

Homework4

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(1)

phi=0.8과 AR(1) 모형을 simulation하세요 (n=1000). 시계열 그림, SACF, SPACF 그래프를 그리세요.

```
library(tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 4.0.2
```

```
## -- Attaching packages ----- tidyverse 1.3.0 --
```

```
## √ ggplot2 3.3.2      √ purrr  0.3.4
## √ tibble  3.0.1      √ dplyr  0.8.5
## √ tidyr   1.1.0      √ stringr 1.4.0
## √ readr   1.3.1      √ forcats 0.5.0
```

```
## Warning: package 'ggplot2' was built under R version 4.0.2
```

```
## Warning: package 'tidyr' was built under R version 4.0.2
```

```
## Warning: package 'stringr' was built under R version 4.0.2
```

```
## Warning: package 'forcats' was built under R version 4.0.2
```

```
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
```

```
library(ggplot2)
library(forecast)
```

```
## Warning: package 'forecast' was built under R version 4.0.2
```

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

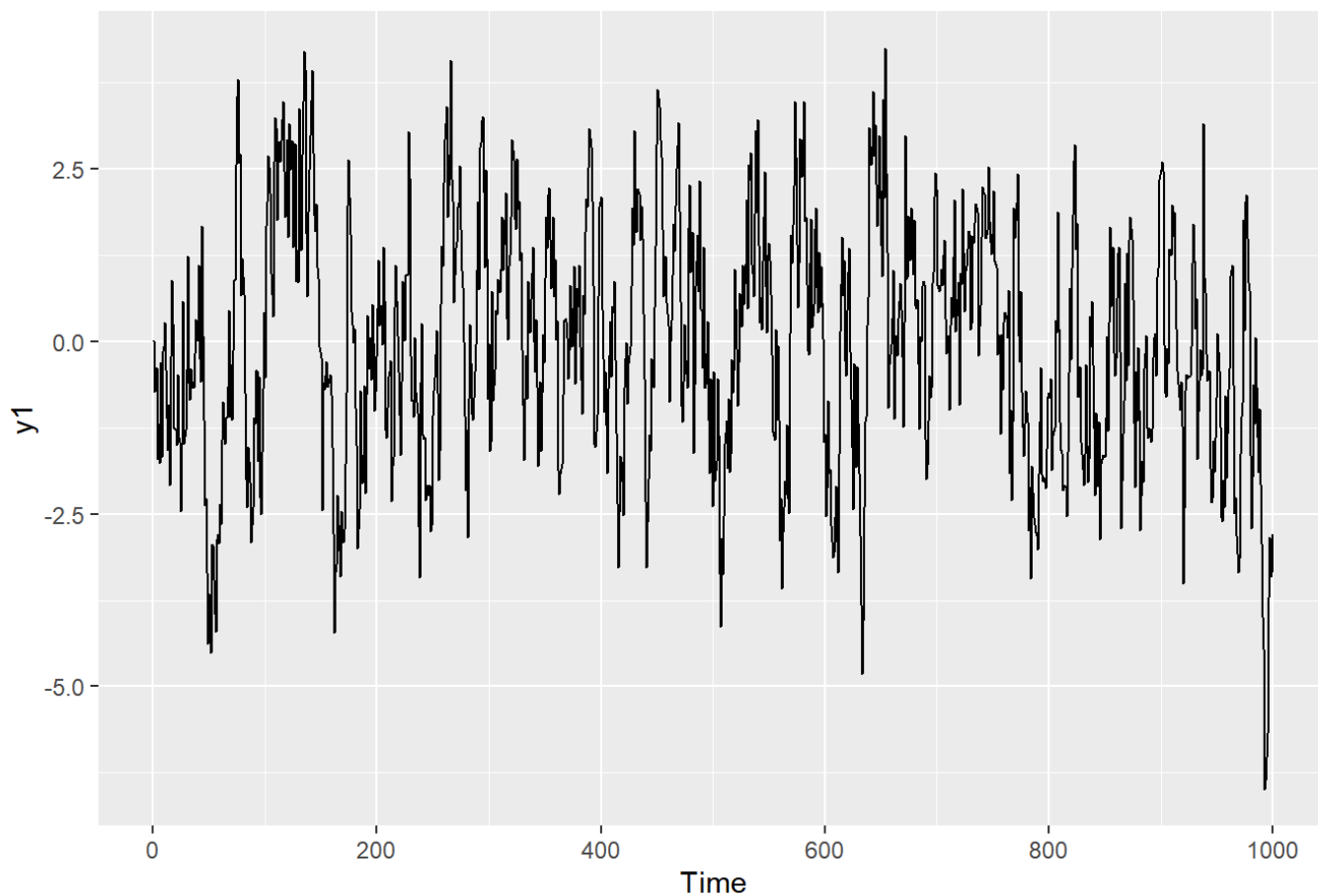
```
library(gridExtra)
```

```
## Warning: package 'gridExtra' was built under R version 4.0.2
```

