

Assignment2

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```
##1
```

```
library(fpp2)
```

```
## Loading required package: ggplot2
```

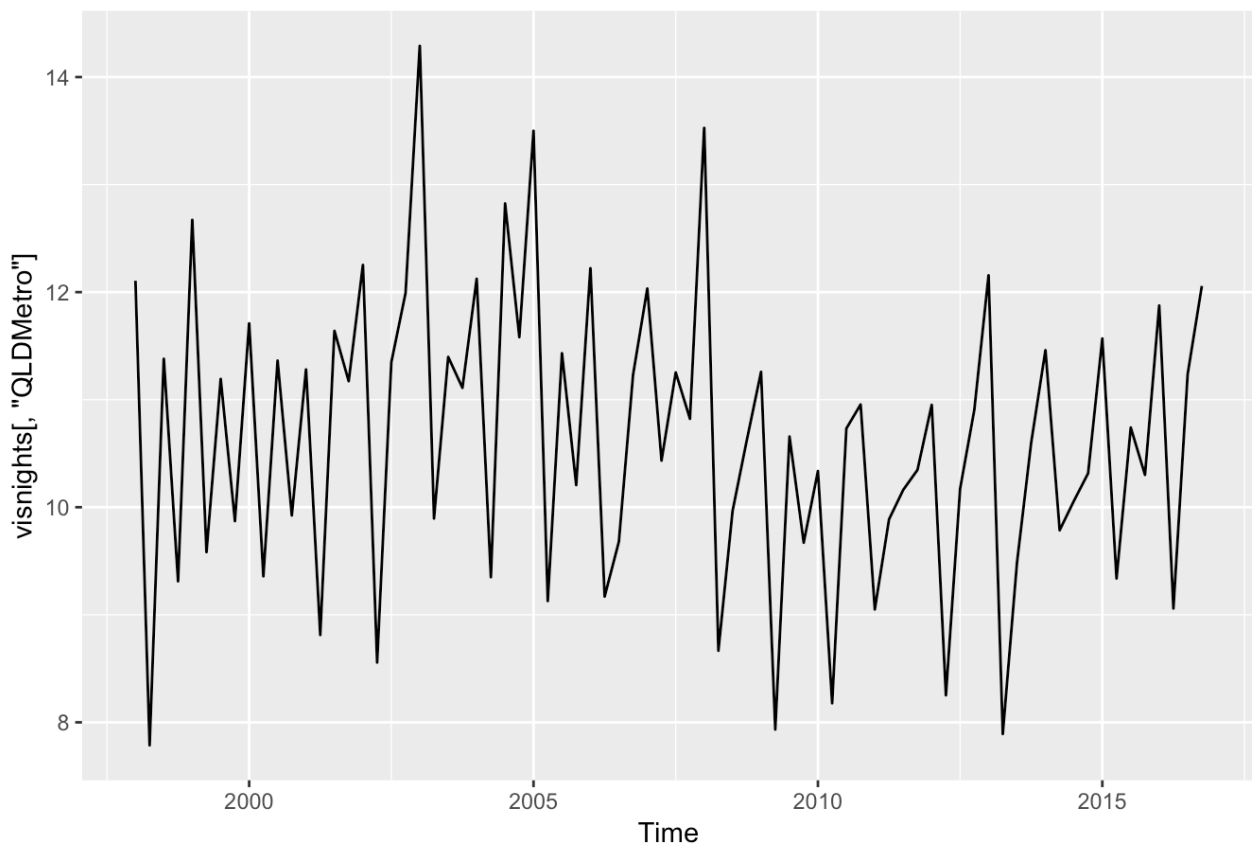
```
## Loading required package: forecast
```

```
## Warning: package 'forecast' was built under R version 3.5.2
```

```
## Loading required package: fma
```

```
## Loading required package: expsmooth
```

```
#View(visnights)  
autoplot(visnights[, "QLDMetro"])
```



```
x <- ts(visnights[, "QLDMetro"], start = 1998, frequency=4)
```

```
#1a)
```

```
train1 <- window(x, end = c(2015, 4))
```

```
train2 <- window(x, end = c(2014, 4))
```

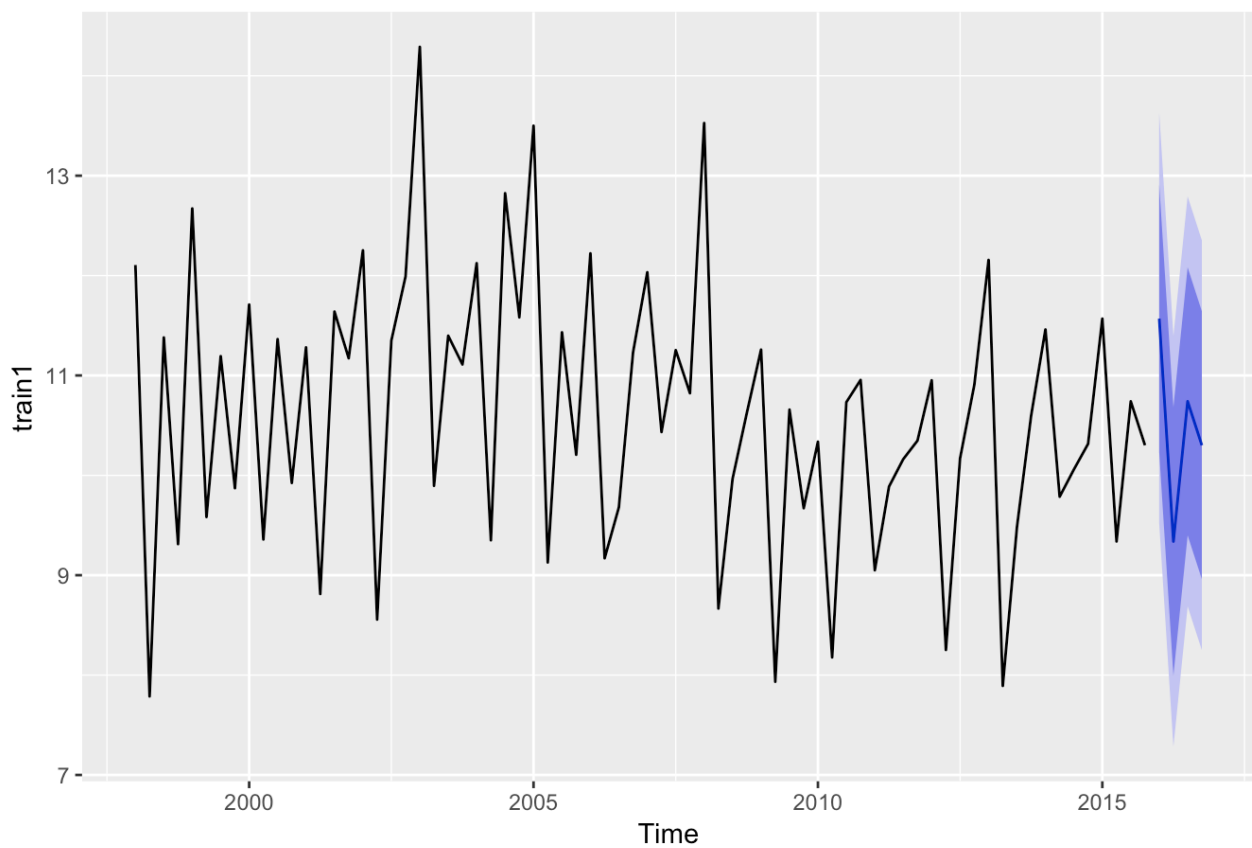
```
train3 <- window(x, end = c(2013, 4))
```

```
#1b)
```

```
fc1 <- snaive(train1, h = 4)
```

```
autoplot(fc1)
```

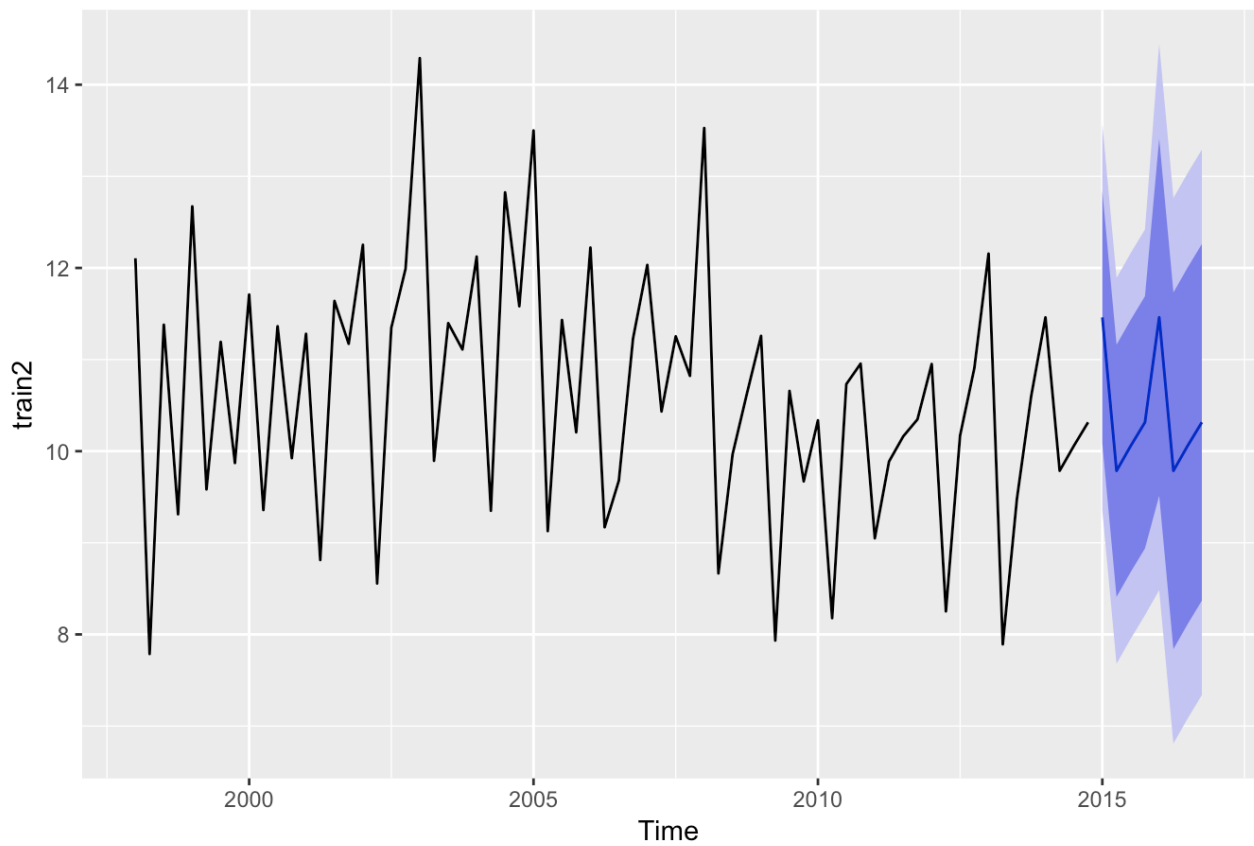
Forecasts from Seasonal naive method



