# Assignment 9

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## Question 1

Working with the inflation data, to do the follows:

- Create a time series of three-month inflation rate

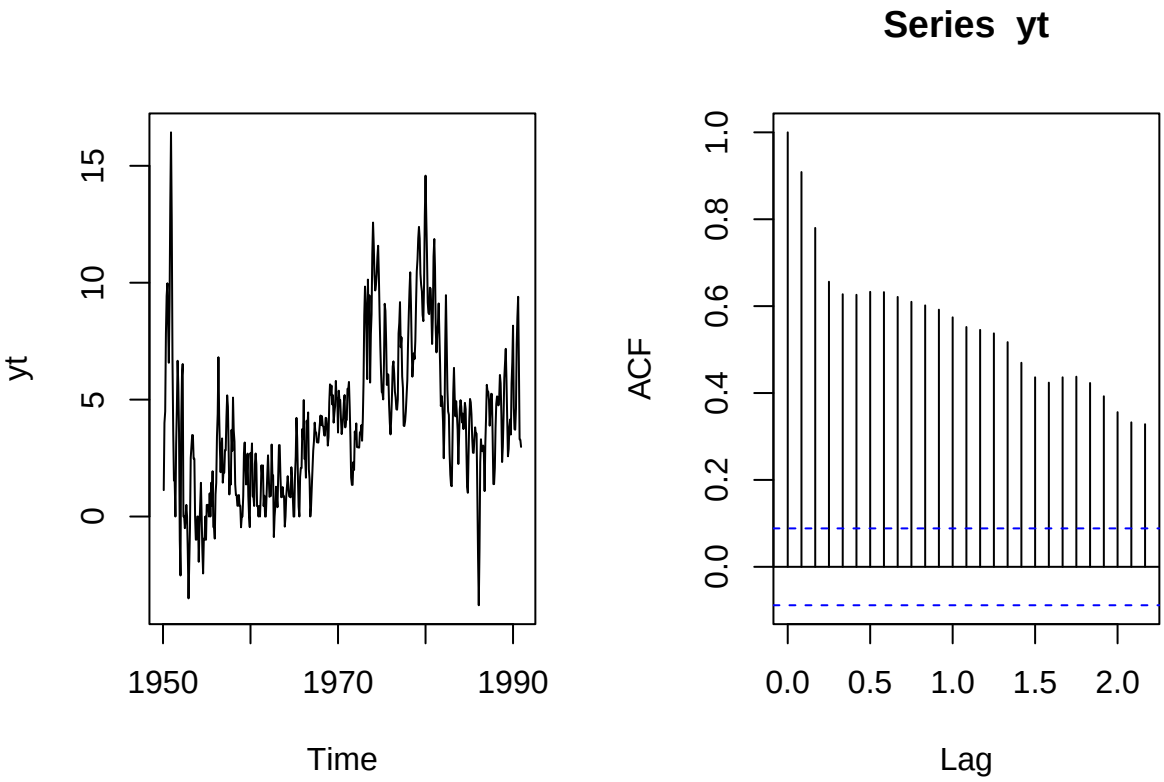
```
library(forecast)
```

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

```
# import the data
df = read.csv("https://bryantstats.github.io/math475/assignments/inflation.csv")

# define the series
yt = ts(df$pai3, frequency = 12, start = c(1950, 2))
```

