

Practical 5: Stationarity Analysis of Commercial Bank Real Estate Loans

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1. Question

Suppose we have a data set containing the monthly volume of commercial bank real estate loans (in billions of dollars) stored in a text file. Write the R program for the following: (a) Import data into the R environment. (b) Convert the data into a time series object. (c) Plot the data to identify the dominant component. (d) Check stationarity or non-stationarity using ACF/PACF plot. (e) Check stationarity or non-stationarity using the Augmented Dickey-Fuller (ADF) test.

2. Objective

To import monthly commercial bank real estate loan data from a text file, convert it into a time series object, analyze its dominant components visually, and test its stationarity using graphical methods (ACF/PACF) and the Augmented Dickey-Fuller test.

3. R Code

```
# Clear workspace
rm(list = ls(all = TRUE))
# Load required libraries
library(tseries)
library(forecast)
# (a) Import data from text file
# (Assuming file has one column of monthly values and no header)
loan_data <- scan("bank_case.txt")
# (b) Convert to time series object
# Assuming data starts from January 2000
loan_ts <- ts(
  loan_data,
  start = c(2000, 1),
  frequency = 12
)
# (c) Plot the time series
plot(
  loan_ts,
  main = "Monthly Commercial Bank Real Estate Loans",
```

```
ylab = "Loans (in Billions)",  
xlab = "Year",  
col = "blue",  
lwd = 2  
)
```

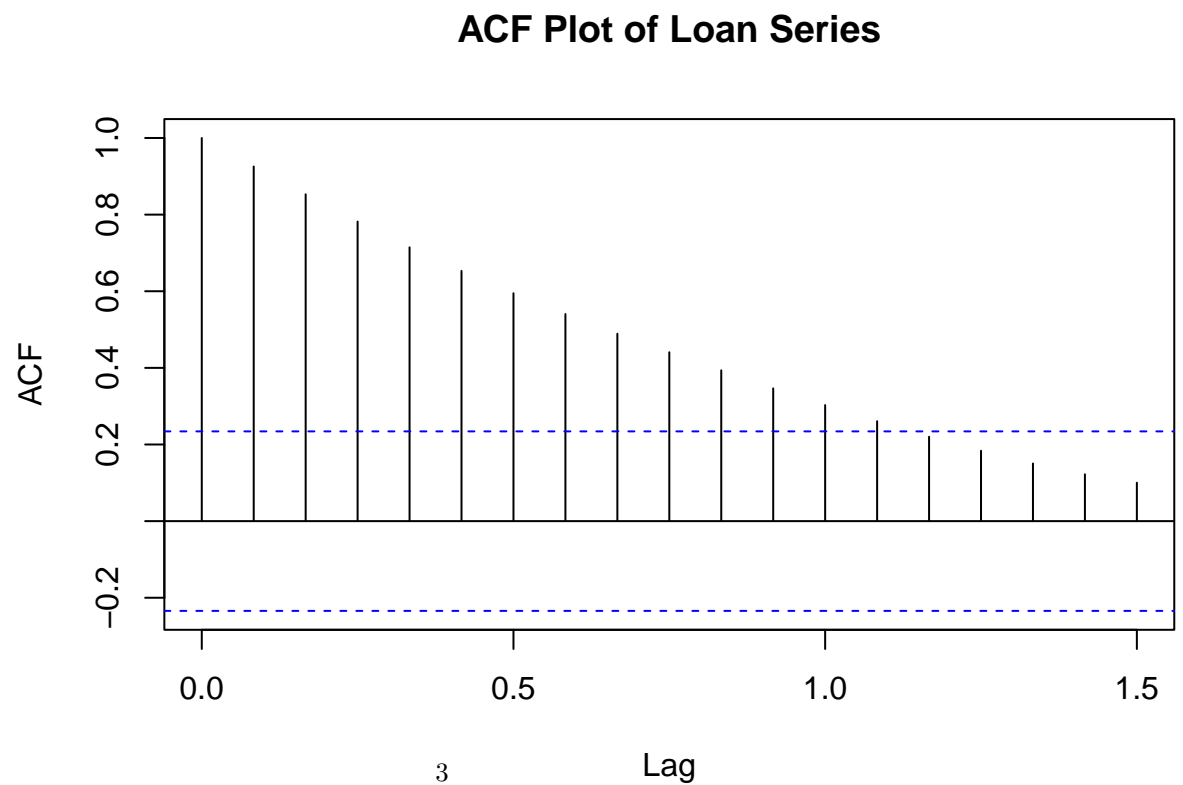
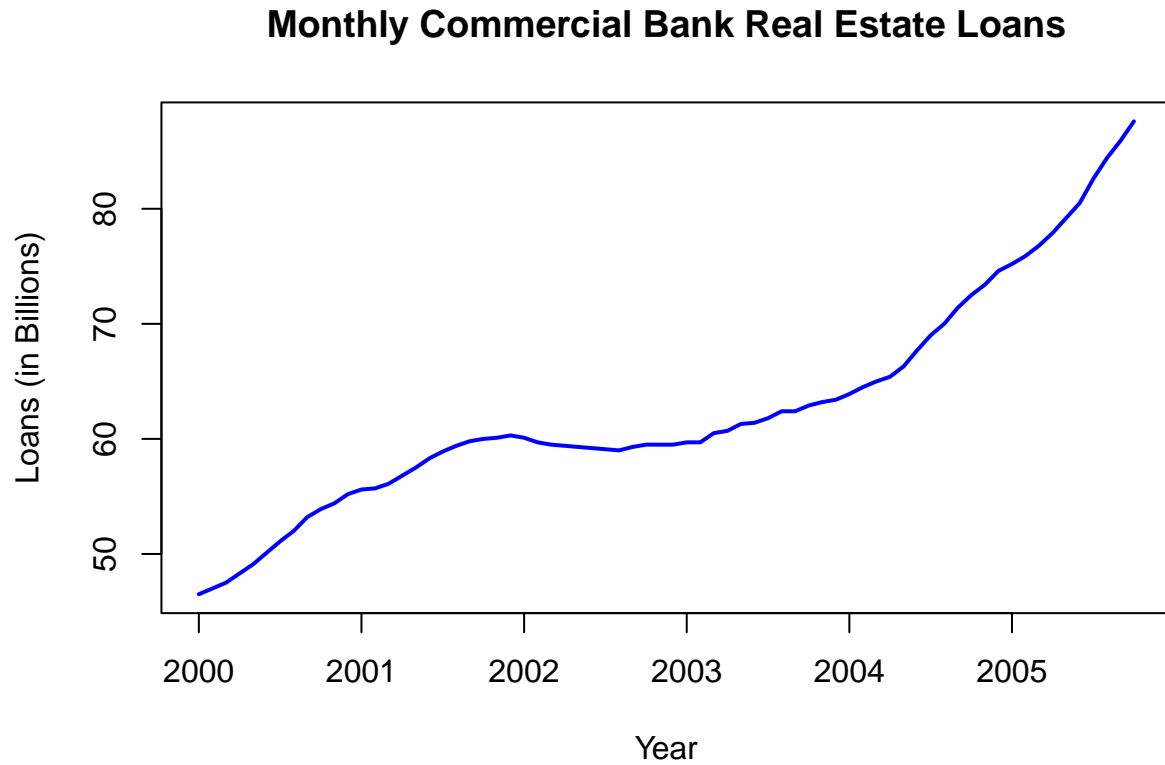
```
# (d) ACF and PACF plots  
acf(loan_ts, main = "ACF Plot of Loan Series")
```

```
pacf(loan_ts, main = "PACF Plot of Loan Series")
```

```
# (e) Augmented Dickey-Fuller Test  
adf_test <- adf.test(loan_ts)  
adf_test
```