```
fc2 <- snaive(train2, h = 8)
```

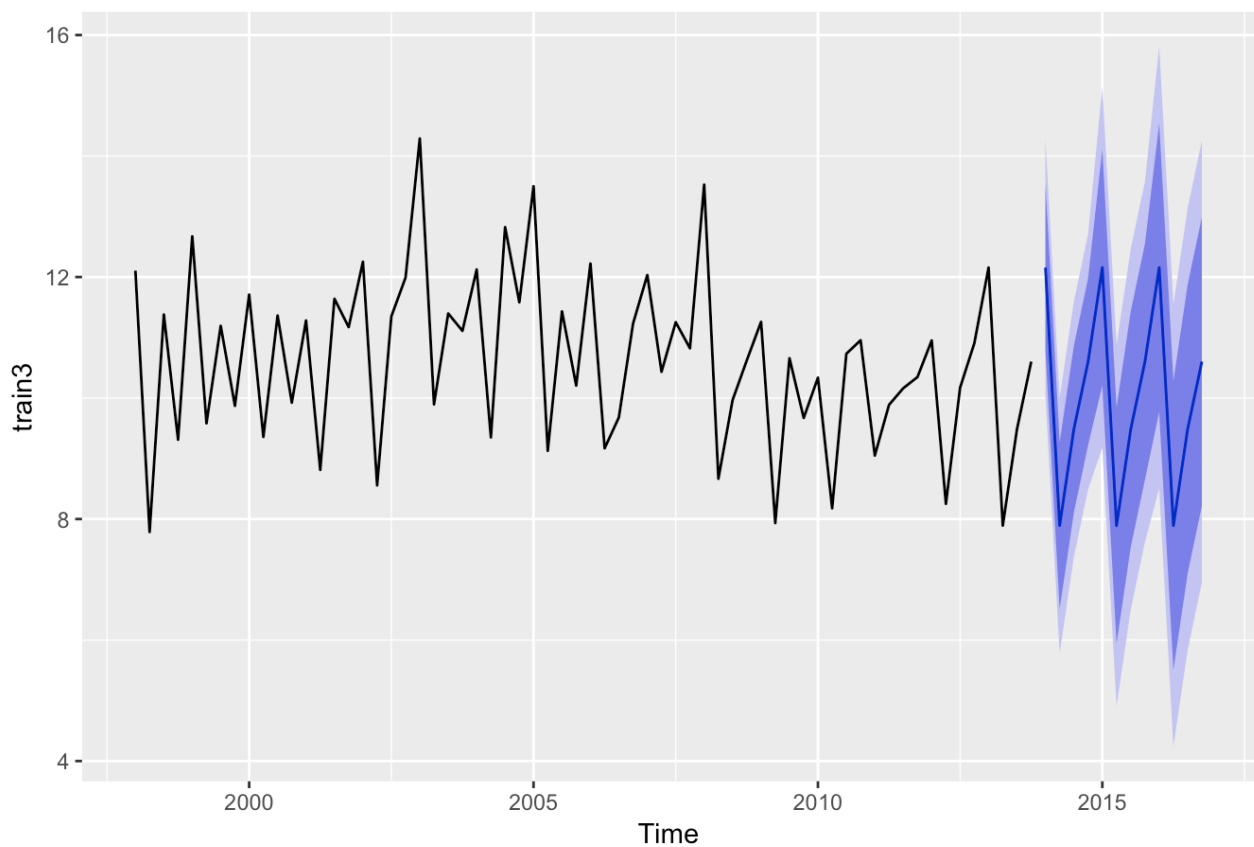
```
autoplot(fc2)
```

Forecasts from Seasonal naive method



```
fc3 <- snaive(train3, h = 12)
autoplot(fc3)
```

Forecasts from Seasonal naive method



```
#1c)
test1 <- window(x,start=c(2016,1), end= c(2016,4))
fc1$mean
```

```
##           Qtr1      Qtr2      Qtr3      Qtr4
## 2016 11.568824   9.337821 10.740806 10.300925
```

```
accuracy(test1,fc1$mean)
```

```
##           ME      RMSE      MAE      MPE      MAPE      ACF1
## Test set -0.5698388 0.9358727 0.7094002 -5.331327 6.825909 0.09003153
##           Theil's U
## Test set 0.7004909
```

```
test2 <- window(x,start=c(2015,1), end= c(2016,4))
accuracy(test2,fc2$mean)
```

```
##           ME      RMSE      MAE      MPE      MAPE      ACF1
## Test set -0.366956 0.8516202 0.6644561 -3.474469 6.51262 -0.002021023
##           Theil's U
## Test set 0.9884293
```

```
test3 <- window(x,start=c(2014,1), end= c(2016,4))
accuracy(test3,fc3$mean)
```

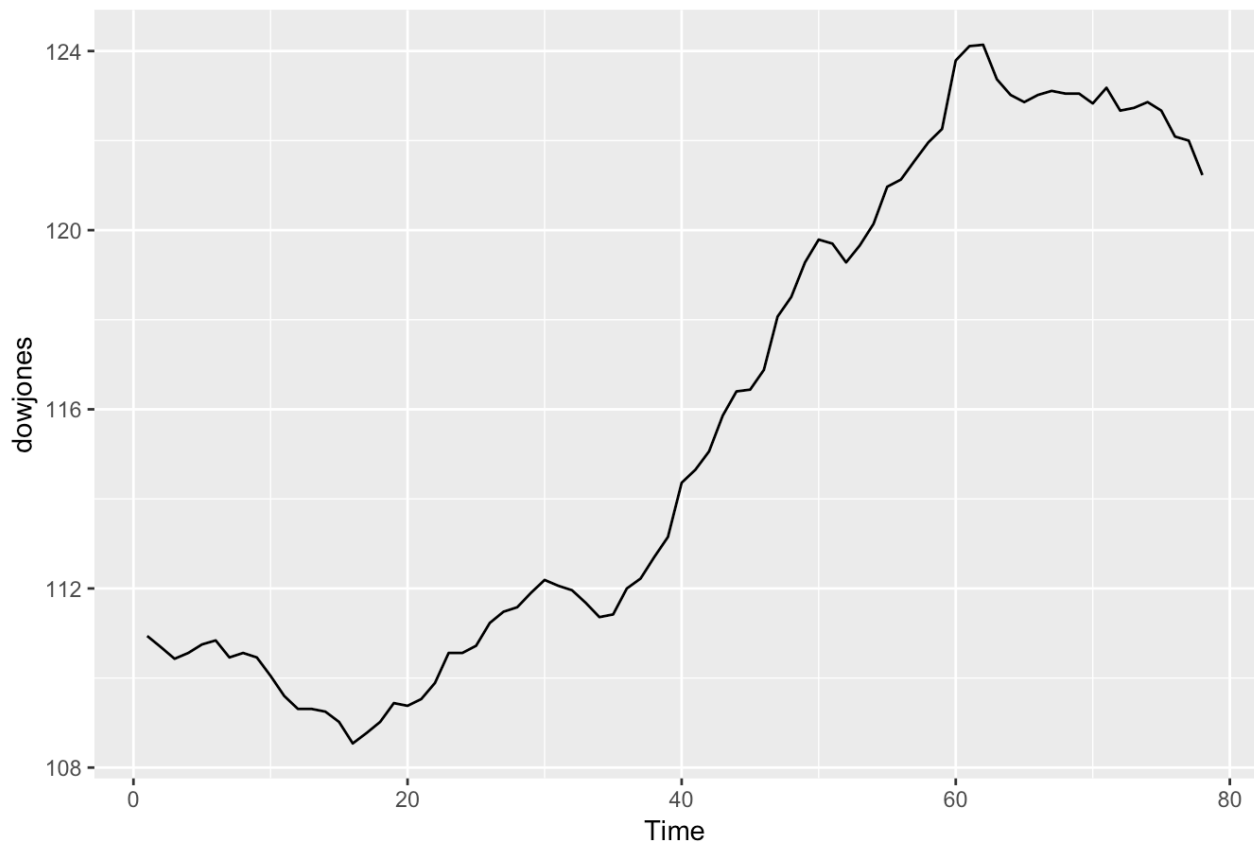
```
##           ME      RMSE      MAE      MPE      MAPE      ACF1 Theil's U
## Test set -0.61547 1.125643 0.974435 -7.50979 10.58103 0.02292347 0.5213396
```

```
#1d)
# MAPE increses for test3, so increase in test set leading to increase in RMSE
and MAPE
```