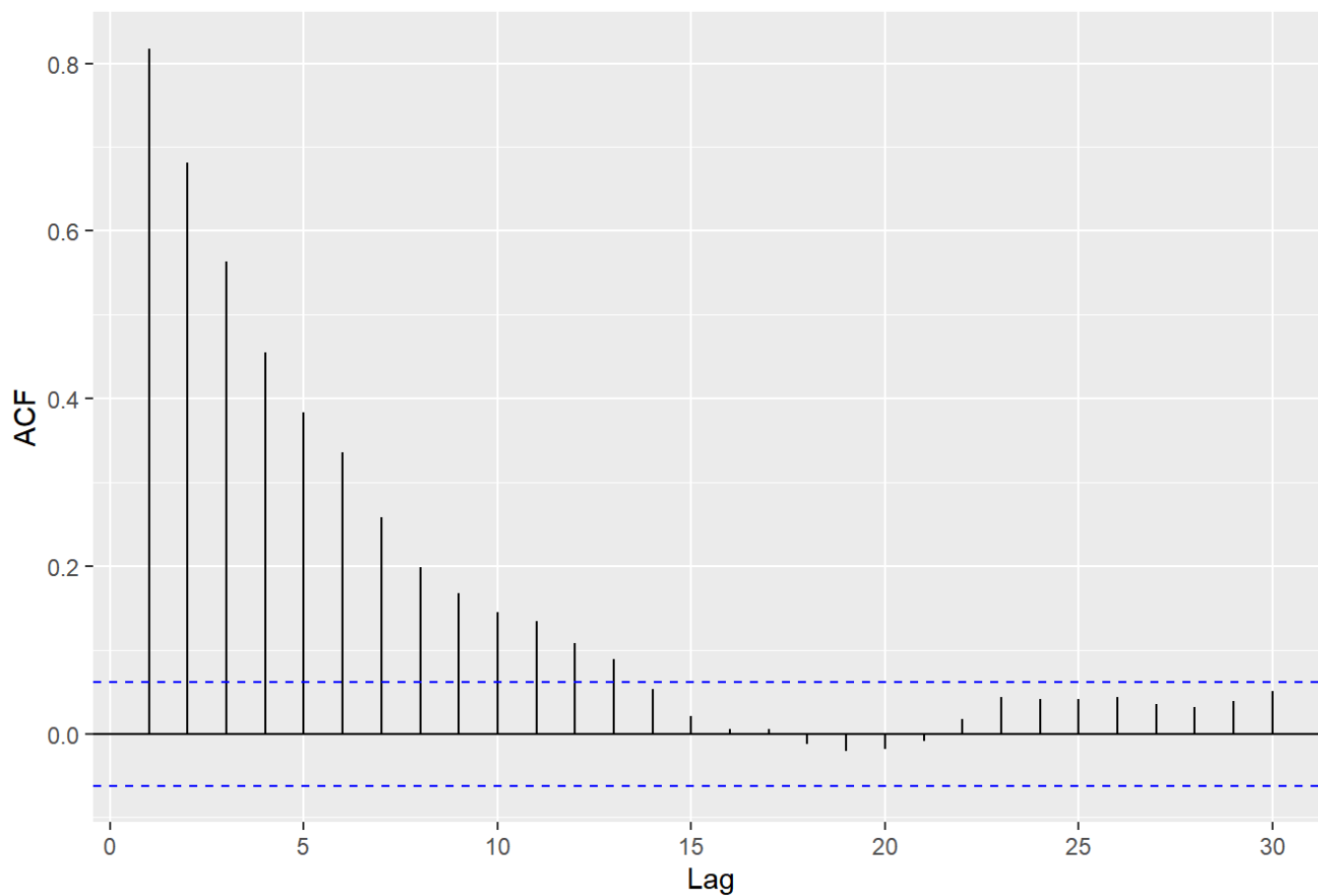
```
##
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##   combine
```

