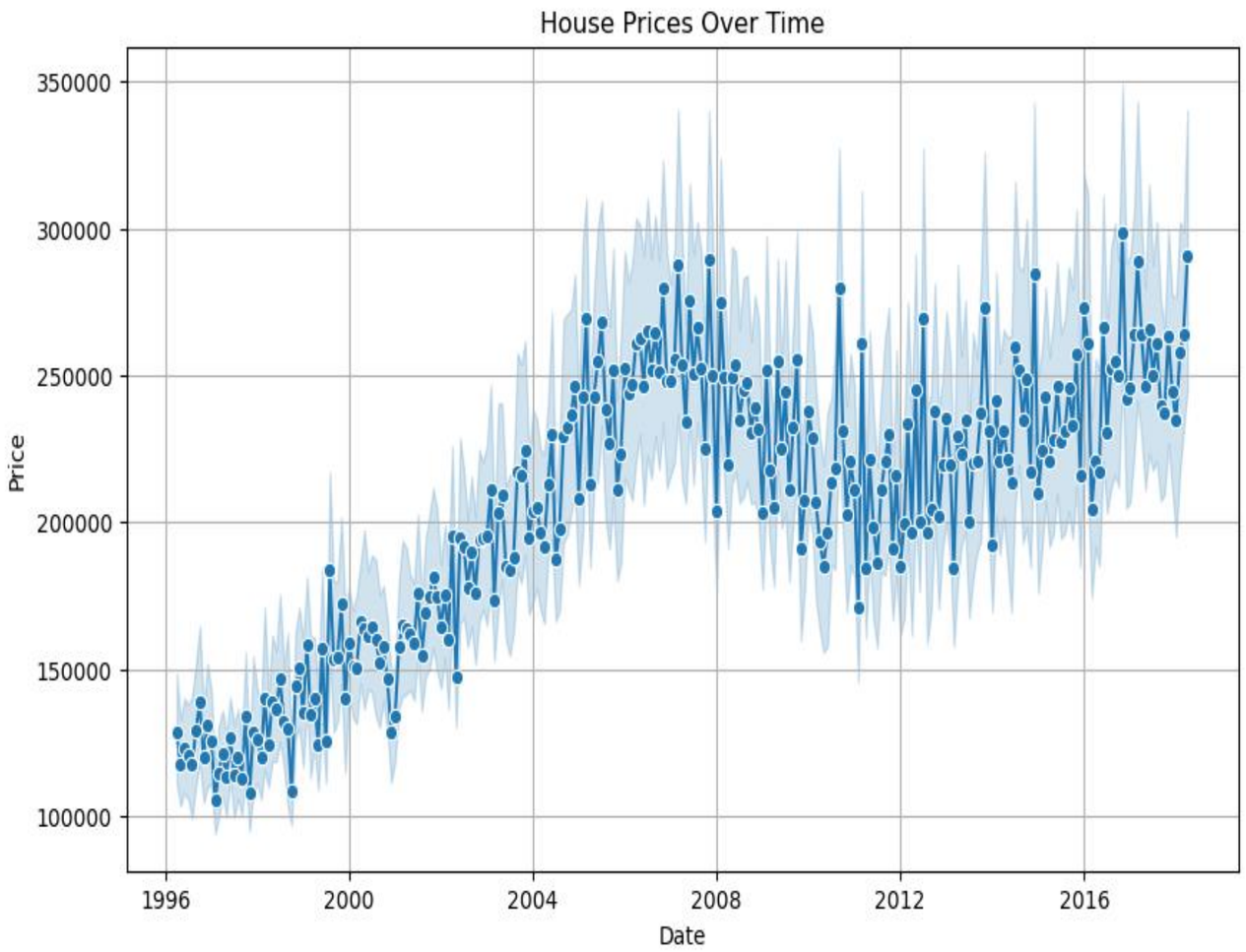
Exploratory Data Analysis

We have conducted the explanatory data analysis to check on the trends of the historical data set. From the graphs shown below, here are the observations made:

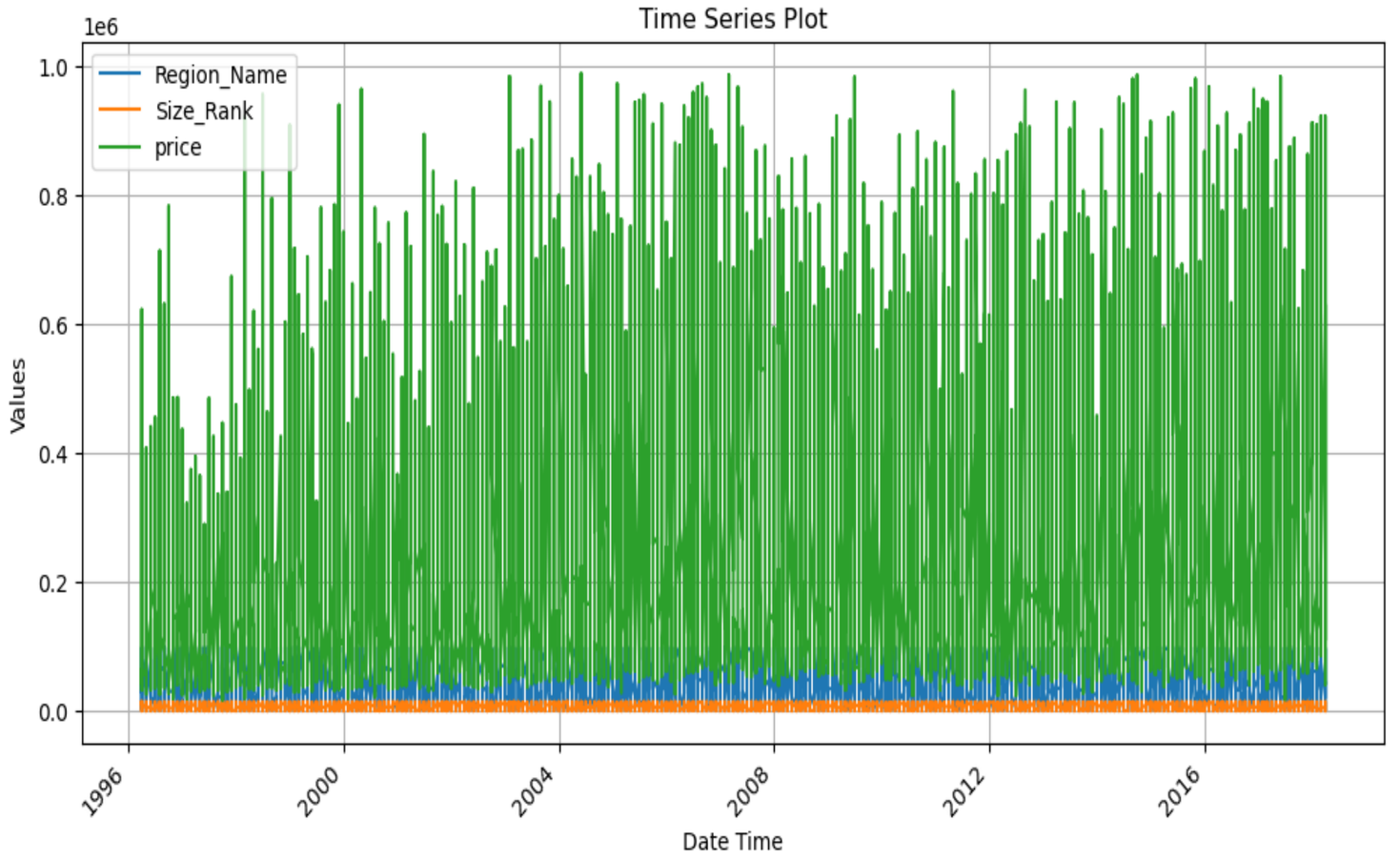
1. The sales prices have a right skew with majority of the houses selling at 2.5M to 3M (Graph I)
2. There has been an upward trend in the prices in the value of properties over time (Graph II)
3. The dataset is stationary which means that the statistical properties of the dataset do not change overtime (Graph III)



Graph I



Graph II


Time Series Plot
1e6
Region_Name
Size_Rank
price
1.0
0.8
0.6
0.4
0.2
0.0
Values
1996
2000
2004
2008
2012
2016
Date Time

Graph III

Modelling

For the forecasting of the real estate prices, we shall use the Arima and Sarima models to predict the future prices of the properties.

Arima Model

The model seems to capture the autoregressive nature of the differenced data (diff1) with statistically significant coefficients for past values (ar.L1 to ar.L4). However, the moving average terms (ma.L1 to ma.L3) don't appear to have a strong influence. The high variance of the error term (sigma2) suggests there might be room for improvement.

SARIMAX Results

Dep. Variable:	price	No. Observations:	20000
Model:	ARIMA(4, 1, 3)	Log Likelihood	-266958.413
Date:	Sat, 29 Jun 2024	AIC	533932.826
Time:	21:27:46	BIC	533996.053
Sample:	0	HQIC	533953.512
	- 20000		
Covariance Type:	opg		

	coef	std err	z	P>|z|	[0.025	0.975]
ar.L1	-1.6988	0.039	-43.502	0.000	-1.775	-1.622
ar.L2	-0.9397	0.040	-23.224	0.000	-1.019	-0.860
ar.L3	-0.0079	0.016	-0.497	0.619	-0.039	0.023
ar.L4	-0.0066	0.009	-0.773	0.439	-0.023	0.010
ma.L1	0.7109	0.038	18.562	0.000	0.636	0.786
ma.L2	-0.7622	0.018	-42.692	0.000	-0.797	-0.727
ma.L3	-0.9476	0.038	-25.161	0.000	-1.021	-0.874
sigma2	2.524e+10	1.24e-13	2.03e+23	0.000	2.52e+10	2.52e+10

Ljung-Box (L1) (Q):	0.00	Jarque-Bera (JB):	31603.95
Prob(Q):	0.99	Prob(JB):	0.00
Heteroskedasticity (H):	1.02	Skew:	2.00
Prob(H) (two-sided):	0.49	Kurtosis:	7.69

Warnings:

[1] Covariance matrix calculated using the outer product of gradients (complex-step).

[2] Covariance matrix is singular or near-singular, with condition number 2.69e+39. Standard errors may be unstable.

Findings

1. Price Trends
2. Market Shifts
3. Risk Assessment

Recommendations

1. Property Valuation: The model can be used to estimate a more data-driven value for specific properties, potentially improving the accuracy of appraisals.

2. Targeted Investments: By identifying factors influencing price fluctuations (e.g., location, property type), stakeholders can make more informed decisions about which properties might offer the best returns.

3. Market Segmentation: The analysis might reveal price variations within different segments of the market (e.g., luxury vs. affordable housing). This knowledge allows stakeholders to tailor their strategies to specific market segments.

4. Continuous Improvement: Recommend regularly updating the model with new data to maintain its accuracy and adapt to evolving market conditions.

Conclusion

In conclusion the project's value has reaffirmed how the time series analysis has provided valuable insights into market trends and price as the driver

Thank You

Gerente General