```
##2
```

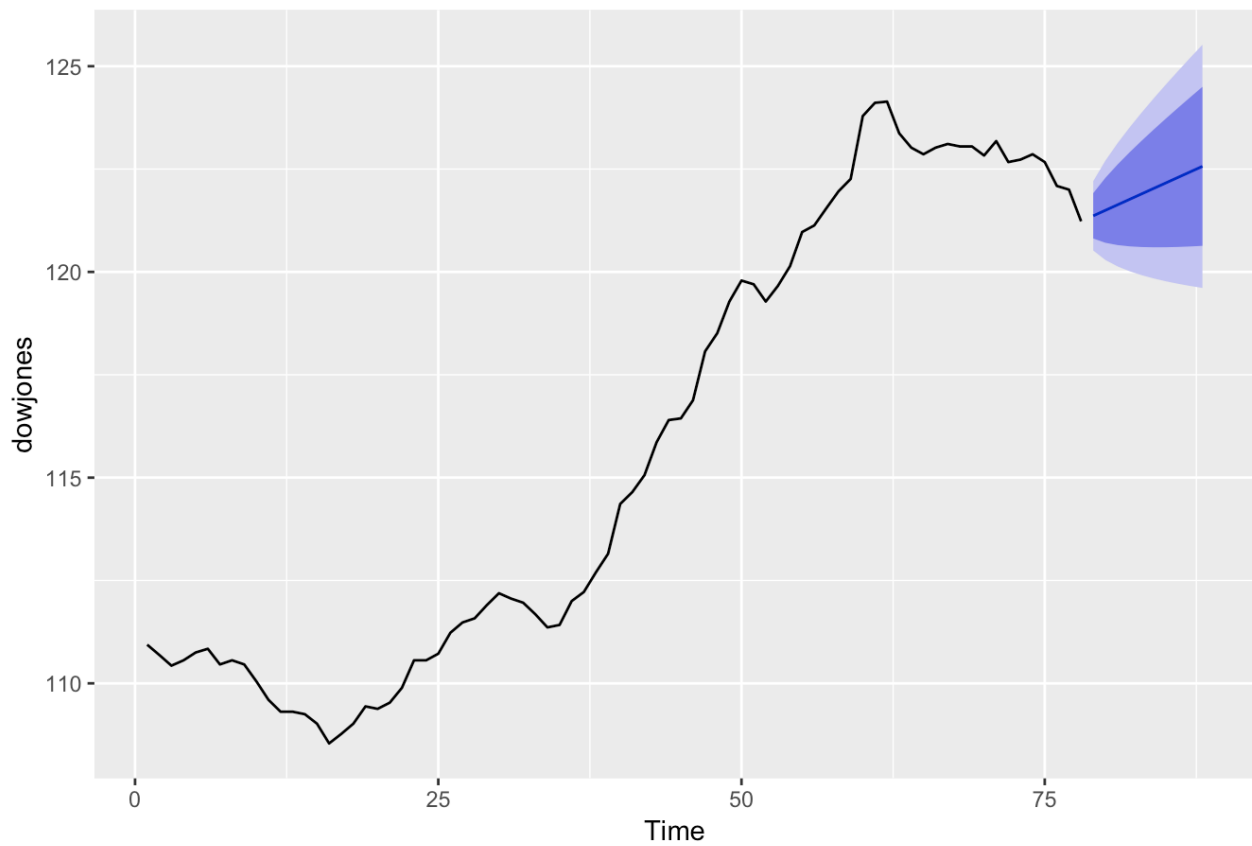
```
#2a)
#View(dowjones)

autoplot(dowjones)
```



```
#2b)
#forecast using drift method
rwf1<- rwf(dowjones,drift = TRUE)
autoplot(rwf(dowjones,drift = TRUE))
```

Forecasts from Random walk with drift



```
#2c)
x1 <- unlist(dowjones[1])
x1
```

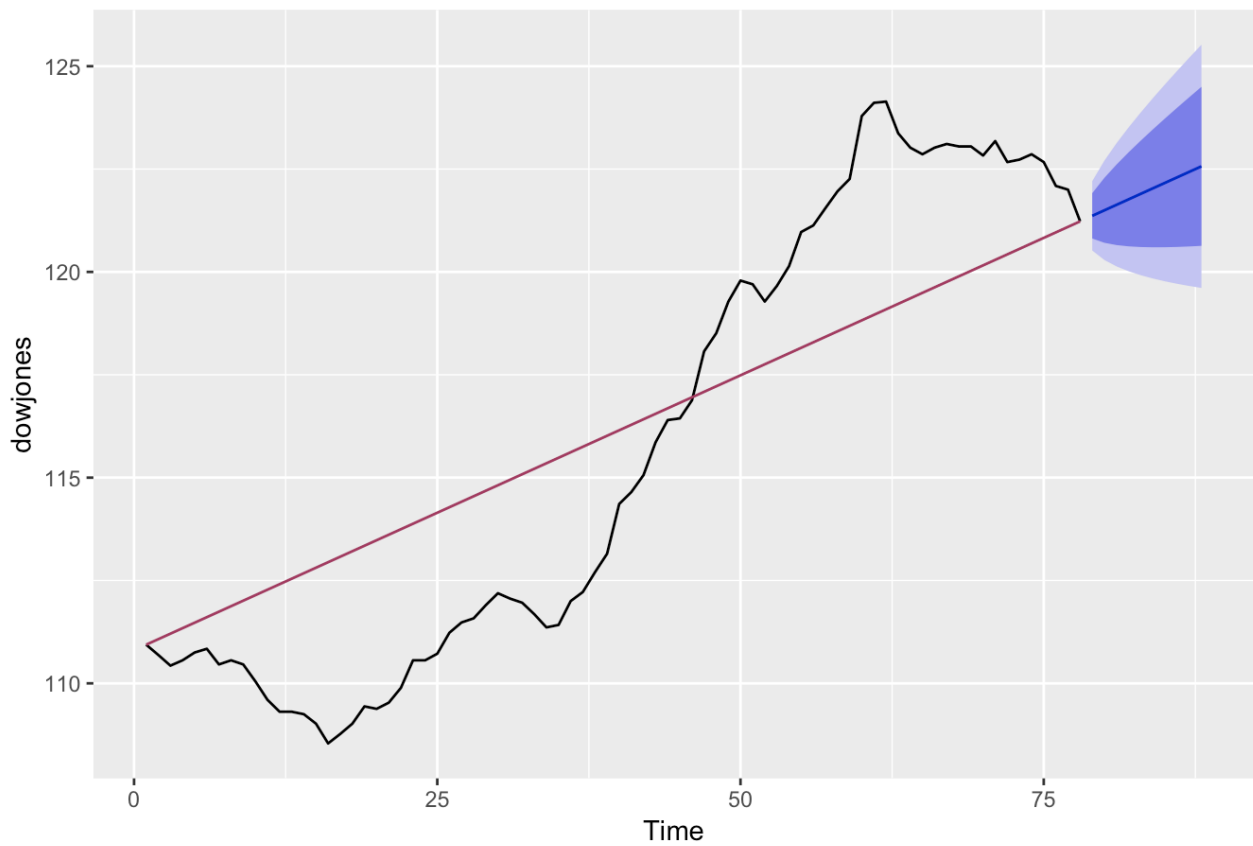
```
## [1] 110.94
```

```
y1 <- unlist(dowjones[78])
y1
```

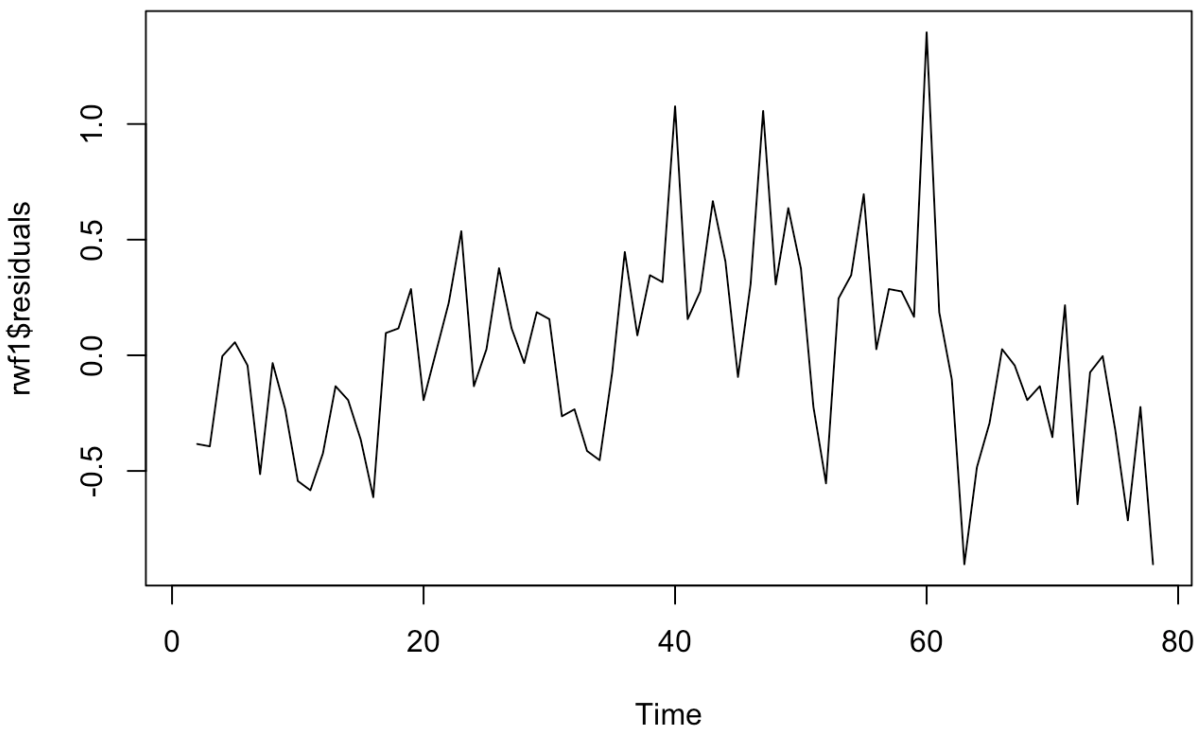
```
## [1] 121.23
```

