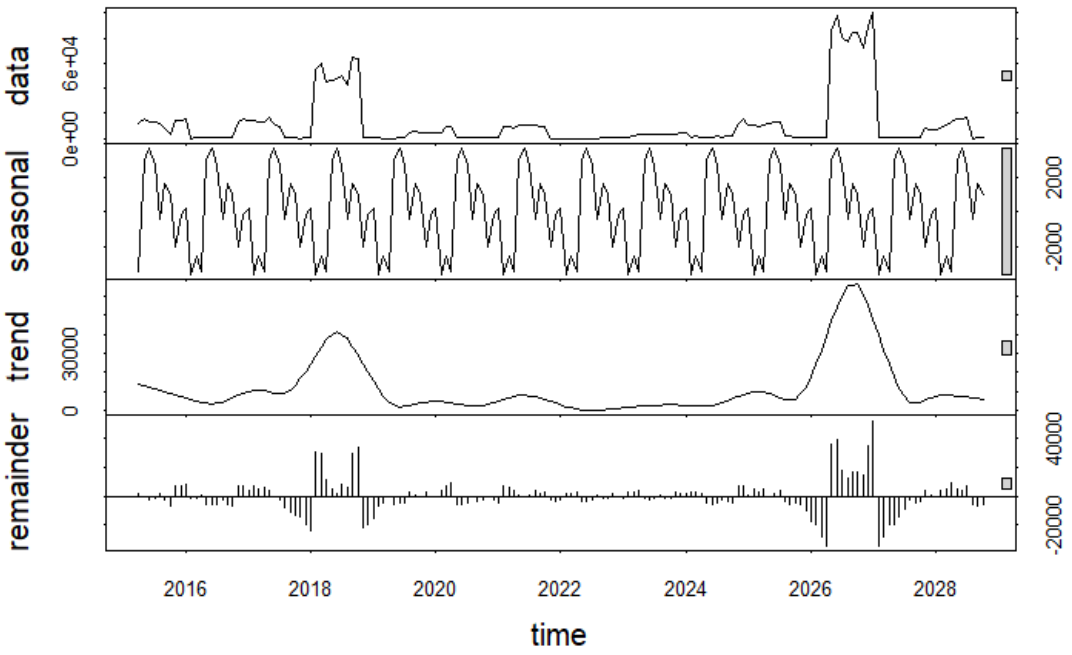
# Passenger-Movement-Time-Series-Analysis

Time series analysis helps identify trends, seasonality, and patterns in historical data. This study analyzes **monthly passenger movement** from various origins to destinations, using STL decomposition and trend modeling. By understanding these patterns, we can forecast future trends, identify seasonal variations, and evaluate the overall growth in air travel demand.

```
# Load necessary library

library(stats)


# Load the dataset

data <- read.csv("C:\\Users\\adith\\OneDrive\\Desktop\\tosubmit\\data set for da 3 regree thoery.csv")


# Create a time series object using 'Pax From Origin'

time_series_data <- ts(data$Pax.From.Origin, frequency = 12, start = c(min(data$Year), min(data$Month)))


# Decompose the time series using STL

decomposed_data <- stl(time_series_data, s.window = "periodic")

# Print the decomposed components

print(decomposed_data)

# Plot the original and decomposed components

plot(decomposed_data)
```



