

# Tut7\_ST5218

*Name:Zhu Xu*

*User ID:E0337988*

*Matriculation ID:A0191344H*

*3/April/2019*

---

## Question 1:

```
library(tseries)
library(timeSeries)
```

```
## Loading required package: timeDate
```

```
P = get.hist.quote(instrument = "^DJI",
                  start="2001-01-01",end="2010-12-31",
                  quote = c("AdjClose"),
                  provider = "yahoo",
                  compression = "m")
```

```
## 'getSymbols' currently uses auto.assign=TRUE by default, but will
## use auto.assign=FALSE in 0.5-0. You will still be able to use
## 'loadSymbols' to automatically load data. getOption("getSymbols.env")
## and getOption("getSymbols.auto.assign") will still be checked for
## alternate defaults.
```

```
##
```

```
## This message is shown once per session and may be disabled by setting
## options("getSymbols.warning4.0"]=FALSE). See ?getSymbols for details.
```

```
##
```

```
## WARNING: There have been significant changes to Yahoo Finance data.
## Please see the Warning section of '?getSymbols.yahoo' for details.
```

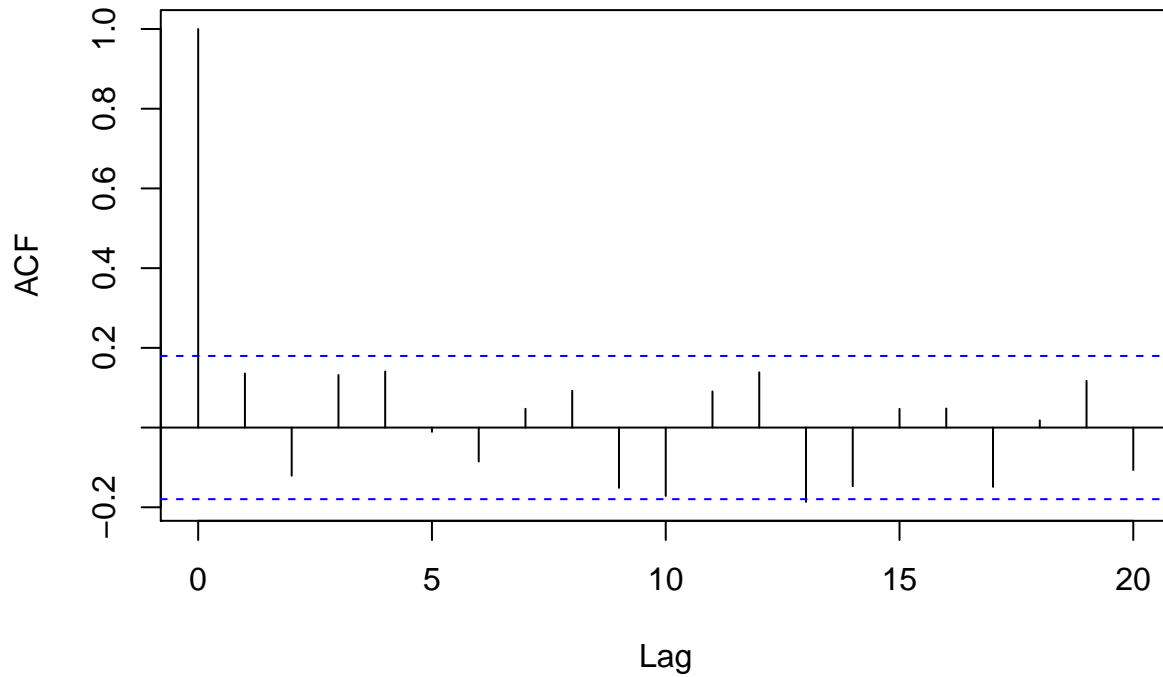
```
##
```

```
## This message is shown once per session and may be disabled by setting
## options("getSymbols.yahoo.warning"]=FALSE).
```

```
## time series ends    2010-12-01
```

```
r = diff(data.matrix(log(P)))
acf(r)
```

## Adjusted



### Question 2:

a)

For all  $t$

$$E(Z_t) = E(X) = \mu, \quad \gamma(t+h, t) = \frac{\text{cov}(Z_{t+h}, Z_t)}{\text{cov}(Z_t)} = \frac{\text{cov}(X, X)}{\text{cov}(X)} = 1$$

Thus  $\{Z_t\}$  is weakly stationary.

b)

According to (a), the covariance is a constant 1.