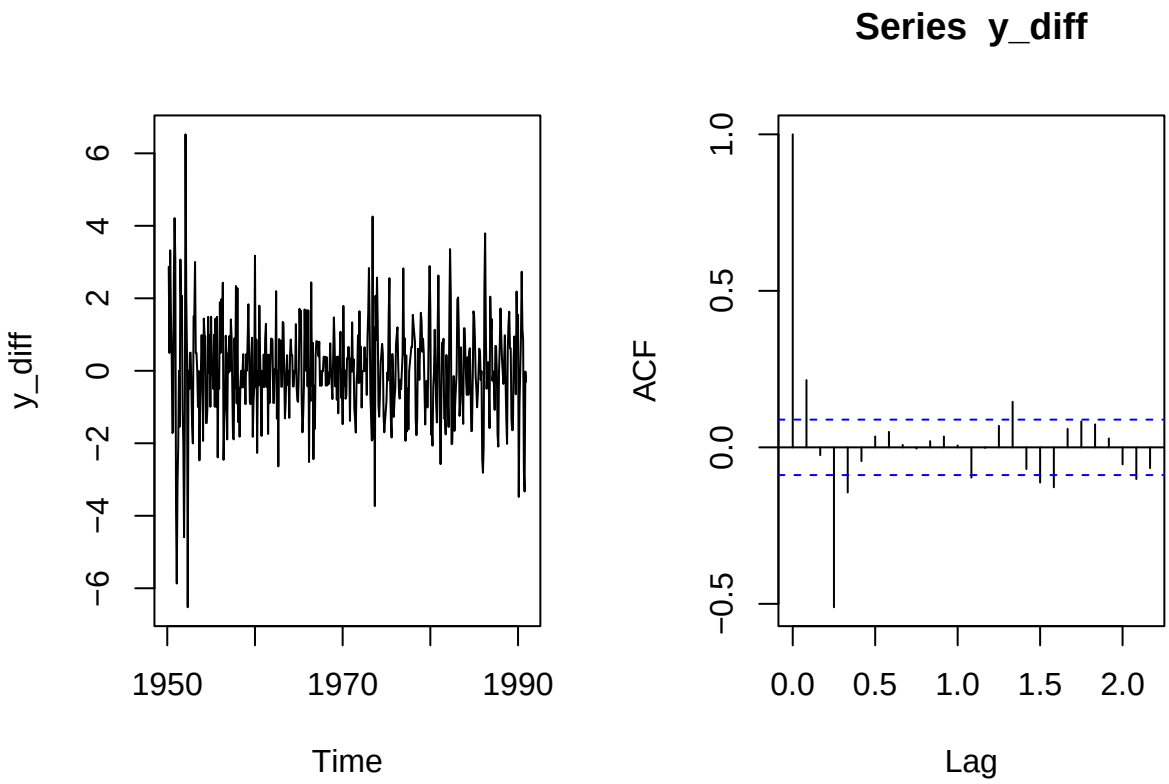
- Plot the series and the ACF to check if the series is stationary

```
# check for stationary
par(mfrow = c(1, 2))
plot(yt)
acf(yt)
```



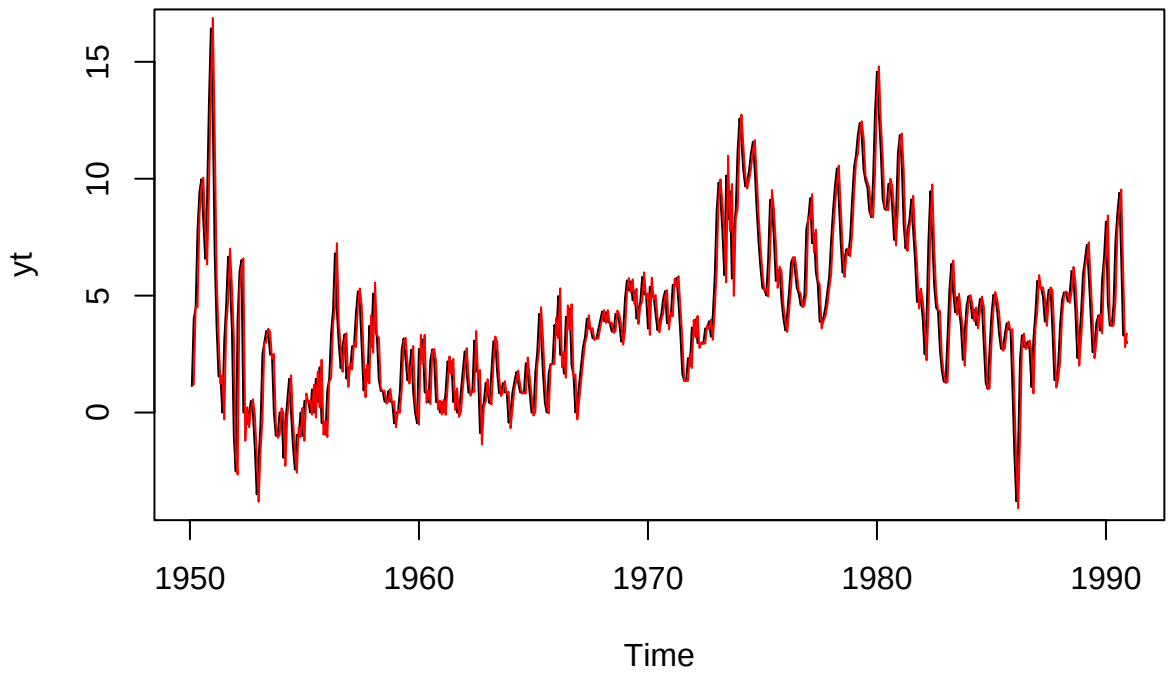

- Create the differenced series and check for stationary

```
# create the differenced series for stationary
y_diff = diff(yt)

# check for stationary
par(mfrow = c(1, 2))
plot(y_diff)
acf(y_diff)
```




