Financial Econometrics Lab

Lab Manual

Exp.No: 1 – Packages needed for timeseries analysis

1. **tseries** package in R
    - Time series analysis and computational finance
    - ARMA( ), kpss.test( ), adf.test ( ) and summary.arma( ) are used from this package to create ARMA models and hypothesis test on it.
    - > install.packages("tseries") -> install tseries package
    - > library(tseries) -> load tseries package in R workspace
2. **forecast** package in R
    - provides methods and tools for displaying and analysing univariate time series forecasts including exponential smoothing via state space models and automatic ARIMA modelling.
    - acf( ), pacf( ) and ARIMA ( ) are used from this package to create univariate time series models and to test autocorrelation among lag variables.
    - > install.packages('forecast')
    - > library(forecast)
3. **quantmod** package in R
    - Quantitative Financial Modelling Framework
    - Specify, build, trade, and analyse quantitative financial trading strategies.
    - Here getSymbols( ) is used to download yahoo finance trading data.
    - > install.packages('quantmod')
    - > library(quantmod)

Exp.No: 2 – Time series data loading and analysis

Air Passengers Forecast dataset

- The dataset consists of monthly totals of international airline passengers, 1949 to 1960. Main aim is to predict next ten years.

Data Information:

- Month:- Month of the year
- Passengers:- Total number of passengers travelled on that particular month.

Load Data

- library(tseries)
- library(forecast)
- airP = data(AirPassengers) // load AirPassengers dataset
- print (airP) // print dataset
- ***output:***

```
##      Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
## 1949 112 118 132 129 121 135 148 148 136 119 104 118
## 1950 115 126 141 135 125 149 170 170 158 133 114 140
## 1951 145 150 178 163 172 178 199 199 184 162 146 166
## 1952 171 180 193 181 183 218 230 242 209 191 172 194
## 1953 196 196 236 235 229 243 264 272 237 211 180 201
## 1954 204 188 235 227 234 264 302 293 259 229 203 229
## 1955 242 233 267 269 270 315 364 347 312 274 237 278
## 1956 284 277 317 313 318 374 413 405 355 306 271 306
## 1957 315 301 356 348 355 422 465 467 404 347 305 336
## 1958 340 318 362 348 363 435 491 505 404 359 310 337
## 1959 360 342 406 396 420 472 548 559 463 407 362 405
## 1960 417 391 419 461 472 535 622 606 508 461 390 432
```

> class(airP)

```
## [1] "ts"
```

> end(airP) // last data in AirPassengers dataset

```
## [1] 1960   12
```

> freq_air = frequency(airP) // cycle of this time series is 12 months in a year

```
## [1] 12
```

> summary(airP) // summary

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   104.0   180.0   265.5   280.3   360.5   622.0
```

> air_data = ts(airP, frequency = freq_air)

//Converting the data into a time series

Decompose:

- Decomposition is a statistical method that deconstructs a time series. The three basics steps to decompose a time series using the simple method are:

  1) Estimating the trend

  2) Eliminating the trend

  3) Estimating Seasonality

- An **additive model** is linear where changes over time are consistently made by the same amount. A linear trend is a straight line. A linear seasonality has the same frequency (width of cycles) and amplitude (height of cycles).

- A **multiplicative model** is nonlinear, such as quadratic or exponential. Changes increase or decrease over time. A nonlinear trend is a curved line. A non-linear seasonality has an increasing or decreasing frequency and/or amplitude over time

> air_decom = decompose(air_data, type = "multiplicative") // decompose