ResearchWk4

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Read in Data

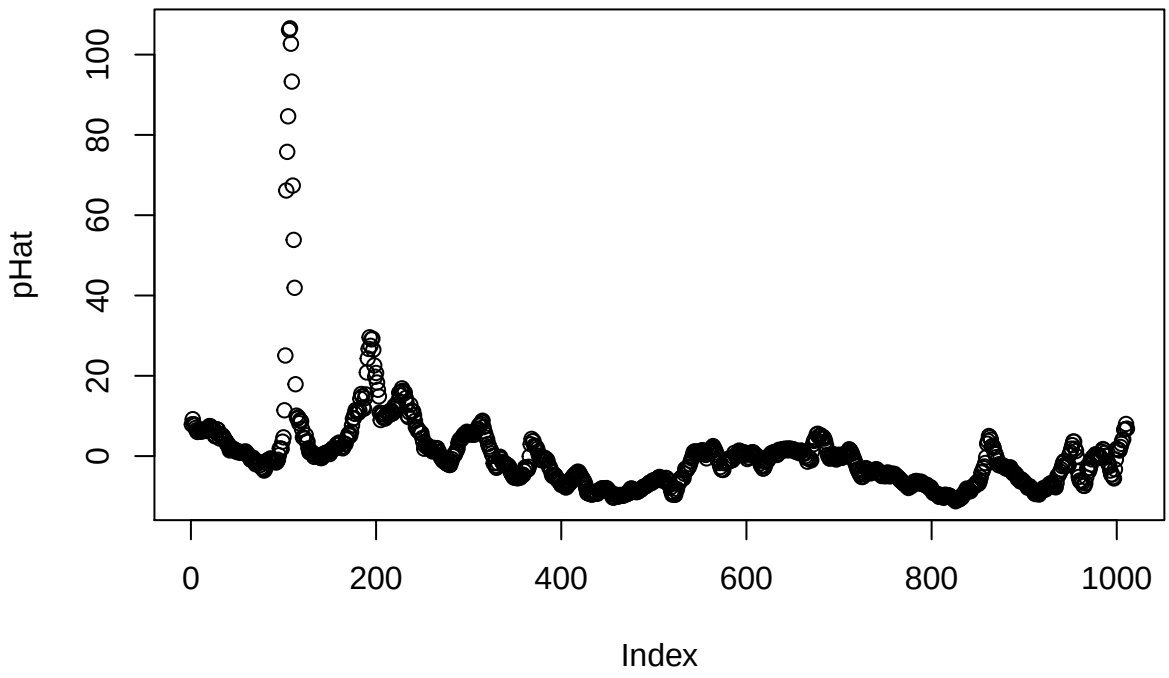
```
T_Bills_3_month_1934_2018 <- read_excel("C:/Users/caste/Desktop/PSTAT199/T-Bills.xlsx")
EconData <- read.csv("C:/Users/caste/Desktop/PSTAT199/EconData.csv")
EconData$Inflation[1] <- 0.024
EconData$Inflation = EconData$Inflation/12
for (i in 1:1011){
  EconData$AdjInf[i] <- (1+sum(EconData$Inflation[i:1011]))/(1+EconData$Inflation[1011])}
```