```
autoplot(rwf1) + geom_line(aes(x = c(1, 78), y = dowjones[c(1, 78)]), colour =
"maroon")
```

Forecasts from Random walk with drift



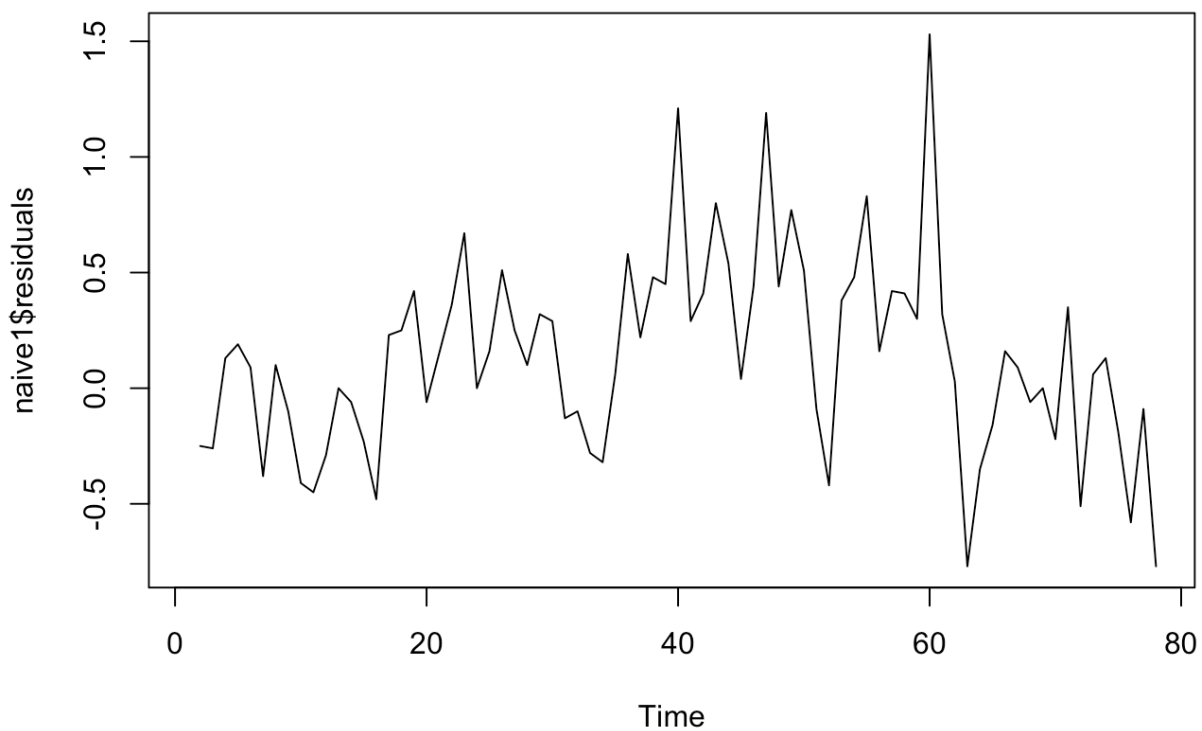
```
#2d)  
plot(rwf1$residuals)
```



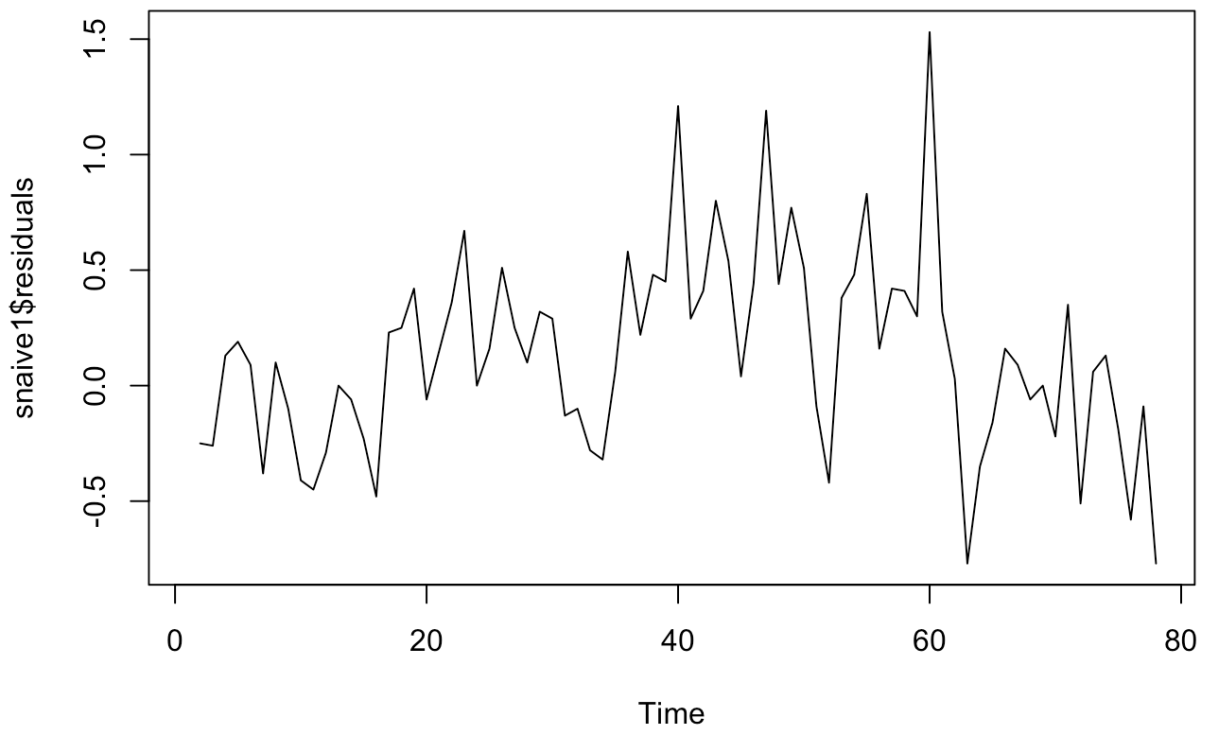
```
naivel <- naive(dowjones)
naivel
```