### Question 3:

a)

Since  $\{X_t\}$  is a zero-mean series

$$E(Z_t) = 5 + 2t + E(X_t) = 5 = 2t$$

b)

$$\gamma(Z_t) = \text{cov}(Z_{t+h}, Z_t) = \text{cov}(X_{t+h}, X_t) = \gamma_X(h)$$

c)

$Z_t$  is not stationary because its expectation is dependent on  $t$ .

**Question 4:**

$$E(X_h) = E(U_t) + E(V_t) = \mu_U + \mu_V$$

$$\Rightarrow \gamma_X(t+h, t) = \frac{\text{cov}(X_{t+h}, X_t)}{\text{cov}(X_t)} = \frac{\gamma_U(h)\gamma_U(0) + \gamma_V(h)\gamma_V(0)}{\gamma_U(0)\gamma_V(0)} = \gamma_X(h) = \gamma_X(-h)$$

Thus both of them are independent with  $t$ , the time series is weakly stationary.

Question 5:

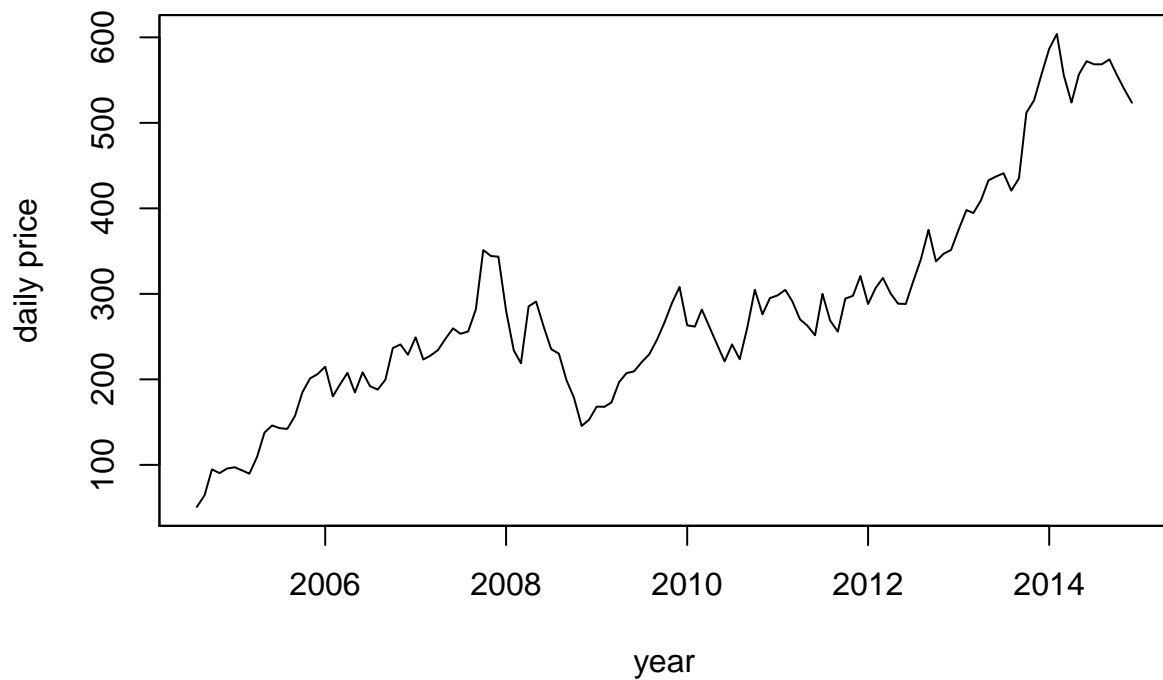
a)

```
P = get.hist.quote(instrument = "Goog",  
                  start="2001-01-01",  
                  end="2014-12-31",  
                  quote = c("AdjClose"),  
                  provider = "yahoo",  
                  compression = "m")
```

```
## time series starts 2004-08-01
```

```
## time series ends 2014-12-01
```