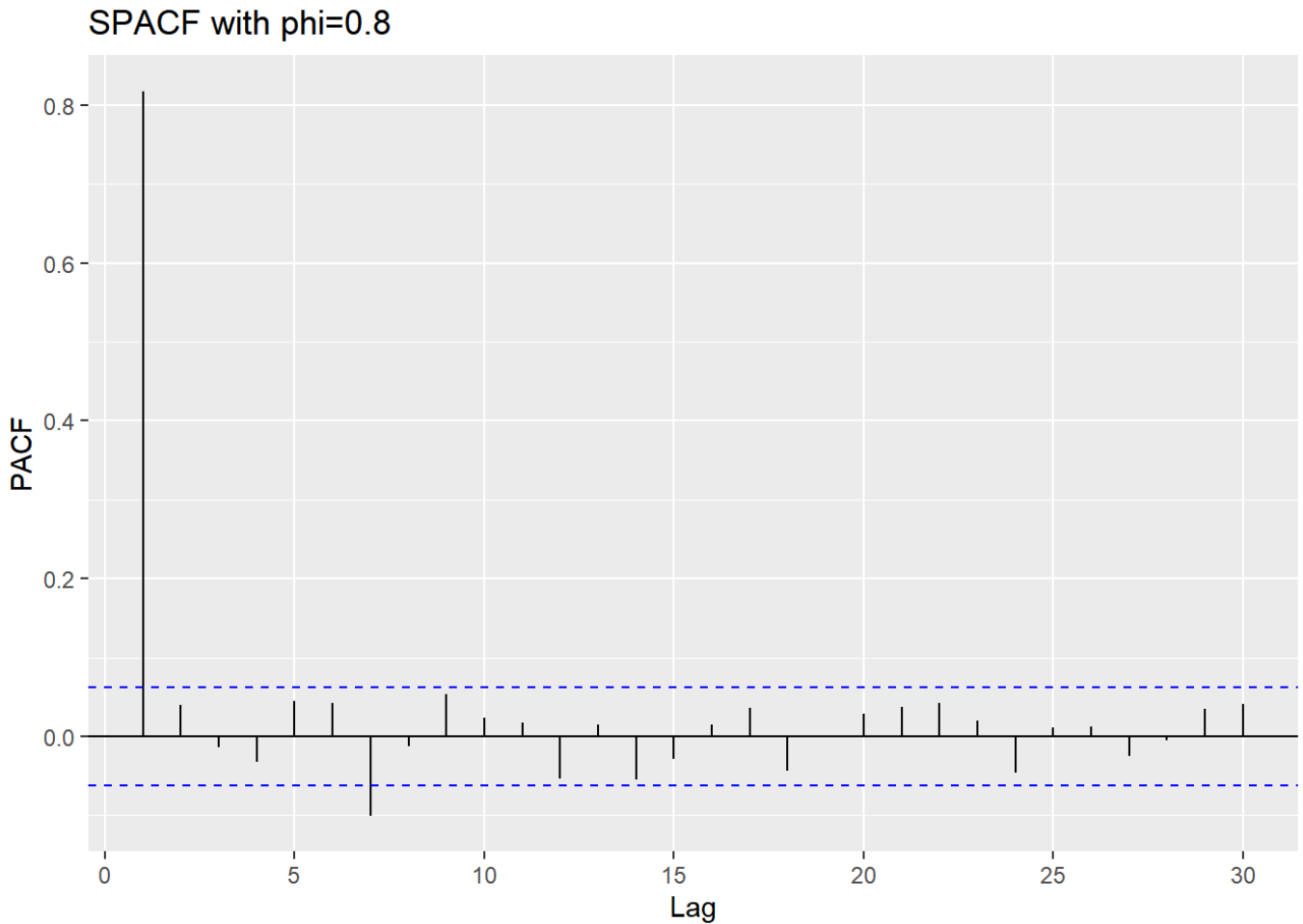
```
y1=arima.sim(n=1000, list(ar=0.8))
autoplot(y1) + ggtitle("AR(1) with phi=0.8 ")
```

