```
STAT 5814 HW1/PROBLEM 4(c)
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sigma = 1
num_samples = 500
eps = rnorm(n=num_samples, m=0, s=sigma)
Y = c(1: length(eps))
time_steps = c(1: length(eps))
theta_set = c(-1, 0.5, 1)
for (theta in theta_set) {
  for (t in 2: length(time_steps)) {
      Y[t] = eps[t] - theta * eps[t-1] ^ 2
  }
  plot(time_steps, Y, type='l', xlab='t', ylab='Y(t)',
main=paste('Simulated Y(t) for theta=', theta, 'and n=',
num_samples))
}
```
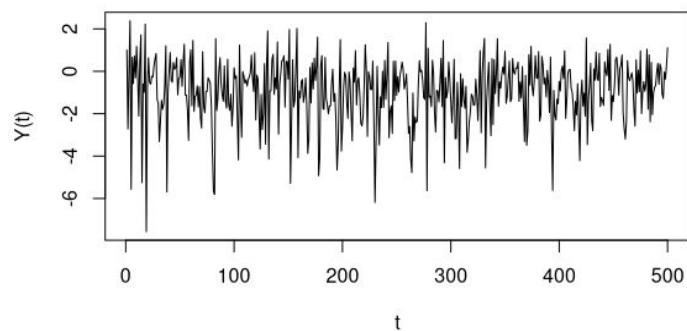
Simulated Y(t) for theta= -1 and n= 500
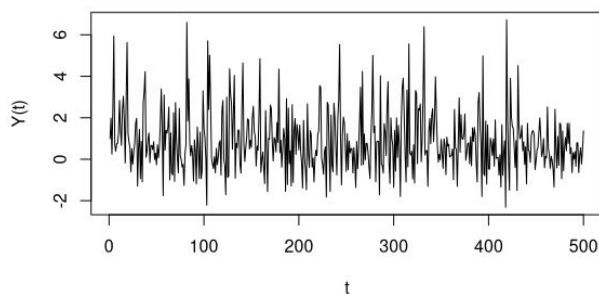


Simulated Y(t) for theta= 0.5 and n= 500
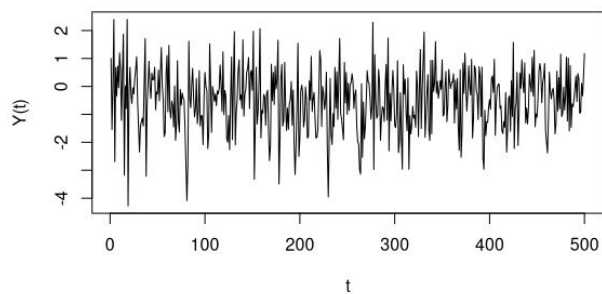