```
##      Point Forecast      Lo 80      Hi 80      Lo 95      Hi 95
## 79          121.23 120.6601 121.7999 120.3584 122.1016
## 80          121.23 120.4240 122.0360 119.9973 122.4627
## 81          121.23 120.2428 122.2172 119.7203 122.7397
## 82          121.23 120.0901 122.3699 119.4867 122.9733
## 83          121.23 119.9556 122.5044 119.2810 123.1790
## 84          121.23 119.8340 122.6260 119.0949 123.3651
## 85          121.23 119.7221 122.7379 118.9239 123.5361
## 86          121.23 119.6180 122.8420 118.7646 123.6954
## 87          121.23 119.5202 122.9398 118.6151 123.8449
## 88          121.23 119.4277 123.0323 118.4736 123.9864
```

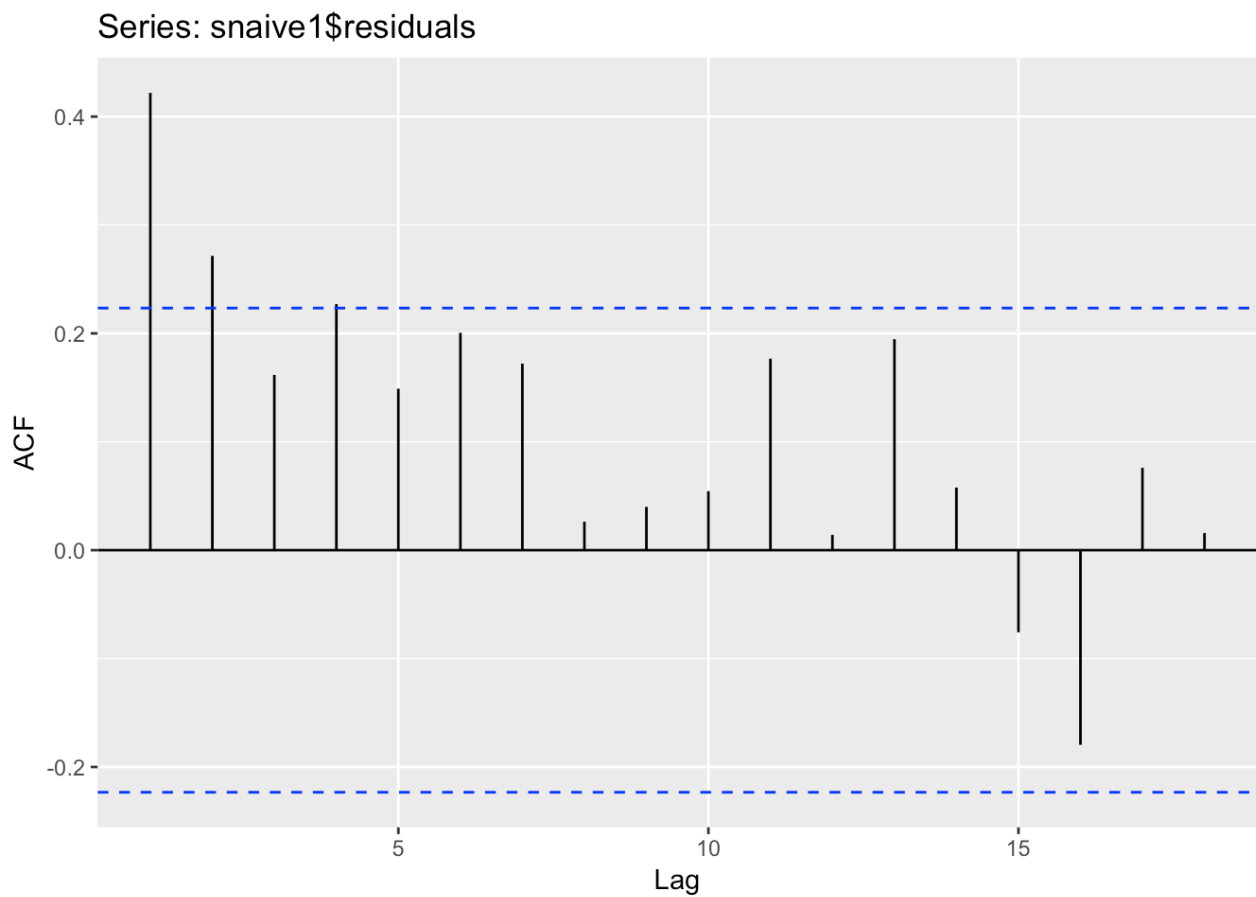
```
plot(naivel$residuals)
```



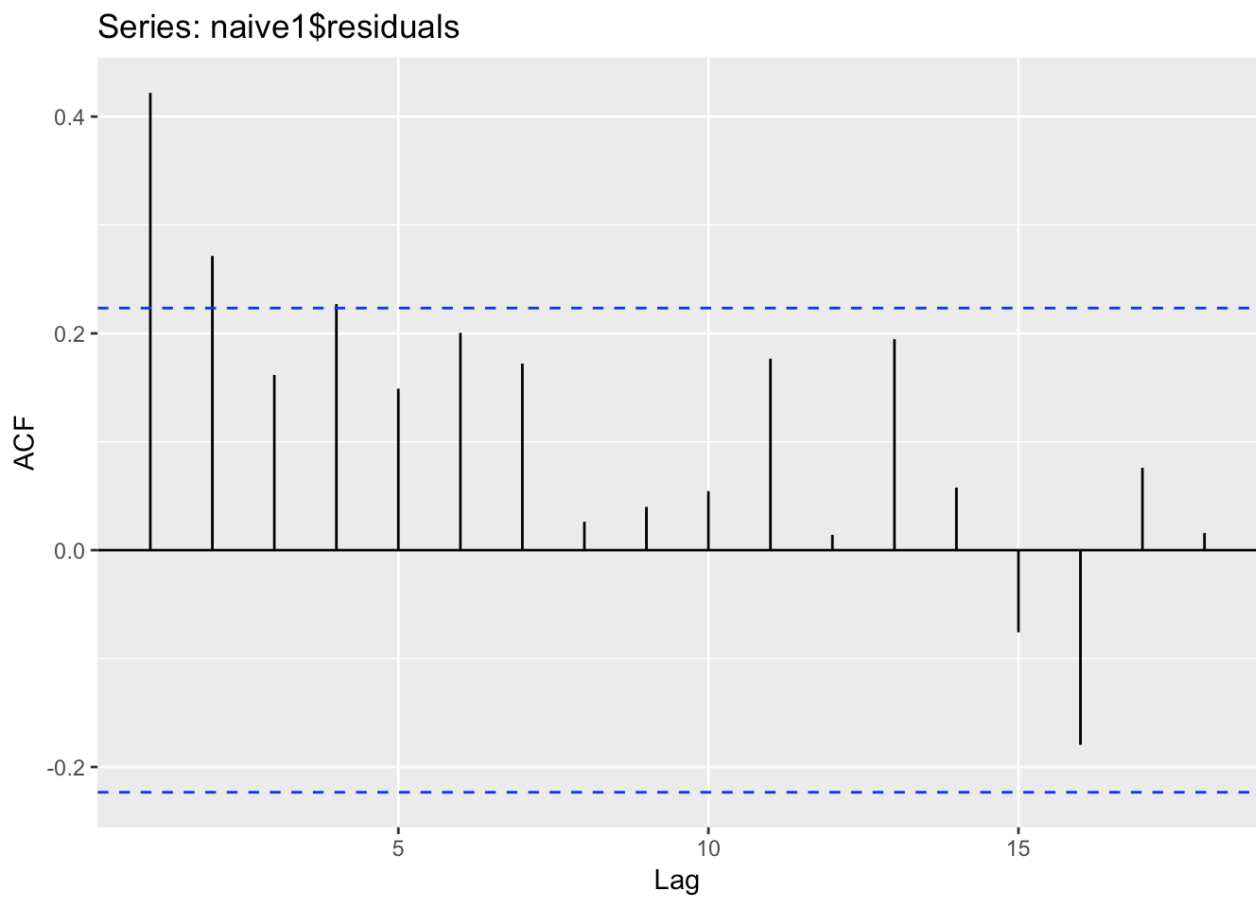
```
snaivel <- snaive(dowjones)
plot(snaivel$residuals)
```

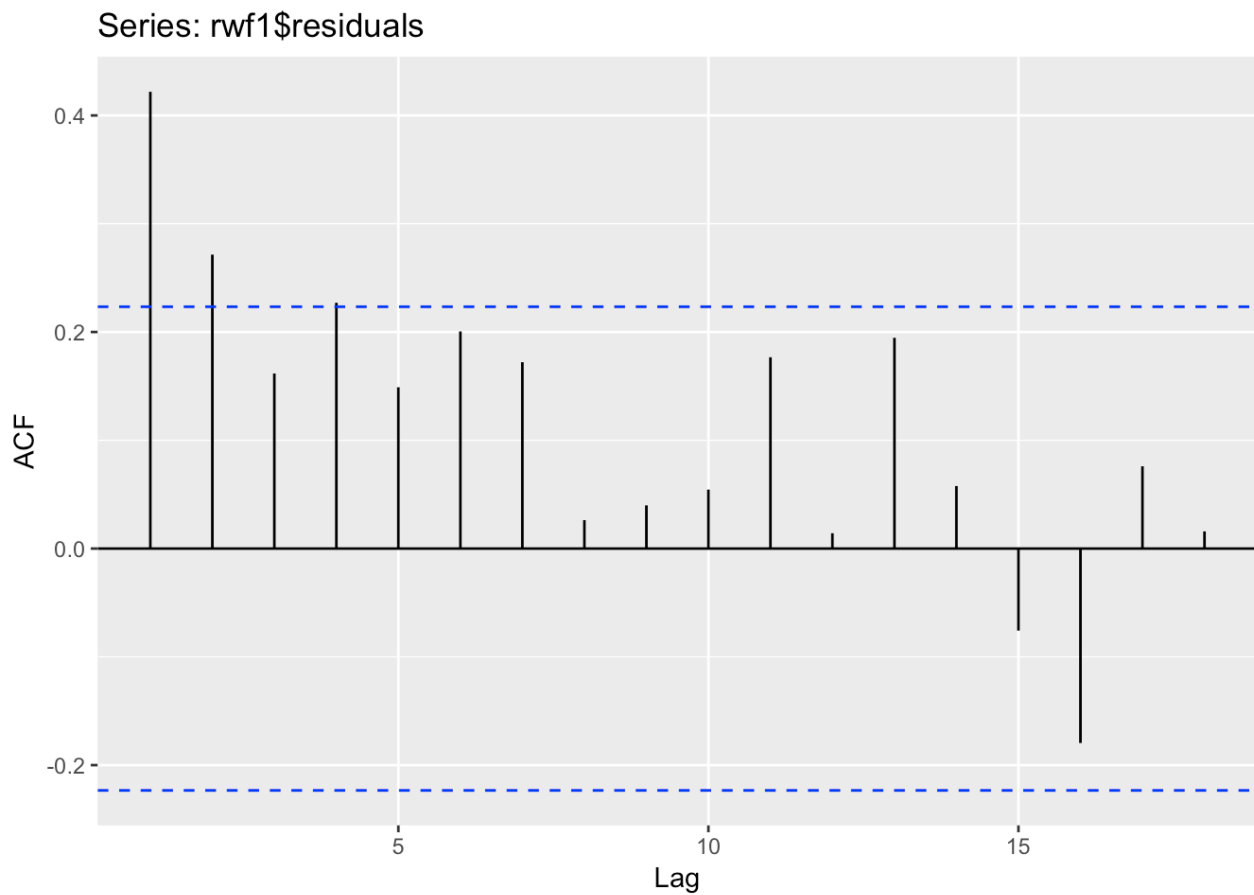
```
ggAcf(snaive1$residuals)
```



```
ggAcf(naive1$residuals)
```



```
ggAcf(rwfl$residuals)
```



```
sum(snaive1$residuals[2:length(snaive1$residuals)])
```

```
## [1] 10.29
```

```
sum(naive1$residuals[2:length(naive1$residuals)])
```

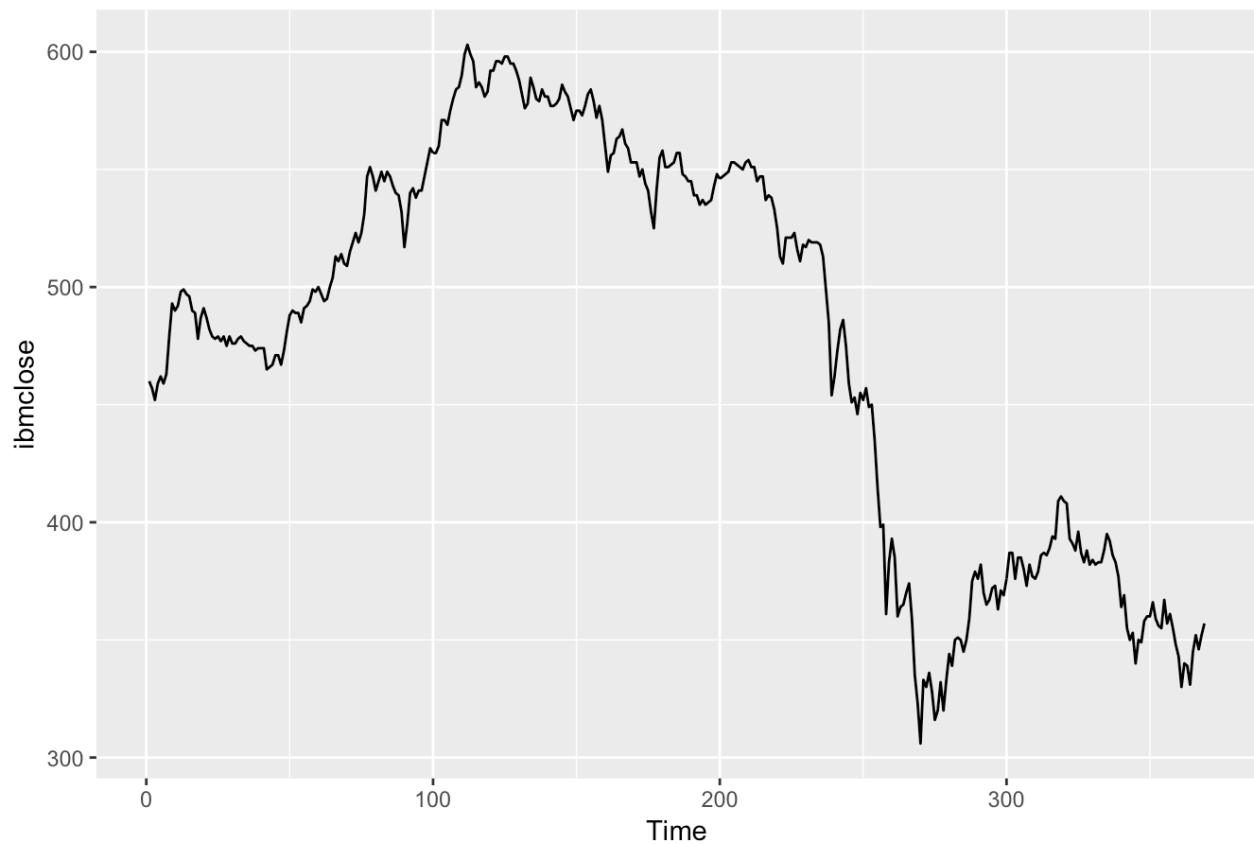
```
## [1] 10.29
```