AR(1) with $\phi=0.8$ 

```
ggAcf(y1)+ggtitle("SACF with phi=0.8")
```

SACF with $\phi=0.8$ 

```
ggPacf(y1)+ggtitle("SPACF with phi=0.8")
```

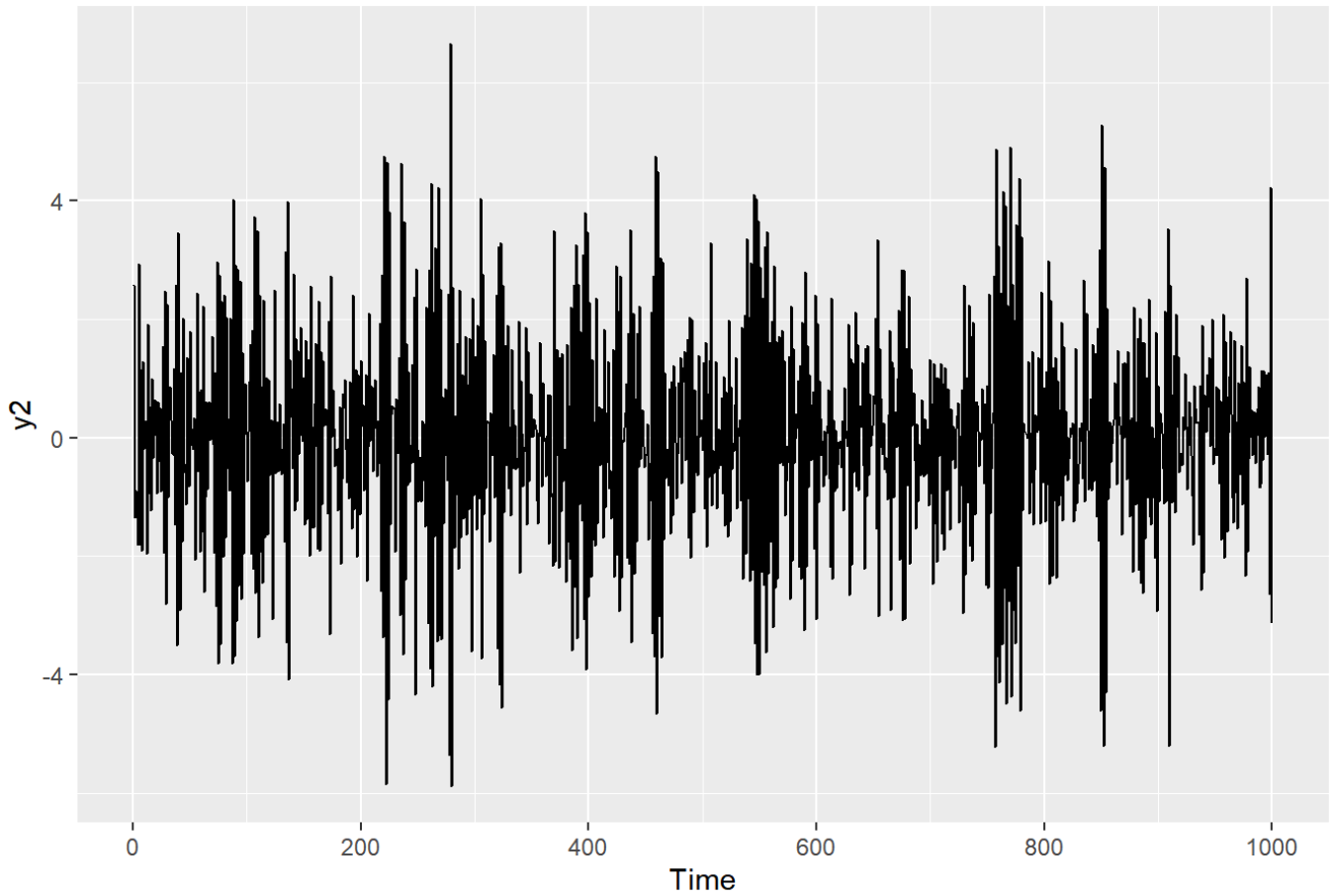


SACF는 지수적으로 감소하며, SPACF는 두번째부터 절단됨을 알 수 있다.

