Task1 a)Discuss why the US unemployment rate, the US inflation rate, the federal funds rate and the growth rate of the S&P 500 could affect Bitcoin growth.

b)Generate a plot that shows Bitcoin's growth rate and the four potential drivers (at quarterly frequency) over the longest time period available.

```r
data <- read_csv("~/Desktop/CaseStudies/dataset_QD.csv")
data <- data_frame(data$BTC_gr,data$UNEMP,data$FEDF,data$INFR,data$SP500_gr)
colnames(data) <- c("BTC","UNEMP","FEDF","INFR","SP500")
data_ts <- ts(data,start=c(2010,3),frequency = 4)
ggplot(data, aes(x=index(data_ts))) +
  geom_line(aes(y = BTC/10), color = "darkred") +
  geom_line(aes(y = UNEMP), color="steelblue") +
  geom_line(aes(y = INFR), color="green")+
  geom_line(aes(y = FEDF), color="black") +
  geom_line(aes(y = SP500), color="purple")
```
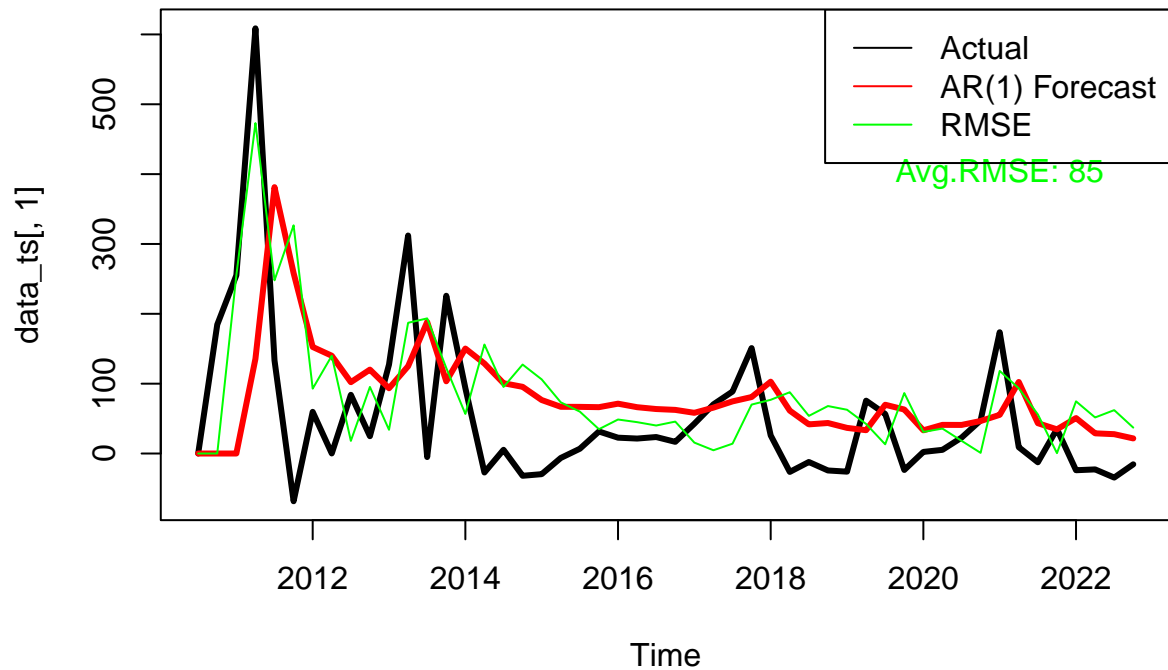


```r
#or
plot(data_ts)
```