```
sum(rwf1$residuals[2:length(rwf1$residuals)])
```

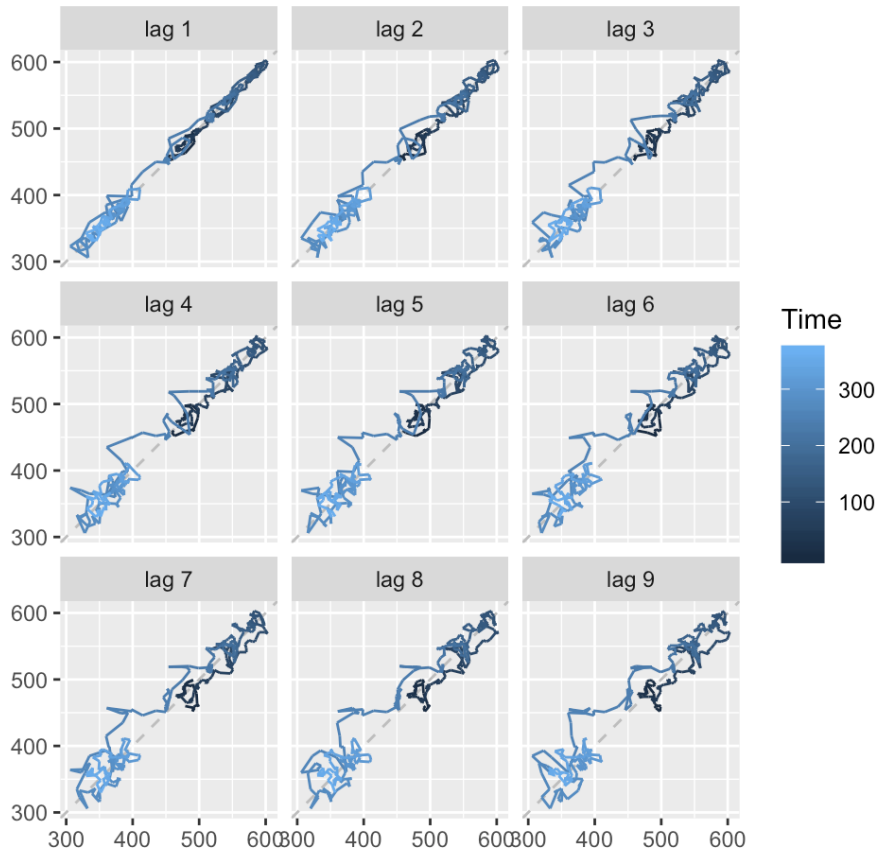
```
## [1] -4.831691e-13
```

```
#drift performs the best among all forecasting methods as we are getting least error.
```

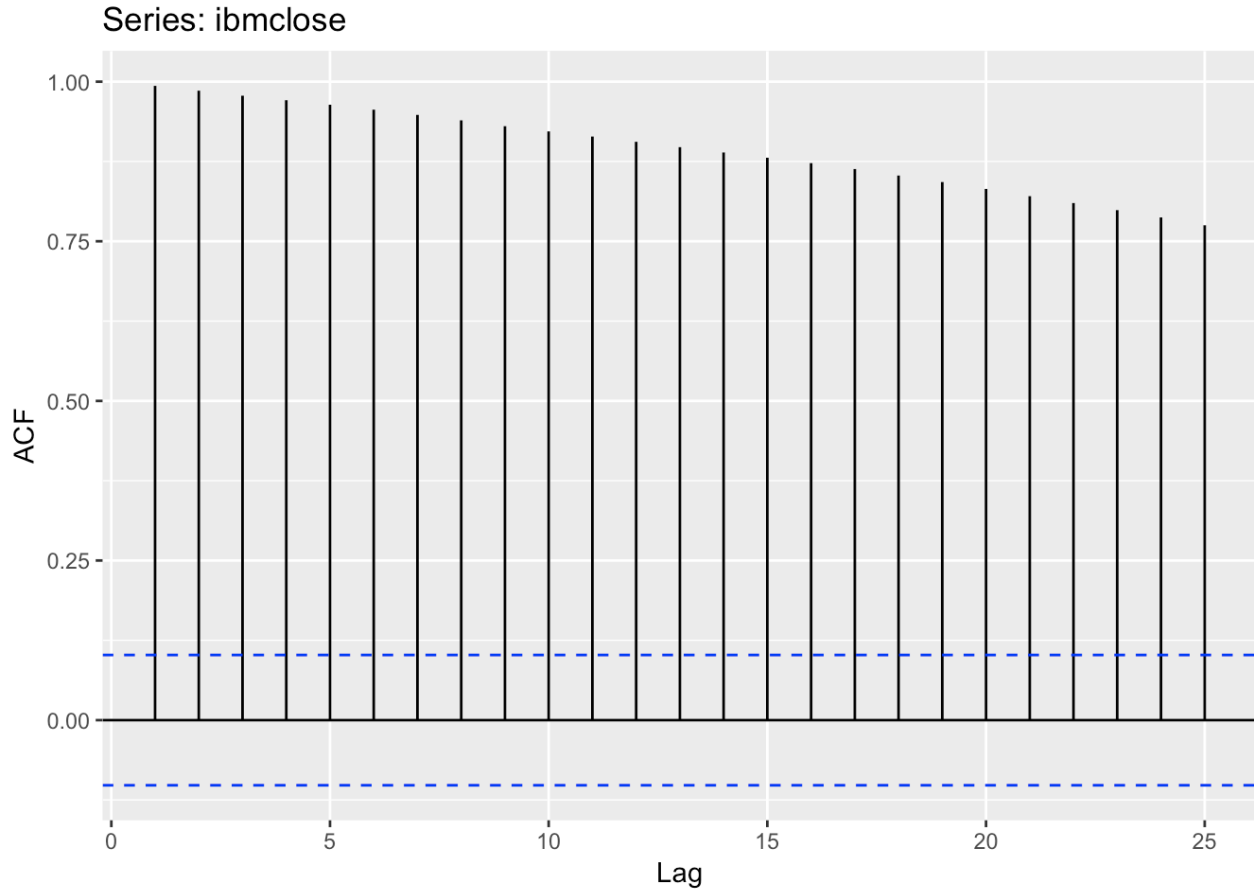
```
#3a)
#a)
autoplot(ibmclose)
```



```
#ggseasonplot(ibmclose)
#data is not seasonal
#ggsubseriesplot(ibmclose)
gglagplot(ibmclose)
```



```
ggAcf( ibmclose )
```



```
#data looks and good and there is no white noise in the data
```

```
#3b)  
length(ibmclose)
```

```
## [1] 369
```

```
train <- ibmclose[1:300]  
test <- ibmclose[301:369]
```

```
#3c)  
  
# seasonal naive  
snaive2 <- snaive(train, h = 69)  
accuracy(test,snaive2$mean)
```

```
##                ME      RMSE      MAE      MPE      MAPE      ACF1 Theil's U  
## Test set  3.724638 20.2481 17.02899 0.9905951 4.528986 0.9314689      Inf
```

```
# naive method  
naive2 <- naive(train, h = 69)  
accuracy(test,naive2$mean)
```