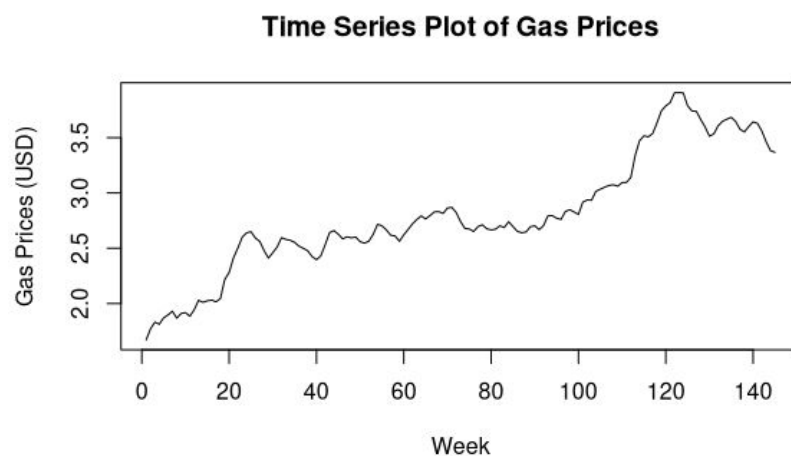Simulated Y(t) for theta= 1 and n= 500

```
STAT 5814 HW1/PROBLEM 8
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library(TSA)

data_path =
'/home/montimaj/Documents/MST/STAT_5814/HW/STAT_TSA/Data/gasprices.tx
t'
data = data.frame(read.table(data_path))
colnames(data) = c('GP')
n = length(data$GP)
data$week = c(1: n)
plot(data$week ,data$GP, xlab='Week', ylab='Gas Prices (USD)',
main='Time Series Plot of Gas Prices', type = "l")
gasprices = data$GP
lag_set = c(1, 2, 3, 5, 15)
for (lag in lag_set) {
  k = lag + 1
  auto_corr = round(cor(gasprices[k:n], zlag(gasprices, lag)[k:n]),
3)
  plot(x=zlag(gasprices, lag), y=gasprices,
xlab=bquote('Y'[t-~.(lag)]), ylab=expression(Y[t]), main=paste('Lag',
lag, 'Scatter Plot\nAutocorrelation=', auto_corr), type='p')
}
```
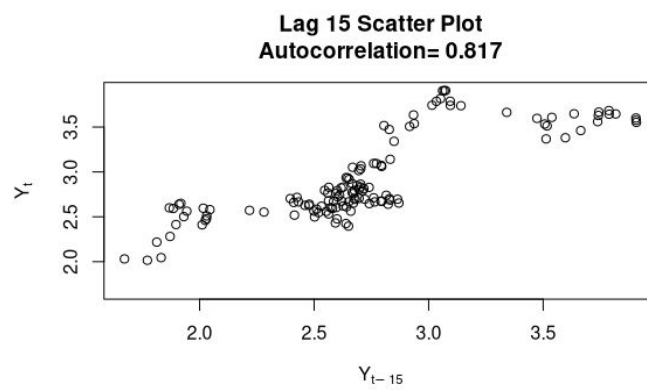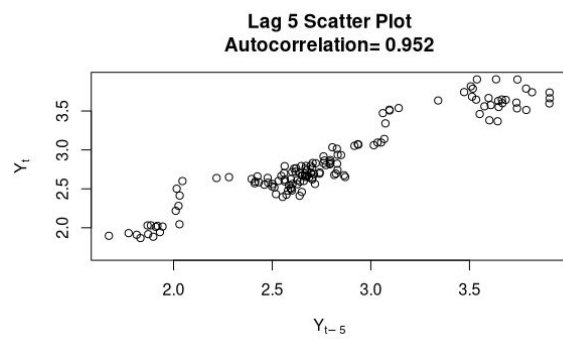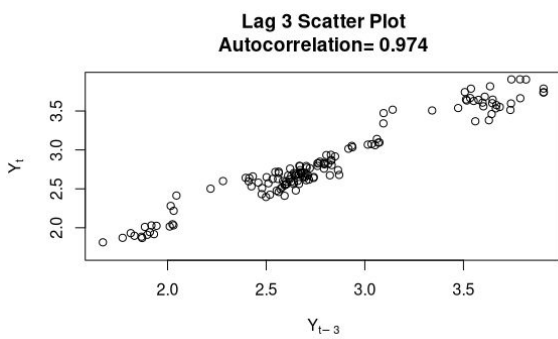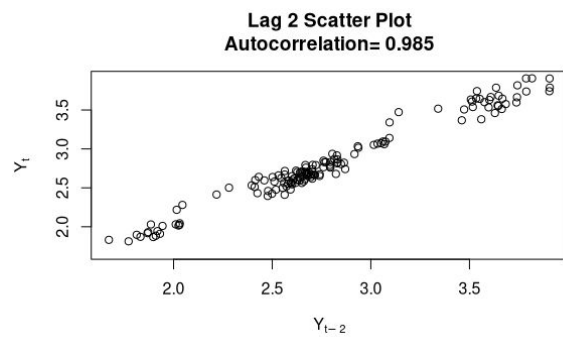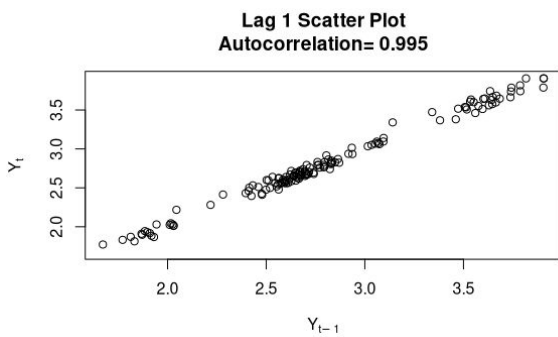
(a)   Time series plot:



Time Series Plot of Gas Prices

(b)-(c)

**Lag 1 Scatter Plot**
**Autocorrelation= 0.995**



**Lag 2 Scatter Plot**
**Autocorrelation= 0.985**



**Lag 3 Scatter Plot**
**Autocorrelation= 0.974**



**Lag 5 Scatter Plot**
**Autocorrelation= 0.952**



**Lag 15 Scatter Plot**
**Autocorrelation= 0.817**

(d)