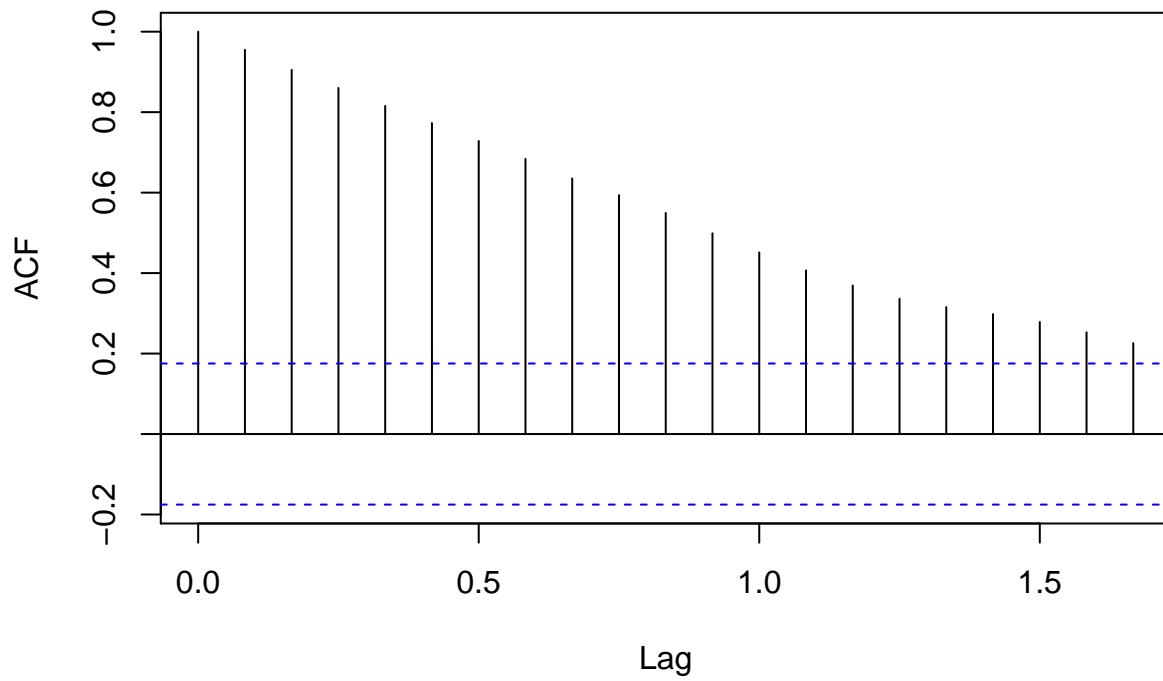
```
plot(P, type='l', ylab='daily price', xlab='year')
```



b)