```
##                ME      RMSE      MAE      MPE      MAPE      ACF1 Theil's U  
## Test set  3.724638 20.2481 17.02899 0.9905951 4.528986 0.9314689      Inf
```

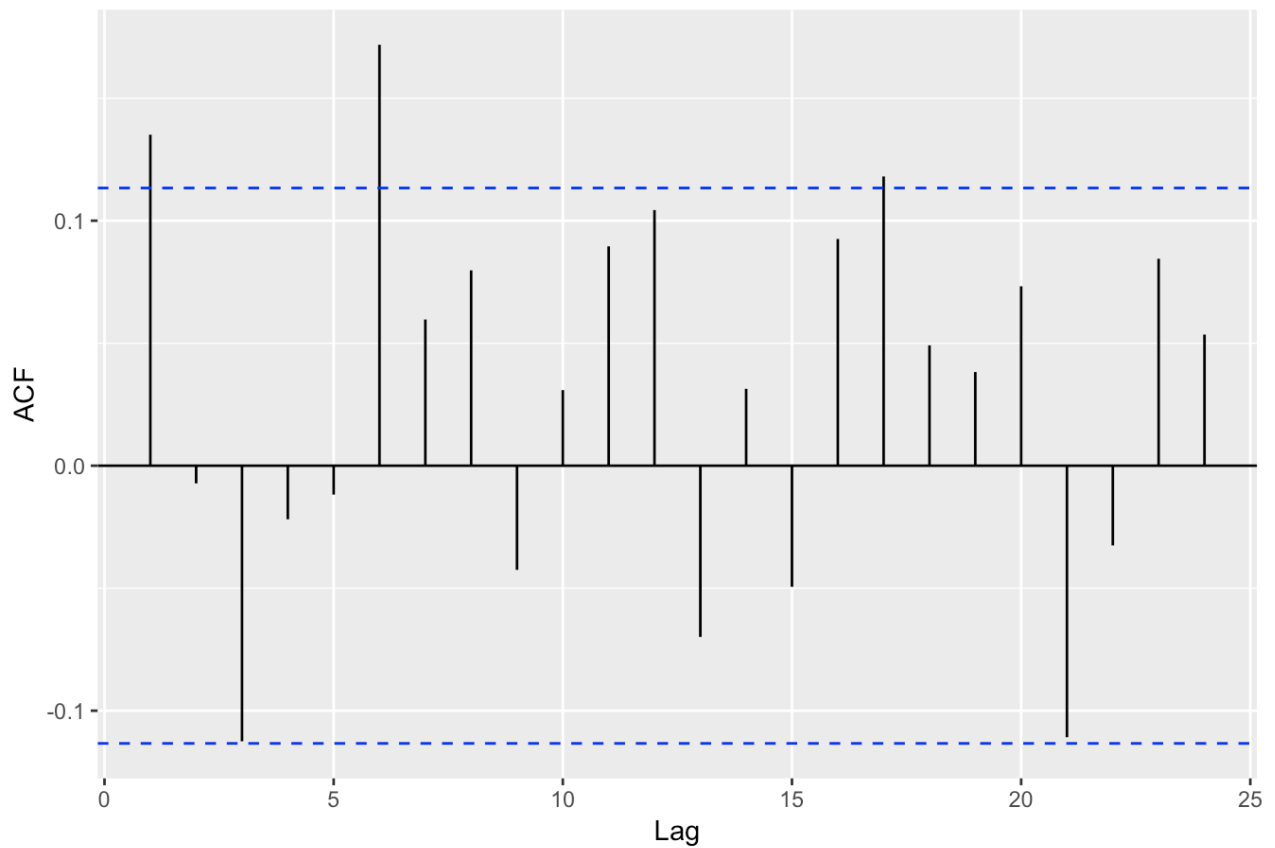
```
# drift method  
rwf2 <- rwf(train, h = 69, drift = TRUE)  
accuracy(test,rwf2$mean)
```

```
##                ME      RMSE      MAE      MPE      MAPE      ACF1 Theil's U  
## Test set -6.108138 17.06696 13.97475 -1.626844 3.81021 0.9045875 60.7862
```

```
# drift method because of least RMSE error
```

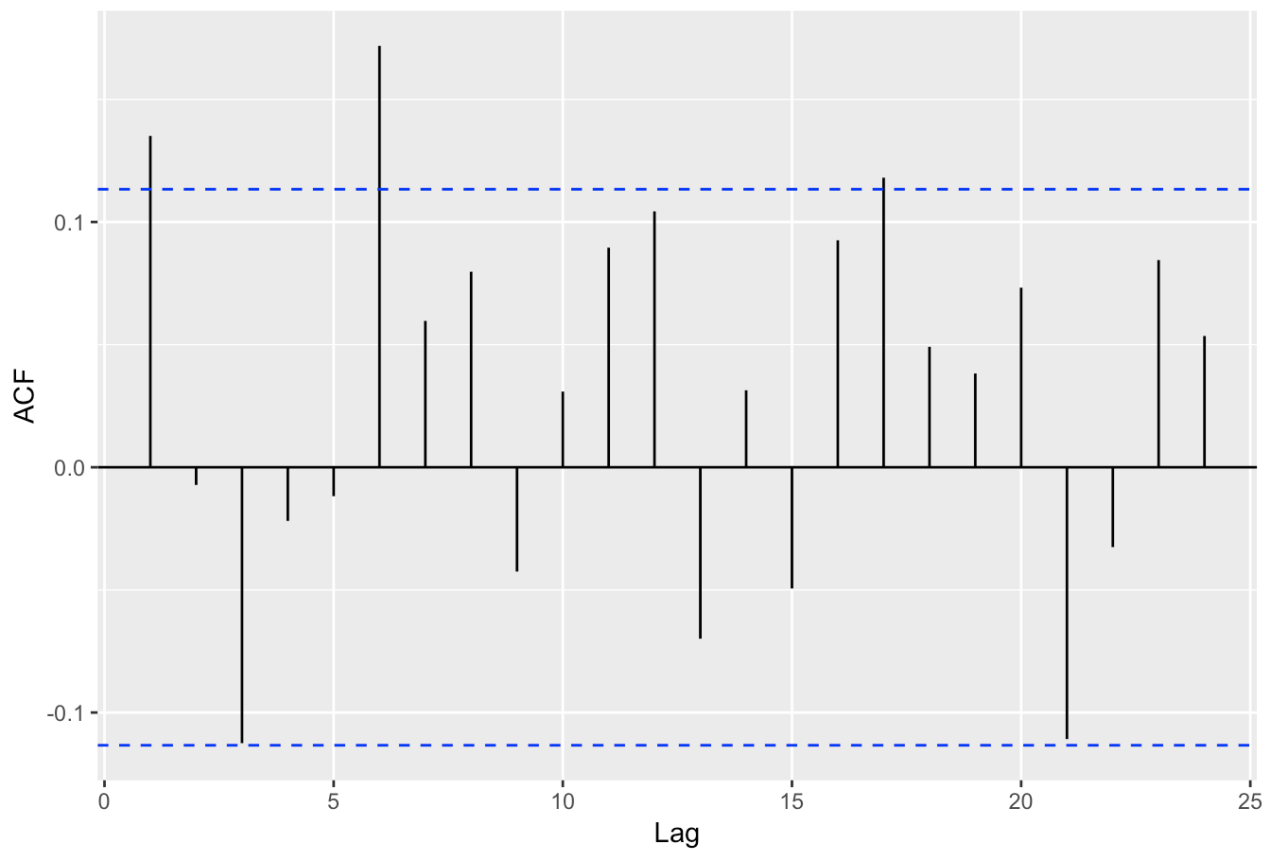
```
#3d)  
ggAcf(snaive2$residuals)
```

Series: snave2\$residuals

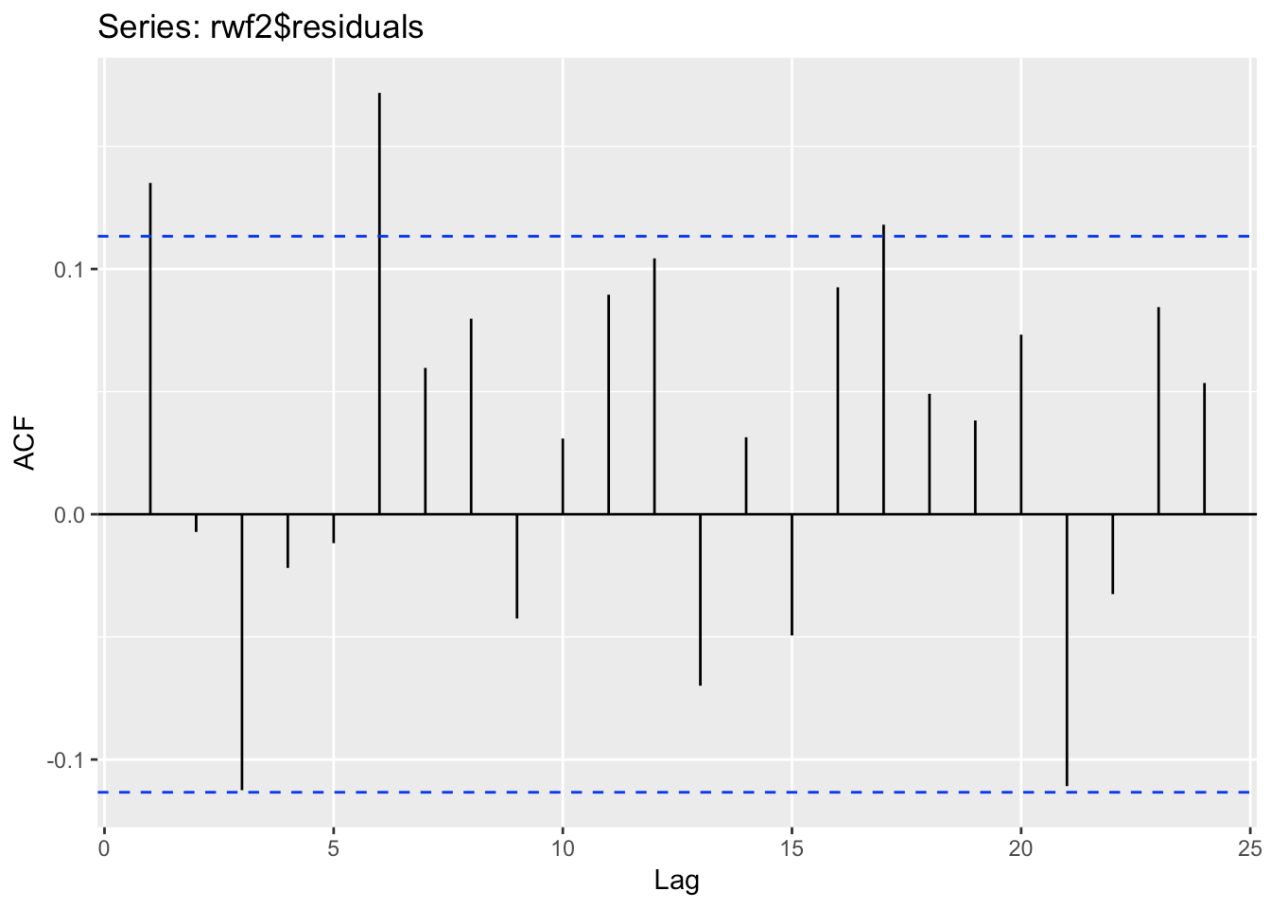