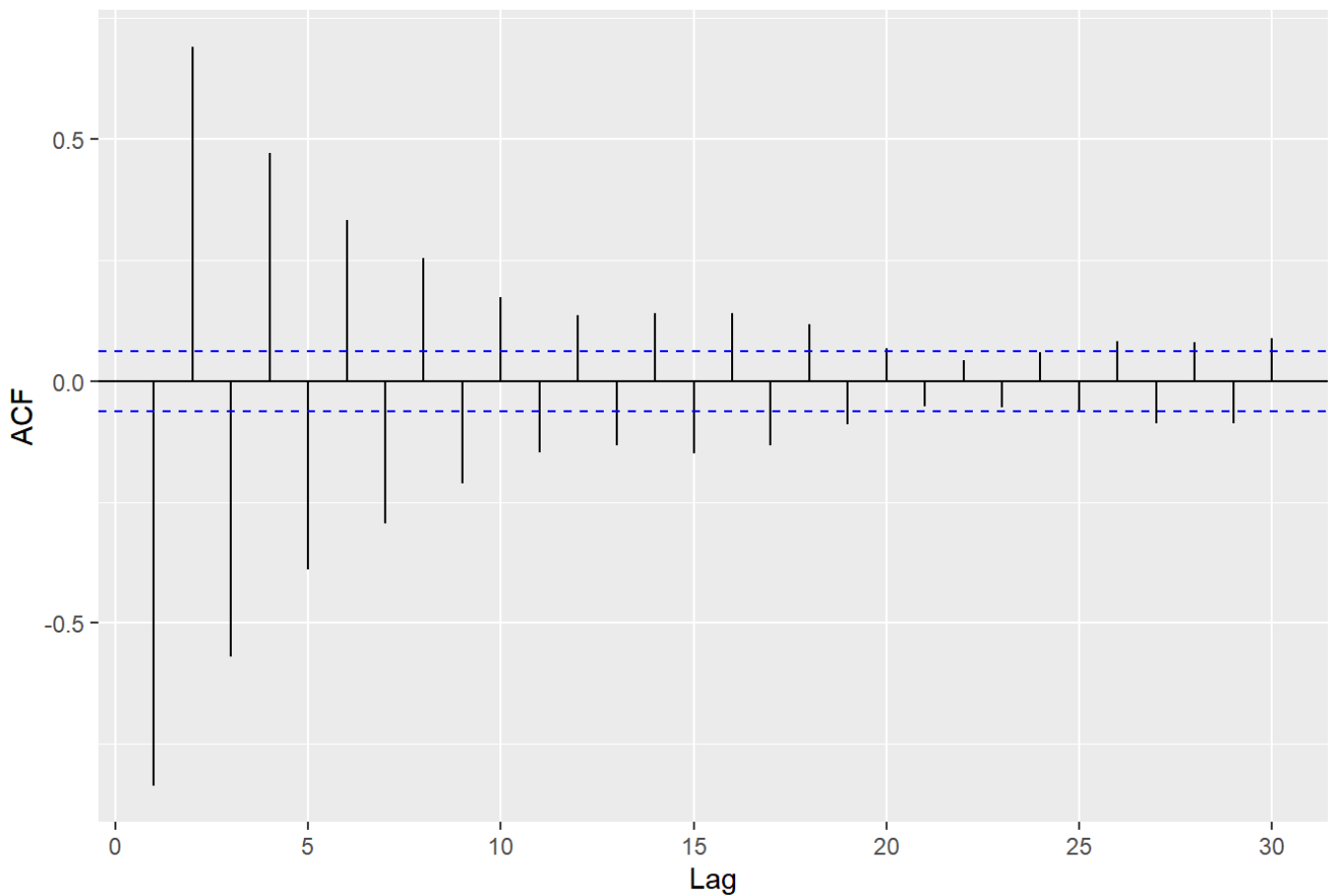
(2)

phi=-0.8일 때, (1)을 반복하세요.

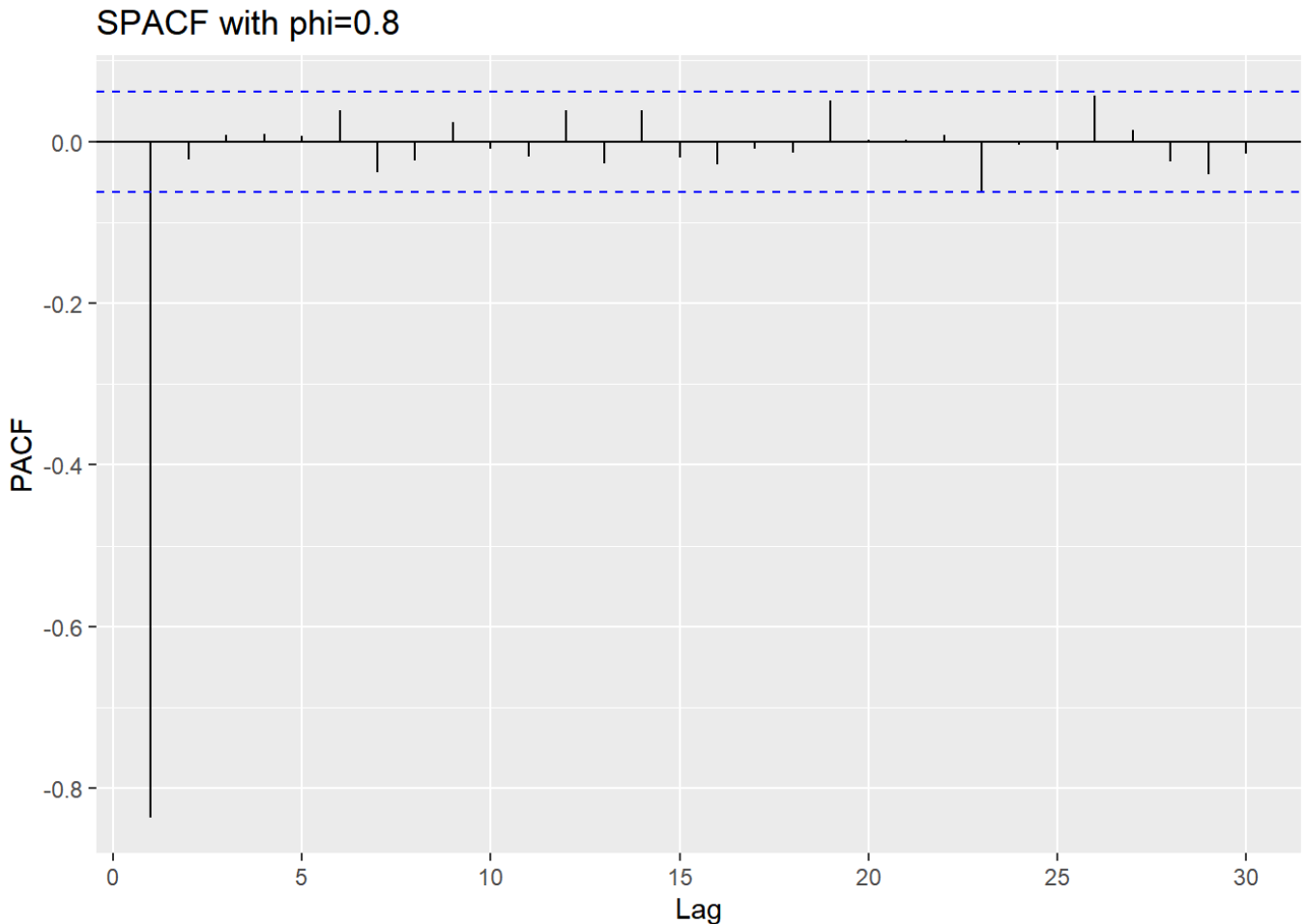
```
y2=arima.sim(n=1000, list(ar=-0.8))  
autoplot(y2) + ggtitle("AR(1) with phi=-0.8 ")
```