- Fit the MA(1) model to the series and plot the fitted series

```
# fit the MA(1) model to the differenced series
y_ma = arima(y_diff, order = c(0,0,1))

# plot the fitted series
plot(yt)
lines(yt-y_ma$residuals, col = "red")
```



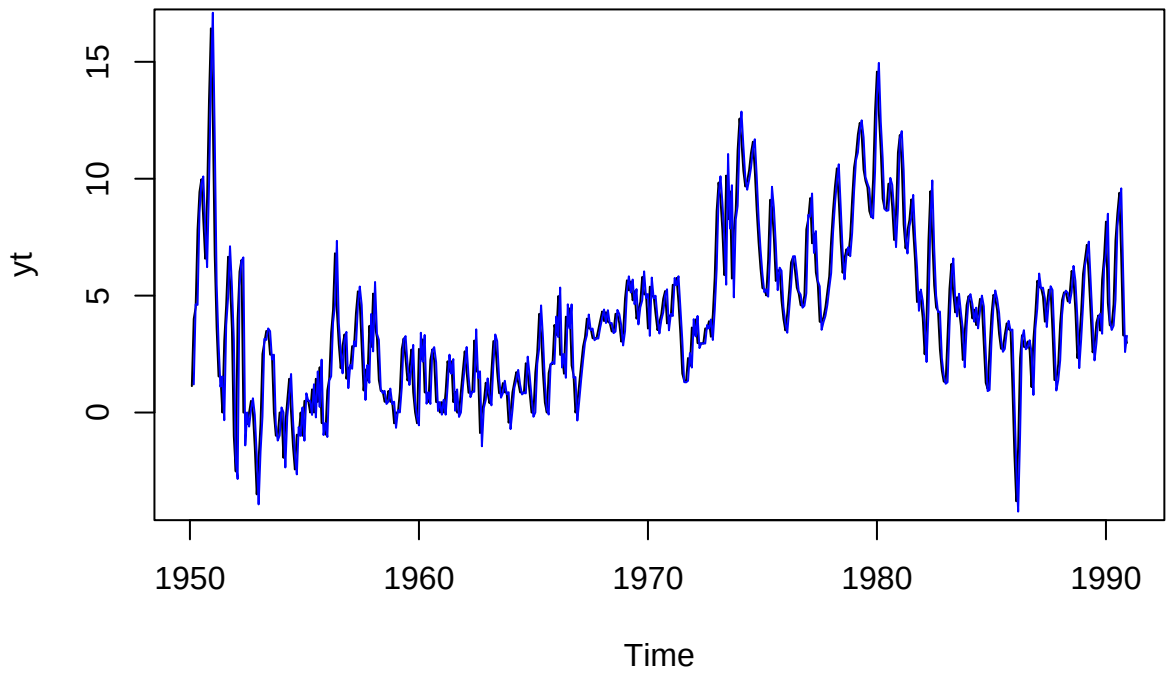

- Make prediction on the next value of three-month inflation rate

```
# make predictions
d_n = forecast(y_ma, h = 1)
y_next = d_n$mean + yt[length(yt)]
y_next = as.numeric(y_next)
y_next
```

```
## [1] 2.909541
```

- Fit the AR(1) model to the series and plot the fitted series

```
y_ar = arima(y_diff, order = c(1,0,0))

plot(yt)
lines(yt-y_ar$residuals, col = "blue")
```




- Make prediction on the next value of three-month inflation rate

```
# make predictions
d_n = forecast(y_ar, h = 1)
y_next = d_n$mean + yt[length(yt)]
y_next = as.numeric(y_next)
y_next
```

```
## [1] 2.916789
```

## Question 2

Consider the Consumption data. This is a quarterly data on consumption and expenditure in Canada. The series started from Quarter 1 in 1947.