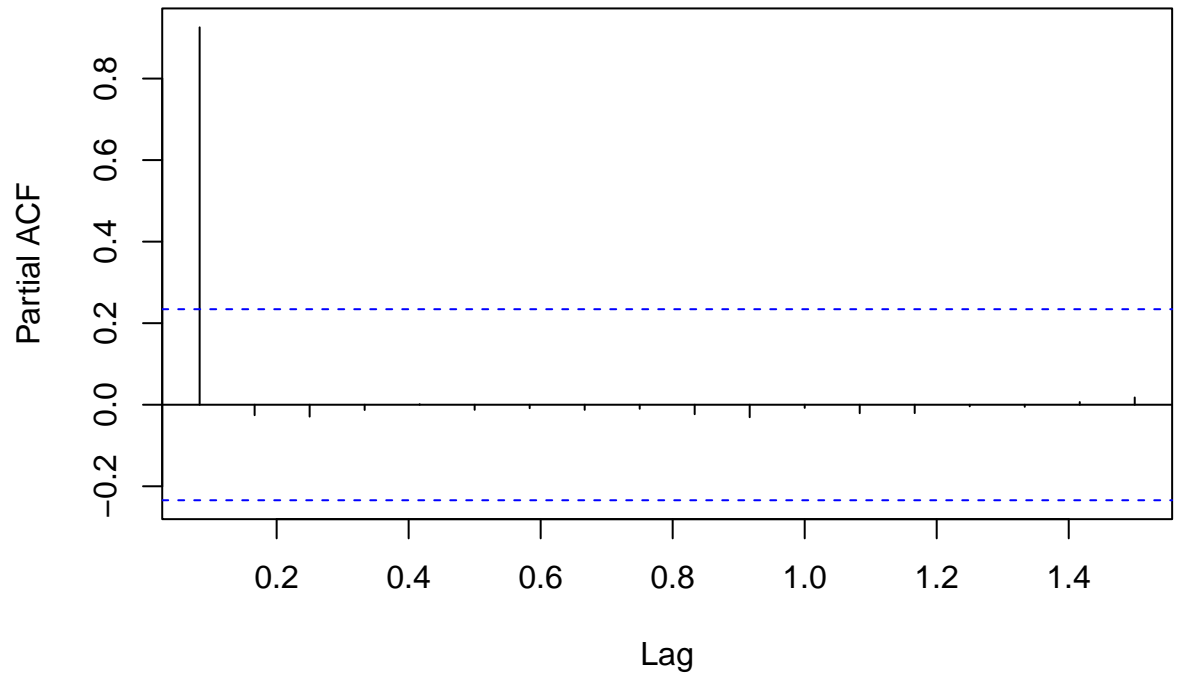
4. Output

Time Series Plot



ACF Plot

PACF Plot of Loan Series



```
### PACF Plot
### ADF Test Result
```

```
##
## Augmented Dickey-Fuller Test
##
## data: loan_ts
## Dickey-Fuller = -0.26816, Lag order = 4, p-value = 0.9894
## alternative hypothesis: stationary
```

5. Conclusion

In this practical, we successfully imported monthly commercial bank real estate loan data from a text file and converted it into a time series object with a monthly frequency (frequency = 12). From the time series plot, the dominant component can be visually identified. If the data shows a consistent upward or downward movement, the trend component is dominant. If repeating patterns appear every 12 months, seasonality is present. The ACF and PACF plots help determine stationarity. If the ACF decays slowly, the series is non-stationary. The Augmented Dickey-Fuller (ADF) test formally checks for stationarity. If the p-value is greater than 0.05, the series is non-stationary. If the p-value is less than 0.05, the series is stationary. Thus, graphical and statistical methods together help determine whether differencing or transformation is required before further modeling.