AR(1) with $\phi=-0.8$ 

```
ggAcf(y2)+ggtitle("SACF with phi=0.8")
```

SACF with $\phi=0.8$ 

```
ggPacf(y2)+ggtitle("SPACF with phi=0.8")
```

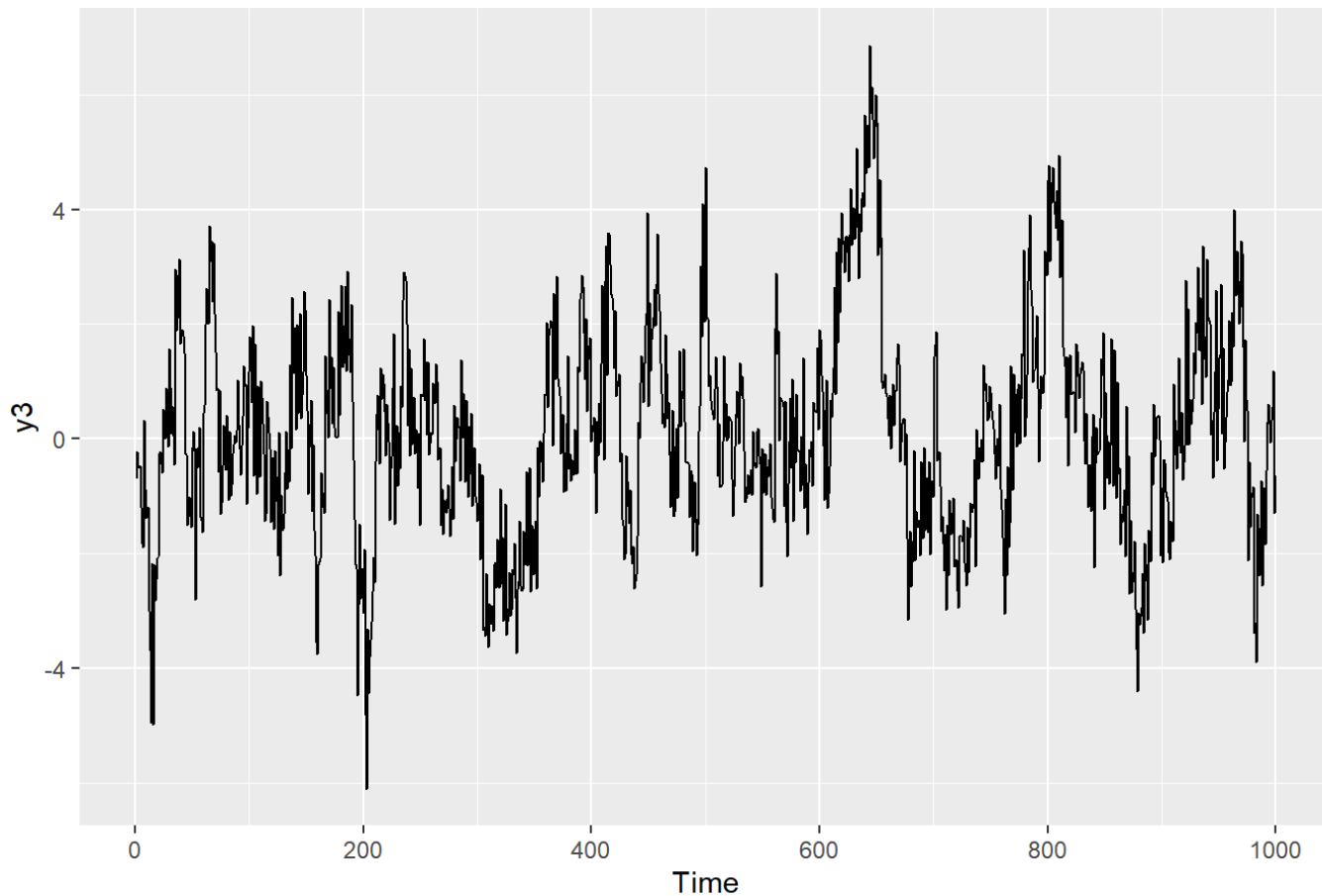


시계열 그림이 (1)보다 심한 진동을 보인다. SACF는 진동하며 지수적으로 감소하고, SPACF는 두번째부터 절단됨을 알 수 있다.

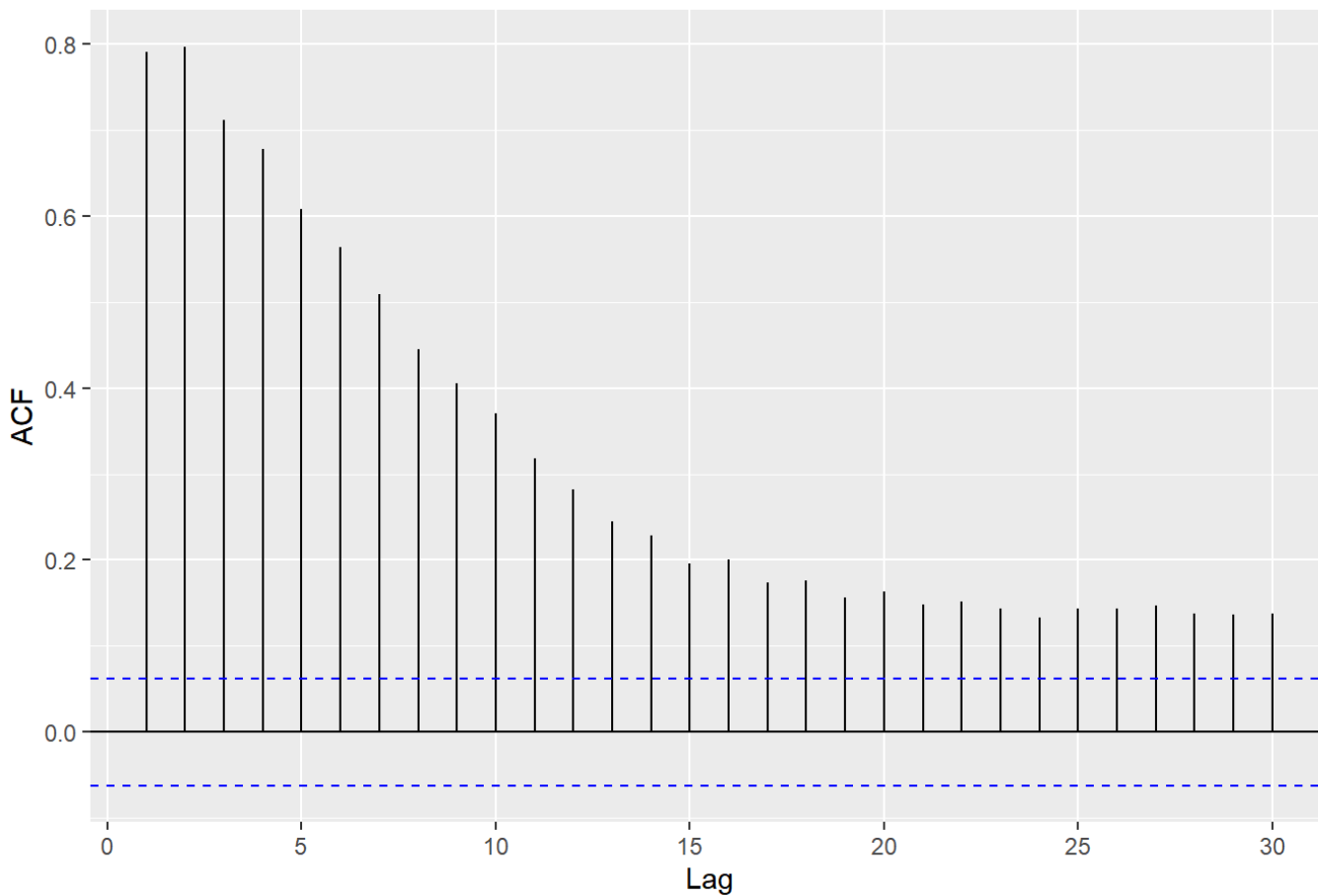
(3)