1
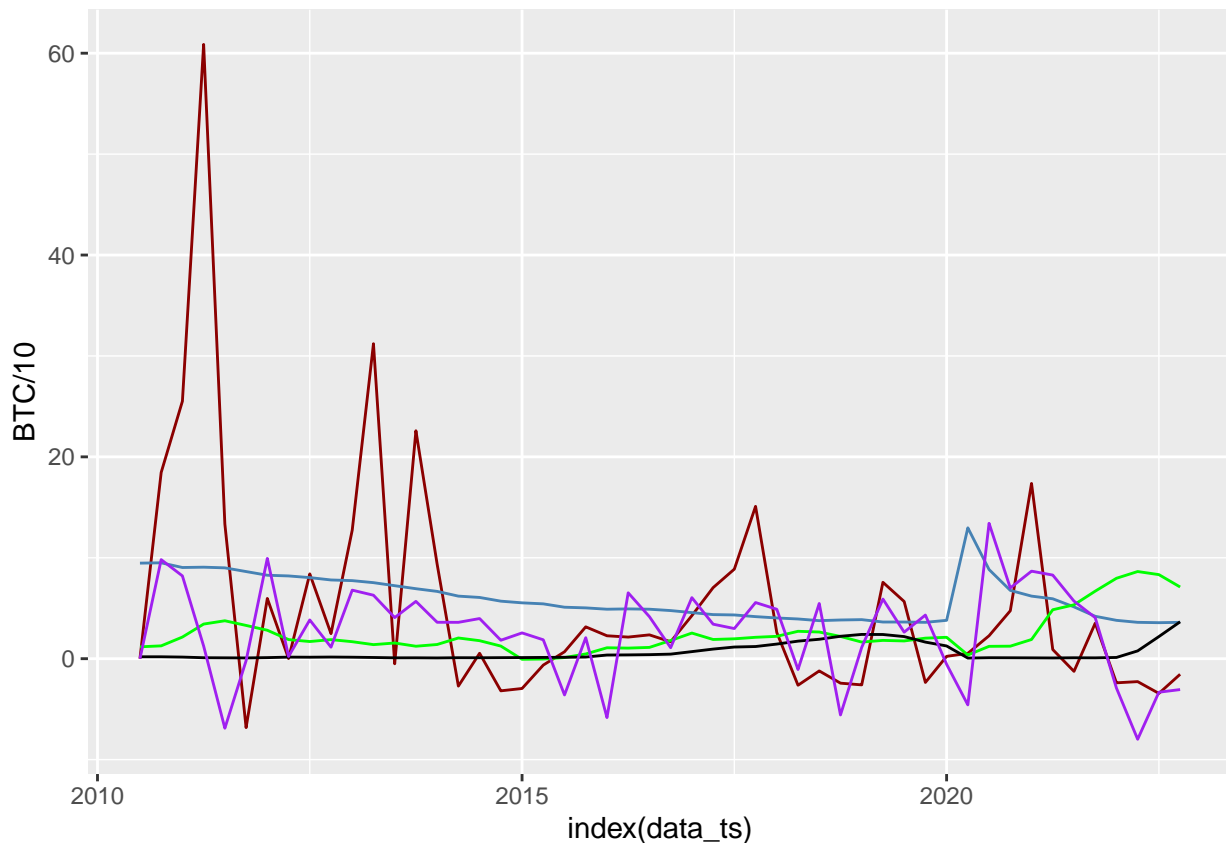
data_ts
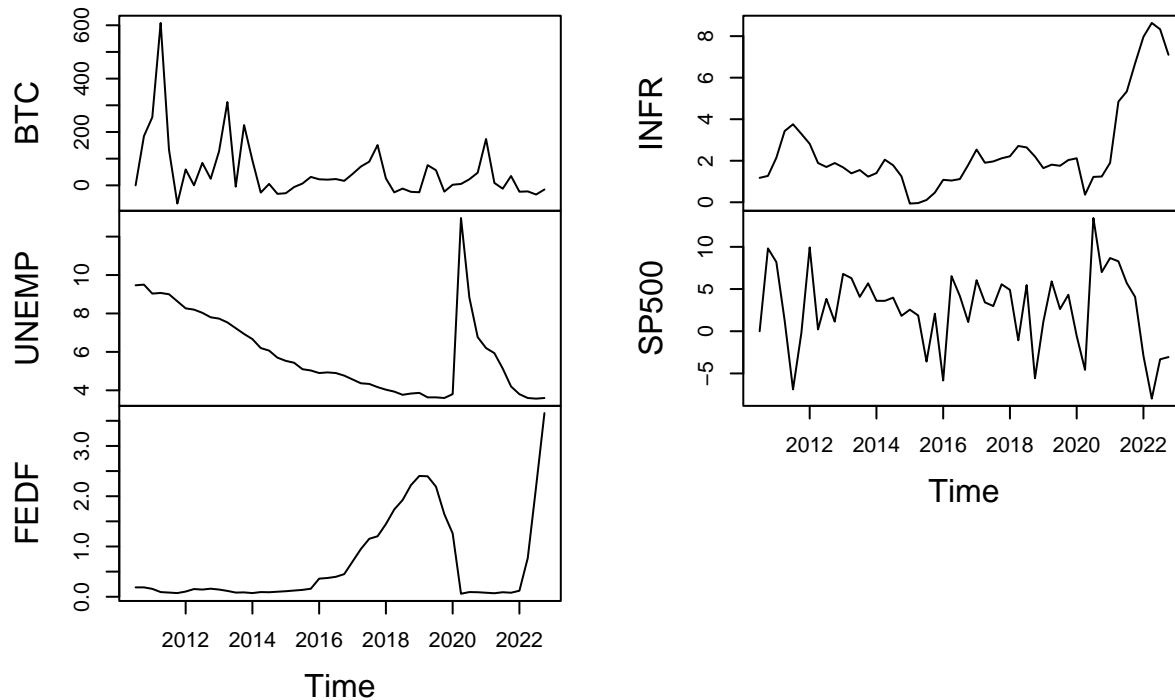
c)-Create one-quarter-ahead forecasts of Bitcoin growth for this time period using an autoregressive model of order one (i. e., an AR(1) model). Illustrate the forecasts together with the actual growth rates in one plot. Calculate the root mean squared forecasting error over the whole period.[2] Here and in the following you can set all required starting values equal to zero.

```r
ar1_fcast <- c(0,0)

rmse <- c(0,0)
for (i in 2:49) {
  ar1 <- arima(data_ts[,1][1:i], order = c(1,0,0))
  ar1_fcast[i+1] <- forecast(ar1, h = 1)$mean[1]
  rmse[i+1] <- sqrt(mean((ar1_fcast[i+1] - data_ts[,1][i+1])^2))
}
plot(data_ts[,1], main = "Bitcoin Growth Rates",lwd=3)
lines(ts(ar1_fcast,start=c(2010,3),frequency = 4), col = "red",lwd=3)
lines(ts(rmse,start=c(2010,3),frequency = 4), col = "green")
text(x = c(2021,2), y = 400, col="green",labels = paste0("Avg.RMSE: ", round(mean(rmse), 1)))
legend("topright", c("Actual", "AR(1) Forecast", "RMSE"), col=c("black", "red", "green"), lty=1)
```

Bitcoin Growth Rates

d) Create one-quarter-ahead forecasts of Bitcoin growth for the same period using a vector autoregressive model of order one (i. e., a VAR(1) model) containing the four additional variables. Illustrate the forecasts together with the actual growth rates and the forecasts based on the AR(1) model in one plot, potentially extending the plot in (c). Calculate the root mean squared forecasting error over the whole period.