The time series containing :

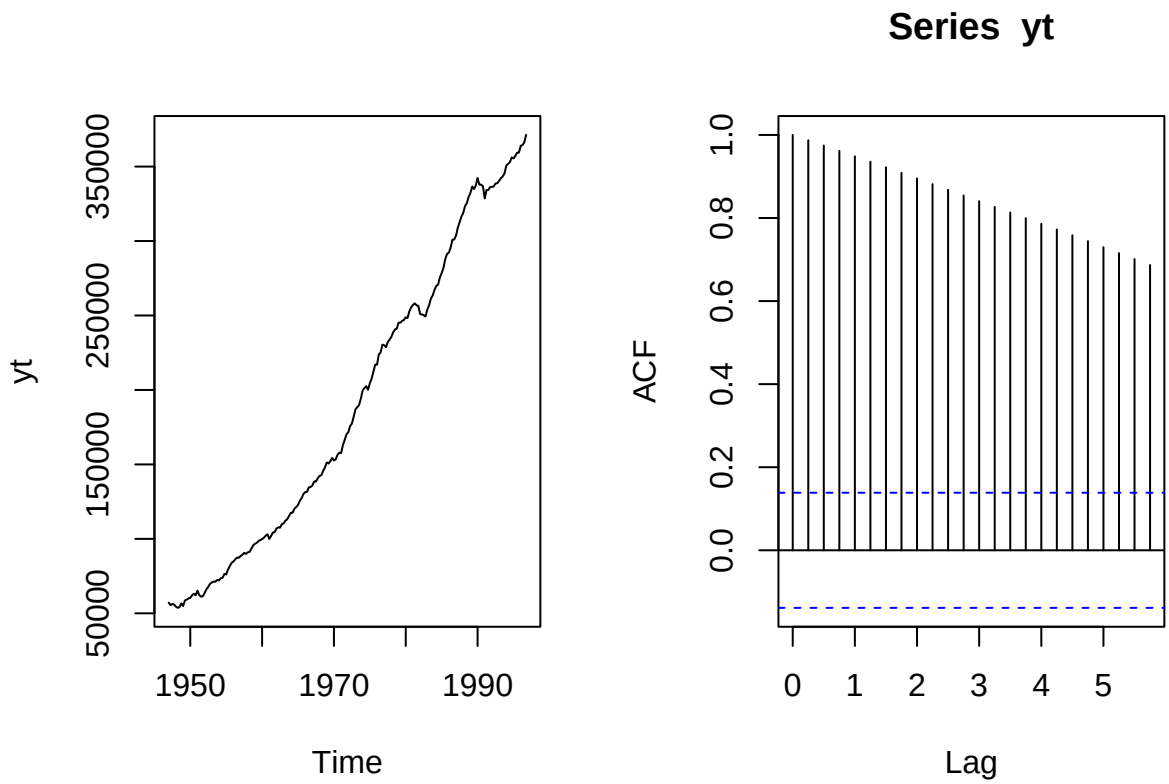
- yd: personal disposable income, 1986 dollars
- ce: personal consumption expenditure, 1986 dollars

Let Yt be the personal consumption expenditure series. Assume that the differenced series of Yt is stationary.

