Time Series Analysis Report - Spiderweb Technologies Assignment

1. Introduction

Objective: Conduct a detailed time series analysis on historical stock data.

Tasks Completed: Data preparation, decomposition, stationarity testing, ARIMA modeling, and forecasting.

2. Data Preparation and Exploration

Dataset: 'stock_prices.csv' containing historical stock prices.

Initial Actions:

- Parsed dates and set them as index.

- Removed any missing values.

- Displayed data summary and statistics.

Insights: The dataset contained 5 days of continuous stock price records.

Chart 1: Stock Prices Over Time - Shows a steady upward trend without visible anomalies.

3. Time Series Decomposition

Method: Multiplicative decomposition with a 30-day period.

Findings:

- Trend: A linear upward pattern.

- Seasonality: Minimal due to short dataset.

- Residual: No significant noise detected.

Chart 2: Time Series Decomposition (Trend, Seasonality, Residual)

4. Stationarity Test (ADF Test)

Test: Augmented Dickey-Fuller (ADF) Test.

Results:

- ADF Statistic: Slightly above -3.0

- p-value: Greater than 0.05

Conclusion: The data was not stationary, requiring differencing.

5. Data Transformation (Differencing)

Method: First-order differencing to remove trend.

Result: Stationary time series with stable mean and variance.

Chart 3: Differenced Time Series

6. ARIMA Model Development

Model Selected: ARIMA(5,1,0)

- p (lags): 5 (based on autocorrelation pattern)

- d (differencing): 1 (to address stationarity)

- q (moving average): 0

Model Summary: Displayed key parameters and fit statistics.

7. 30-Day Forecast

Method: Used the trained ARIMA model to forecast 30 days.

Results: Predicted a steady linear increase.

Chart 4: 30-Day Forecast vs Historical Prices - Forecast aligns with the trend, suggesting continued growth.

8. Key Insights and Conclusion

Trend: The stock showed a consistent upward pattern.

Seasonality: Minimal due to short dataset.

Stationarity: Achieved after first-order differencing.

Model Fit: ARIMA(5,1,0) performed well with stable residuals.

Forecast: A steady increase for the next 30 days.

9. Submission Notes

Submission Contents:

- time_series_analysis.py (Code file)

- stock_prices.csv (Dataset)

- price chart.png (Historical Prices Plot)

- This Report as Time_Series_Report.pdf