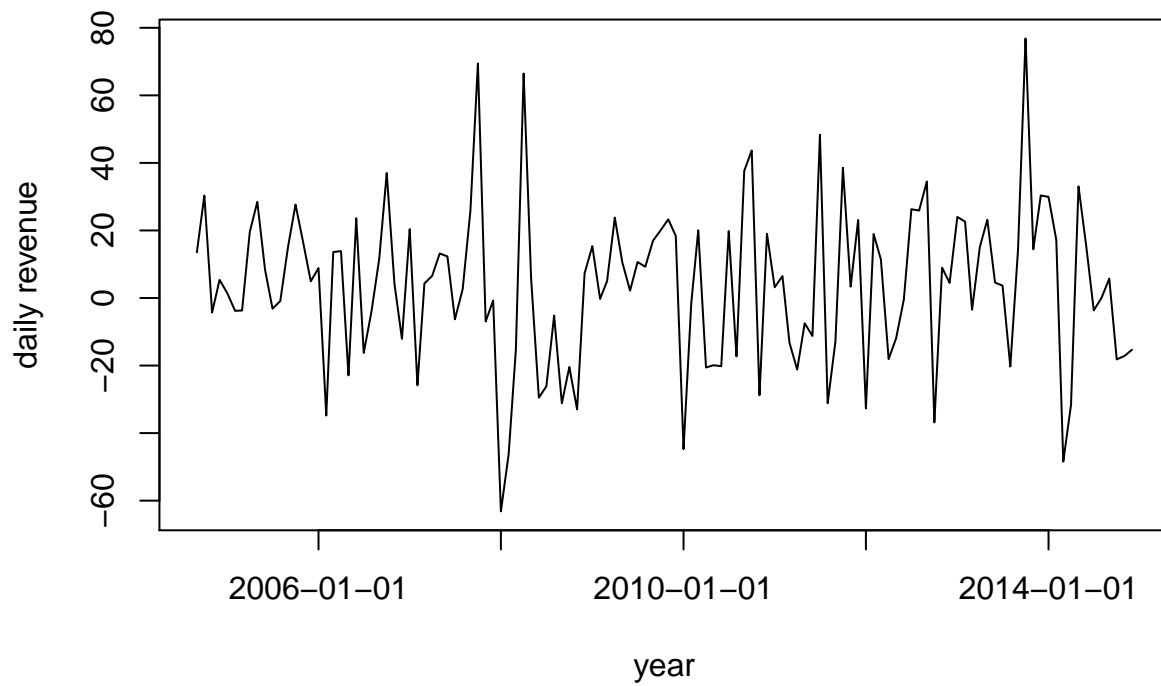
```
acf(as.timeSeries(P))
```

### Series as.timeSeries(P)



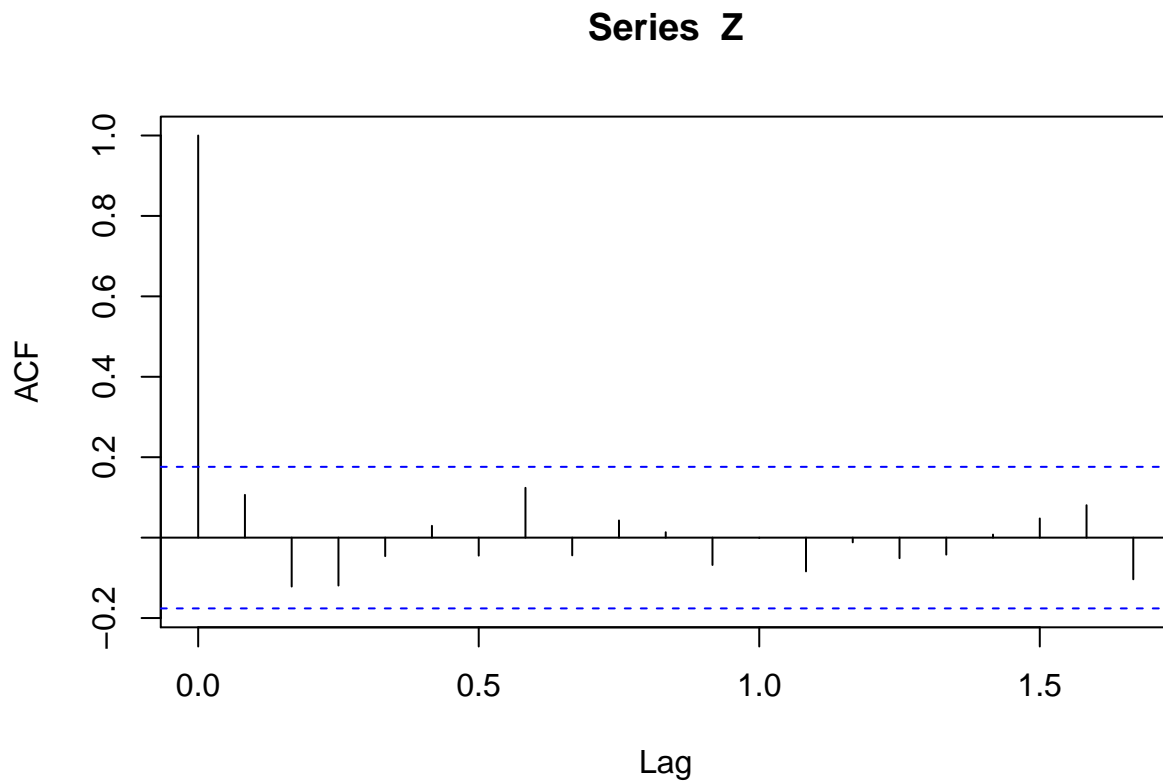
c)

```
Z = as.timeSeries(diff(P))  
plot(Z, type='l', ylab='daily revenue', xlab='year')
```



d)

```
acf(Z)
```



e)

```
Box.test(Z, lag=20, type="Ljung")
```

```
##
## Box-Ljung test
##
## data: Z
## X-squared = 13.605, df = 20, p-value = 0.8499
```

```
Box.test(Z^2, lag=20, type="Ljung")
```

```
##
## Box-Ljung test
##
## data: Z^2
## X-squared = 21.718, df = 20, p-value = 0.356
```