AR(2)를 ϕ_1 과 ϕ_2 를 임의로 설정하여 simulation하고 (1)을 반복하세요

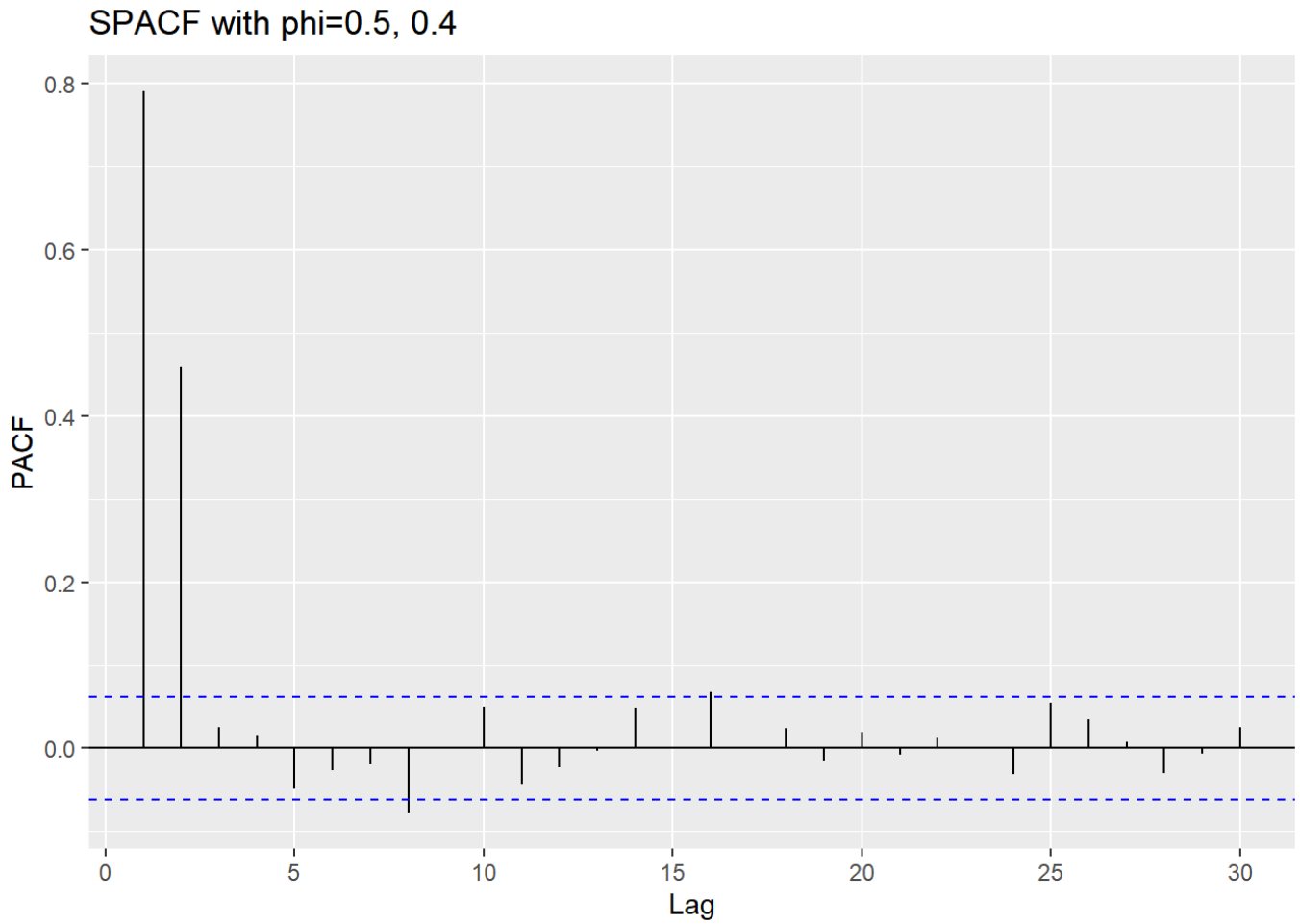
```
y3<- arima.sim(n=1000, list(ar=c(0.5, 0.4)))
autoplot(y3) + ggtitle("AR(2) with phi=0.5, 0.4 ")
```

AR(2) with $\phi=0.5, 0.4$ 

```
ggAcf(y3)+ggtitle("SACF with phi=0.5, 0.4")
```

SACF with $\phi=0.5, 0.4$ 

```
ggPacf(y3)+ggtitle("SPACF with phi=0.5, 0.4")
```



SACF는 지수적으로 감소하며, SPACF는 3번째 부터 절단됨을 알 수 있다.