# Untitled

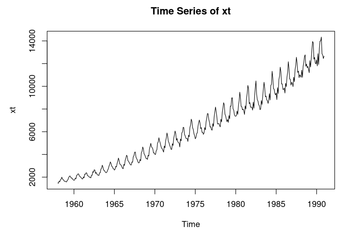
2022-06-28

## R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

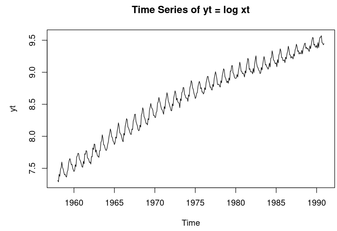
When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
data <- 'cbe.dat'
data <- read.table(data, header = TRUE)

xt <- ts(data$elec, start = c(1958,1), end = c(1990,12), frequency = 12)
yt <- log(xt)

plot(xt, main="Time Series of xt")
```




```
plot(yt, main ="Time Series of yt = log xt")

library(tseries)
```

```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```




```
adf.test(diff(xt, lag = 12))
```

```
## Warning in adf.test(diff(xt, lag = 12)): p-value smaller than printed p-value
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  diff(xt, lag = 12)
## Dickey-Fuller = -4.9938, Lag order = 7, p-value = 0.01
## alternative hypothesis: stationary
```

```
kpss.test(diff(xt, lag=12))
```

```
## Warning in kpss.test(diff(xt, lag = 12)): p-value smaller than printed p-value
```

```
##
##  KPSS Test for Level Stationarity
##
## data:  diff(xt, lag = 12)
## KPSS Level = 2.7421, Truncation lag parameter = 5, p-value = 0.01
```

```
#p-value is smaller than 0.05. =>  assume that xt comes from integrated process
#choosing d = 1

#Then choose p, q, P, Q ∈ {0, 1} according to the best AIC for the logarithm of the original series

AIC(arima(yt, order = c(0,1,0), seasonal = list(order = c(1,1,0), 12)))
```

```
## [1] -1660.195
```

```
AIC(arima(yt, order = c(0,1,0), seasonal = list(order = c(0,1,1), 12)))
```

```
## [1] -1738.92
```

```
AIC(arima(yt, order = c(0,1,0), seasonal = list(order = c(0,1,0), 12)))
```

```
## [1] -1625.263
```

```
AIC(arima(yt, order = c(0,1,0), seasonal = list(order = c(1,1,1), 12)))
```

```
## [1] -1750.762
```

```
AIC(arima(yt, order = c(1,1,0), seasonal = list(order = c(1,1,0), 12)))
```

```
## [1] -1764.072
```

```
AIC(arima(yt, order = c(1,1,0), seasonal = list(order = c(0,1,1), 12)))
```

```
## [1] -1828.401
```

```
AIC(arima(yt, order = c(1,1,0), seasonal = list(order = c(0,1,0), 12)))
```

```
## [1] -1721.034
```

```
AIC(arima(yt, order = c(1,1,0), seasonal = list(order = c(1,1,1), 12)))
```

```
## [1] -1836.322
```

```
AIC(arima(yt, order = c(0,1,1), seasonal = list(order = c(1,1,0), 12)))
```

```
## [1] -1814.401
```

```
AIC(arima(yt, order = c(0,1,1), seasonal = list(order = c(0,1,1), 12)))
```

```
## [1] -1870.802
```

```
AIC(arima(yt, order = c(0,1,1), seasonal = list(order = c(0,1,0), 12)))
```

```
## [1] -1763.833
```

```
AIC(arima(yt, order = c(0,1,1), seasonal = list(order = c(1,1,1), 12)))
```

```
## [1] -1873.532
```

```
AIC(arima(yt, order = c(1,1,1), seasonal = list(order = c(1,1,0), 12)))
```

```
## [1] -1813.542
```

```
AIC(arima(yt, order = c(1,1,1), seasonal = list(order = c(0,1,1), 12)))
```

```
## [1] -1868.915
```

```
AIC(arima(yt, order = c(1,1,1), seasonal = list(order = c(0,1,0), 12)))
```

```
## [1] -1761.975
```

```
AIC(arima(yt, order = c(1,1,1), seasonal = list(order = c(1,1,1), 12)))
```

```
## [1] -1871.538
```

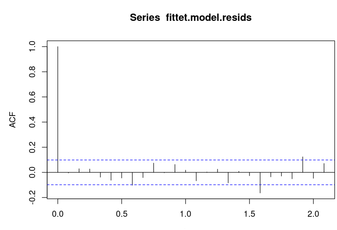
```
#smallest AIC = - 1873.532 at ARIMA (0,1,1)(1,1,1)

fittet.model <- arima(yt, order=c(0,1,1), seasonal = list(order=c(1,1,1), 12))

fittet.model
```

```
##
## Call:
## arima(x = yt, order = c(0, 1, 1), seasonal = list(order = c(1, 1, 1), 12))
##
## Coefficients:
##          ma1     sar1     sma1
##       -0.6530  0.1567  -0.7656
## s.e.   0.0434  0.0719   0.0481
##
## sigma^2 estimated as 0.0004212:  log likelihood = 940.77,  aic = -1873.53
```

```
fittet.model.resids <- fittet.model$residuals

predict(fittet.model)
```

```
## $pred
##          Jan
## 1991 9.439496
##
## $se
##             Jan
## 1991 0.02052339
```

```
#lot the correlogram of the residuals of the best fitted ARIMA process.
#Comment on that.
acf(fittet.model.resids)
```




```
#the residuals of fitted model are approximately white noise. We can assume that it could
#be the best fitting ARIMA model.
```