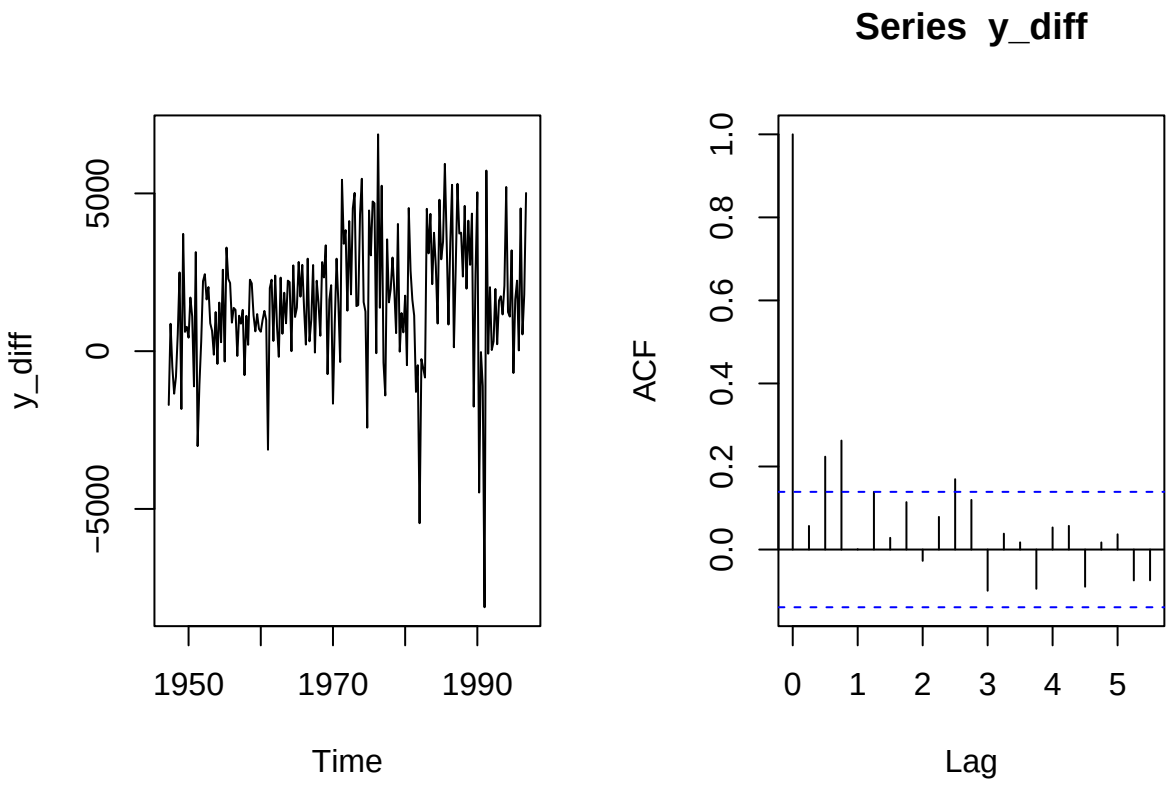
- Use the MA(1) model to fit the differenced series and make a prediction on the next value of Yt

- Plot the fitted Yt and the Yt on the same graph.

```
# import the data
df = read.csv("https://bryantstats.github.io/math475/assignments/consumption.csv")

# define the series
yt = ts(df$ce, frequency = 4, start = c(1947, 1))

# check for stationary
par(mfrow = c(1, 2))
plot(yt)
acf(yt)
```

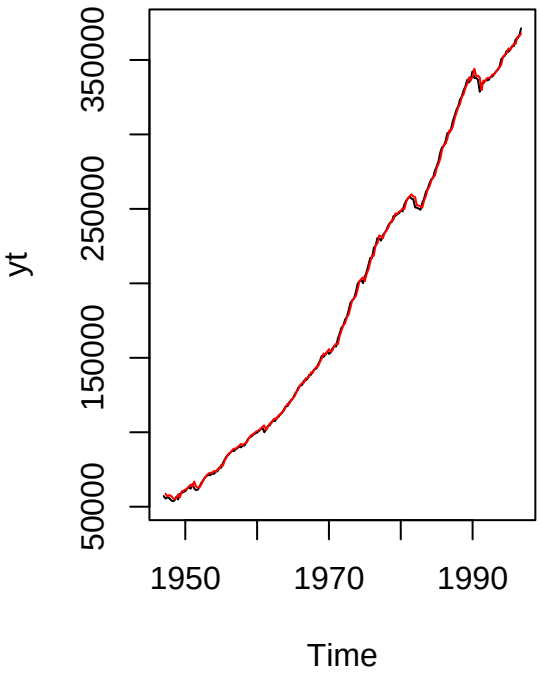



```
# create the differenced series for stationary
y_diff = diff(yt)

# check for stationary
par(mfrow = c(1, 2))
plot(y_diff)
acf(y_diff)
```




```
# fit the MA(1) model to the differenced series
y_ma = arima(y_diff, order = c(0,0,1))

# plot the fitted series
plot(yt)
lines(yt-y_ma$residuals, col = "red")

# make predictions
d_n = forecast(y_ma, h = 1)
y_next = d_n$mean + yt[length(yt)]
y_next = as.numeric(y_next)
y_next
```

```
## [1] 372954.2
```


yt
50000
150000
250000
350000
1950
1970
1990
Time