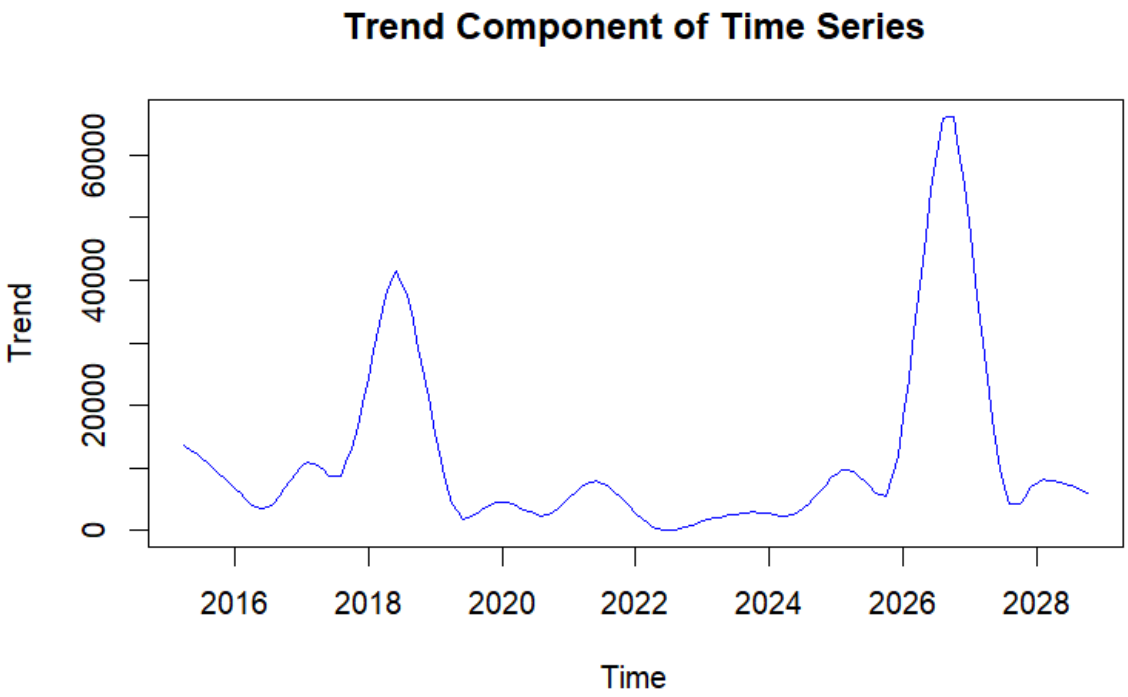

The decomposition plot shows that the time series consists of a clear trend, a repeating seasonal pattern, and some irregular variations. The trend component indicates the overall direction of passenger movement over time, while the seasonal component captures periodic fluctuations. The residual component represents random variations that cannot be explained by the trend or seasonality. This breakdown helps in understanding the key factors influencing passenger traffic patterns.

**# Extract the trend component**

trend_component <- decomposed_data$time.series[, "trend"]

# Plot the trend component

plot(trend_component, type = 'l', col = 'blue', main = "Trend Component of Time Series", xlab = "Time", ylab = "Trend")




The trend component plot shows the long-term direction of passenger movement over time. It helps identify whether the number of passengers is increasing, decreasing, or remaining stable. By fitting a linear model, we can observe the overall growth pattern and assess how passenger traffic has changed. This analysis is useful for forecasting future trends and making data-driven decisions in aviation planning.

**# Fit a linear model to the trend data**

trend_model <- lm(trend_component ~ time(trend_component))

# Summary of the linear model

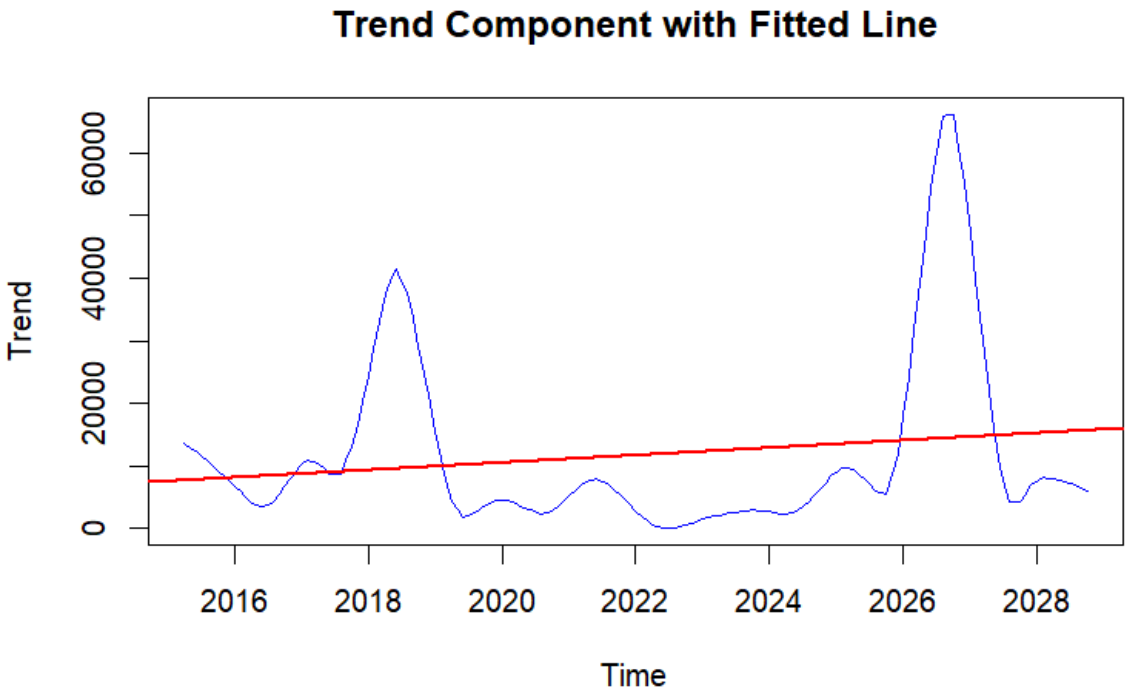
summary(trend_model)

# Adding the trend line to the plot

abline(trend_model, col = "red")

# Replot the trend with the fitted line

```
plot(trend_component, type = 'l', col = 'blue', main = "Trend Component with Fitted Line",
xlab = "Time", ylab = "Trend")

abline(trend_model, col = "red", lwd = 2)
```




The trend component fitted line provides a clear representation of the overall direction of passenger movement over time. The linear model helps quantify the rate of increase or decrease in traffic, making it easier to interpret long-term trends. If the fitted line closely follows the trend component, it confirms a strong linear relationship. This analysis aids in forecasting future passenger trends and supports strategic planning in the aviation sector.

**Conclusion:**

The analysis decomposes the time series into **trend, seasonal, and residual components**, allowing us to observe long-term growth and fluctuations. The fitted linear trend model provides insights into passenger traffic growth over time. The results can support decision-making in aviation management, route planning, and capacity adjustments based on

observed trends and seasonality. Further analysis could incorporate external factors such as economic conditions or policy changes to refine the forecasting accuracy.