hw7_shuangyu_zhao

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```
library(ISLR2)
library(sqldf)
```

```
## Loading required package: gsubfn
```

```
## Loading required package: proto
```

```
## Loading required package: RSQLite
```

```
library(forecast)
```

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

```
library(TSA)
```

```
## Registered S3 methods overwritten by 'TSA':
##   method       from
##   fitted.Arima forecast
##   plot.Arima   forecast
```

```
##
## Attaching package: 'TSA'
```

```
## The following objects are masked from 'package:stats':
##
##     acf, arima
```

```
## The following object is masked from 'package:utils':
##
##     tar
```

1.

a. assume 52 weeks per year.

```
today_ts <- ts(data = Weekly$Today, frequency = 52)
```

b.

```
arima_model <- auto.arima(today_ts)
arima_model
```

```
## Series: today_ts
## ARIMA(3,0,0) with non-zero mean
##
## Coefficients:
##           ar1     ar2      ar3    mean
##       -0.0674  0.0498  -0.0637  0.1498
## s.e.   0.0302  0.0303   0.0302  0.0656
##
## sigma^2 = 5.5:  log likelihood = -2471.5
## AIC=4953.01   AICc=4953.06   BIC=4977.97
```

c.

```
mean(abs(na.omit(arima_model$residuals)/today_ts))
```

```
## [1] 1.313987
```

d.

```
mean_val <- mean(Weekly$Today)
diff_Val <- Weekly$Today - mean_val
length(diff_Val)
```

```
## [1] 1089
```

```
lag1_diff <- diff_Val[3:1088]
lag2_diff <- diff_Val[2:1087]
lag3_diff <- diff_Val[1:1086]
target <-Weekly$Today[4:1089]
predict <- arima_model$coef[1]*lag1_diff + arima_model$coef[2]*lag2_diff + + arima_model$coef[3]*lag3_di
mean(abs(predict - target/target))
```

```
## [1] 0.8542771
```

e.

```
lag2_diff <- diff_Val[3:1088]
lag3_diff <- diff_Val[2:1087]
lag4_diff <- diff_Val[1:1086]
target_e <-Weekly$Today[5:1089]
predict <- arima_model$coef[1]*( arima_model$coef[1]*lag2_diff + arima_model$coef[2]*lag3_diff + + arima
mean(abs(predict - target_e/target_e))
```

```
## Warning in predict - target_e/target_e: longer object length is not a multiple
## of shorter object length
```

```
## [1] 0.8632318
```

2.

a.

```
oil_gas <- read.csv("/Users/apple/Desktop/STT811_appl_stat_model/data/oil-gas.csv")
dim(oil_gas)
```

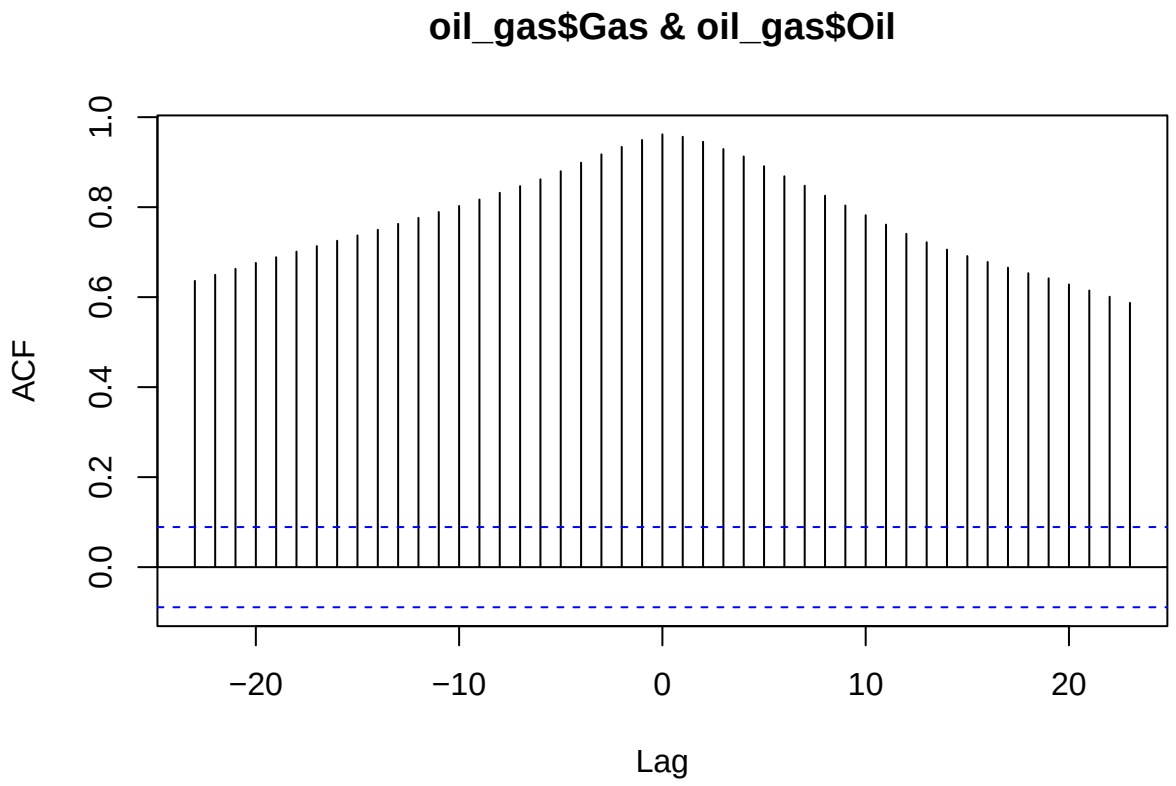
```
## [1] 484   3
```

```
gas_ts <- ts(data = oil_gas$Gas, frequency = 52)
arima_model_gas <- auto.arima(gas_ts)
arima_model_gas
```

```
## Series: gas_ts
## ARIMA(1,1,0)(1,0,0)[52]
##
## Coefficients:
##          ar1     sar1
##       0.5238  -0.0100
## s.e.  0.0391   0.0559
##
## sigma^2 = 0.002118:  log likelihood = 802.43
## AIC=-1598.85   AICc=-1598.8   BIC=-1586.31
```

b.

```
ccf(oil_gas$Gas, oil_gas$Oil)
```



best result is lag1

c.

```
arimax <- arimax(oil_gas$Gas, order = c(1,1,0), xreg = lag(oil_gas$Oil,1))
```

```
mean(abs(na.omit(arimax$residuals)/oil_gas$Gas))
```

```
## [1] 0.01102007
```