```
ggAcf(naive2$residuals)
```

Series: naive2\$residuals

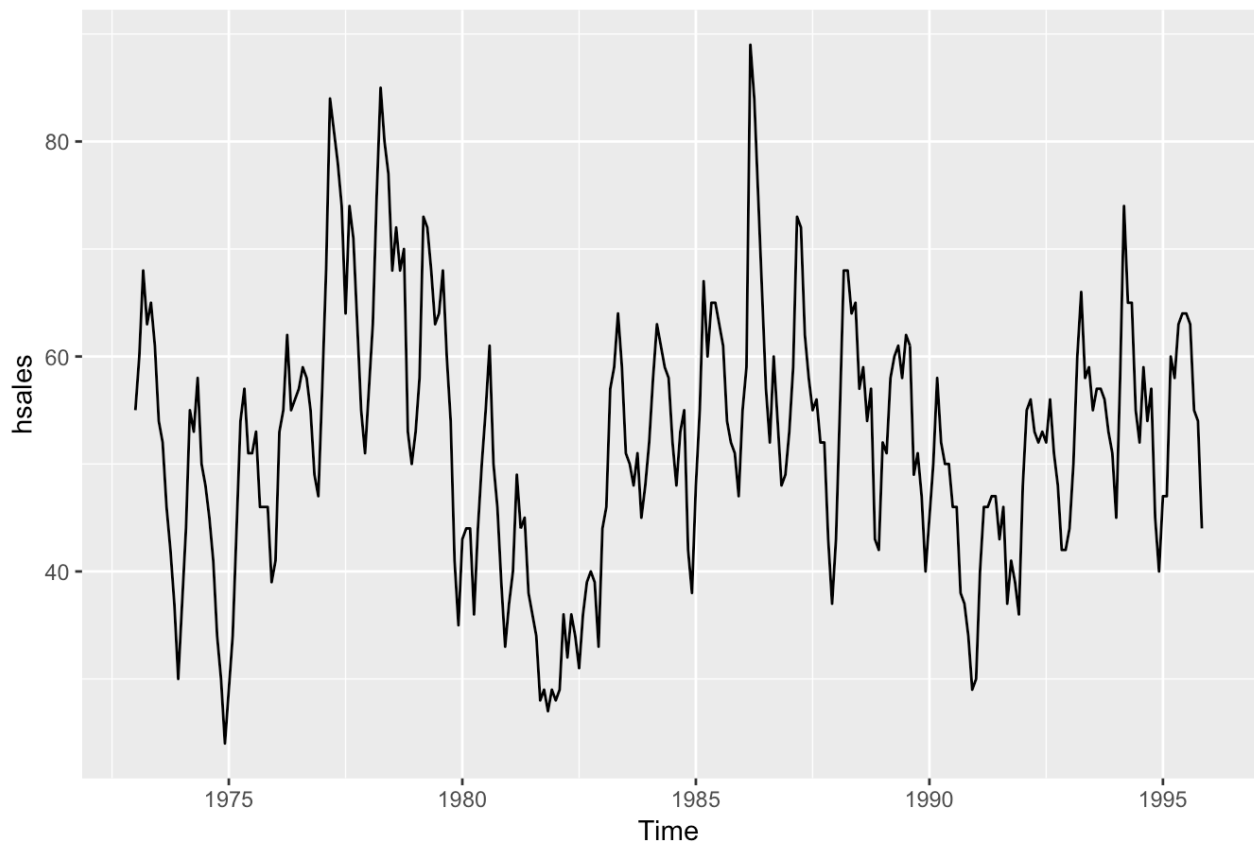


```
ggAcf(rwf2$residuals)
```



```
# All did perform equally
```

```
autoplot(hsales)
```

```
#b)
hsal <- ts(hsales, start = 1973, frequency=12)
hsal
```

```
##      Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
## 1973  55  60  68  63  65  61  54  52  46  42  37  30
## 1974  37  44  55  53  58  50  48  45  41  34  30  24
## 1975  29  34  44  54  57  51  51  53  46  46  46  39
## 1976  41  53  55  62  55  56  57  59  58  55  49  47
## 1977  57  68  84  81  78  74  64  74  71  63  55  51
## 1978  57  63  75  85  80  77  68  72  68  70  53  50
## 1979  53  58  73  72  68  63  64  68  60  54  41  35
## 1980  43  44  44  36  44  50  55  61  50  46  39  33
## 1981  37  40  49  44  45  38  36  34  28  29  27  29
## 1982  28  29  36  32  36  34  31  36  39  40  39  33
## 1983  44  46  57  59  64  59  51  50  48  51  45  48
## 1984  52  58  63  61  59  58  52  48  53  55  42  38
## 1985  48  55  67  60  65  65  63  61  54  52  51  47
## 1986  55  59  89  84  75  66  57  52  60  54  48  49
## 1987  53  59  73  72  62  58  55  56  52  52  43  37
## 1988  43  55  68  68  64  65  57  59  54  57  43  42
## 1989  52  51  58  60  61  58  62  61  49  51  47  40
## 1990  45  50  58  52  50  50  46  46  38  37  34  29
## 1991  30  40  46  46  47  47  43  46  37  41  39  36
## 1992  48  55  56  53  52  53  52  56  51  48  42  42
## 1993  44  50  60  66  58  59  55  57  57  56  53  51
## 1994  45  58  74  65  65  55  52  59  54  57  45  40
## 1995  47  47  60  58  63  64  64  63  55  54  44
```

```
train <- subset(hsales, end = length(hsales)-24 )
test <- subset(hsales, start = length(hsales)-23)
```

```
#c)
# seasonal naive
snaive3 <- snaive(train, h = 23)
accuracy(test,snaive3$mean)
```

```
##              ME      RMSE      MAE      MPE      MAPE      ACF1
## Test set -1.478261 5.733199 4.608696 -2.918753 8.490072 0.1472239
##              Theil's U
## Test set  1.011567
```

```
# naive method
naive3 <- naive(train, h = 23)
accuracy(test,naive3$mean)
```

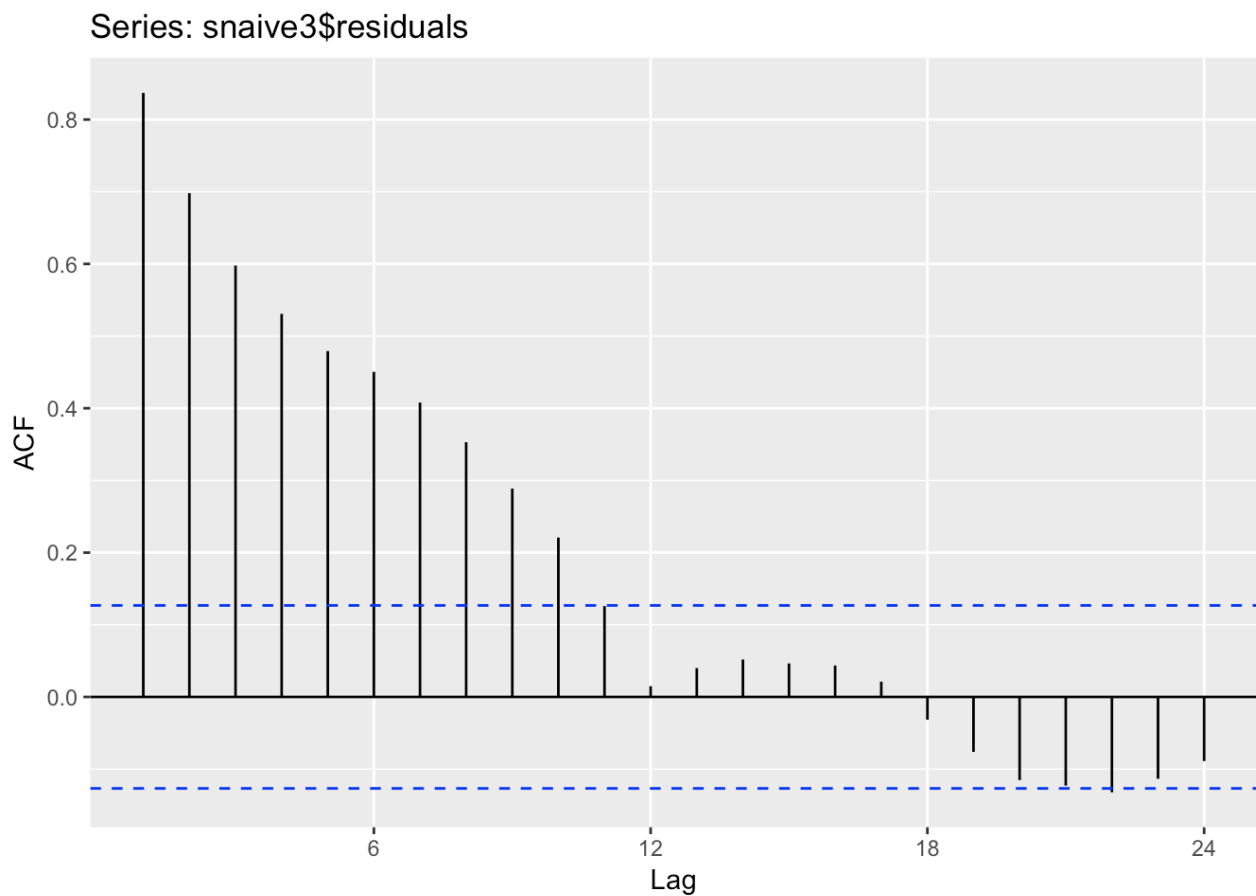
```
##              ME      RMSE      MAE      MPE      MAPE      ACF1
## Test set -3.304348 8.612428 7.130435 -6.234619 13.45365 0.5702549
##              Theil's U
## Test set      Inf
```

```
# drift method
rwf3 <- rwf(train, h = 23, drift = TRUE)
accuracy(test, rwf3$mean)
```

```
##
## Test set -3.400348 8.65225 7.181217 -6.428236 13.57333 0.570349 1104.257
```

```
# seasonal naive method because of least RMSE error
```

```
#d)
ggAcf(snaive3$residuals)
```



```
# Seasonal naive doesnt depict the white noise
```