Initialize P_t, $\bar{P}$, R_t, and $\bar{R}$ and adjusted for Inflation

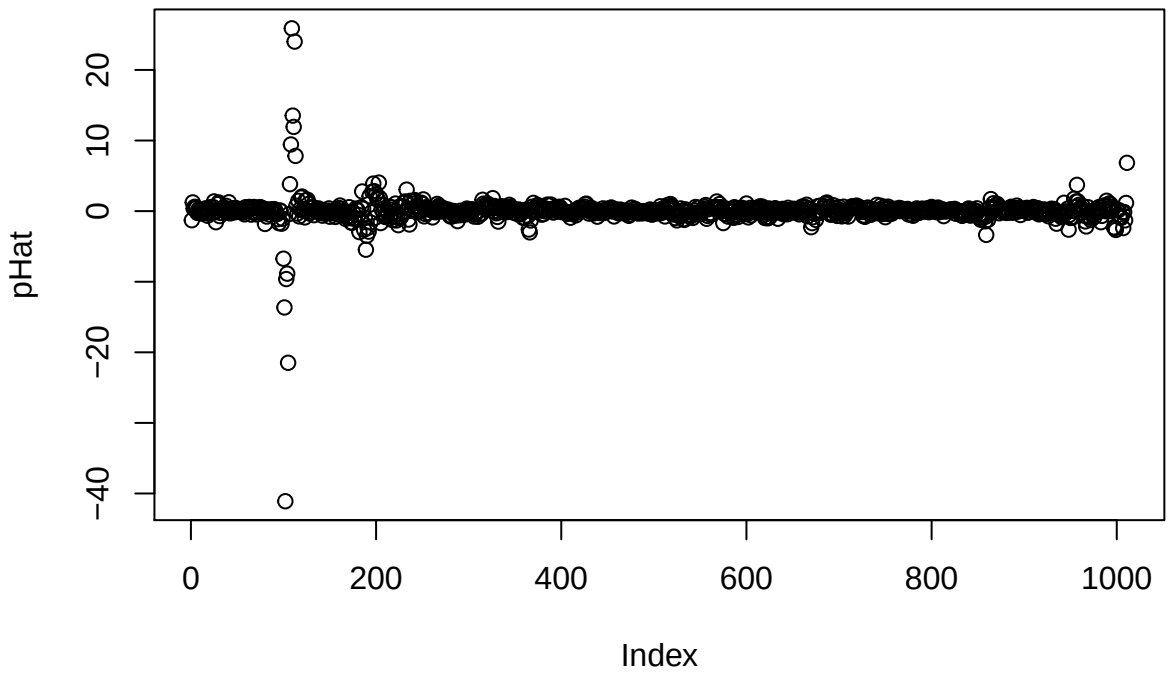
```
EconData$AdjustedPE <- EconData$S.P.500.PE.Ratio.by.Month./(1+ EconData$Inflation)
Pt <- EconData$AdjustedPE[1:1011]
P_ <- mean(Pt)

tb <- T_Bills_3_month_1934_2018$TB3MS
Rt <- (tb/12 - EconData$Inflation[1:1011])
R_ <- mean(Rt)
```

Initialize $\hat{P}$ and $\hat{R}$ along with plotting and adjusting for trend

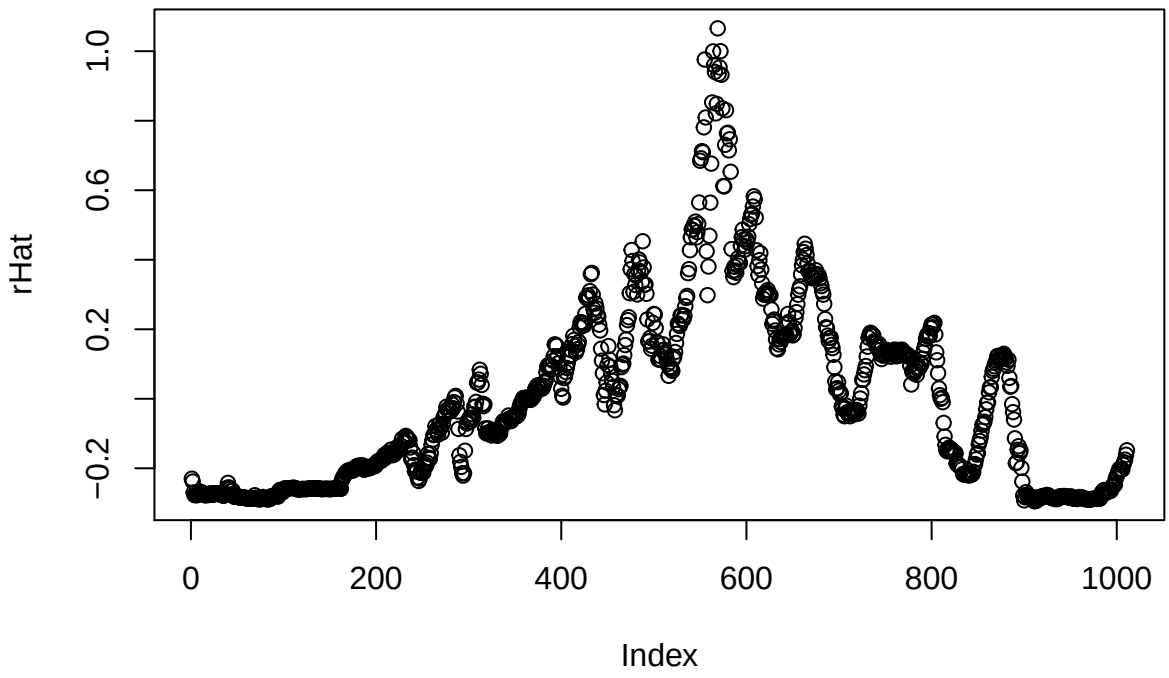
```
pHat <- Pt - P_
plot(pHat)
```



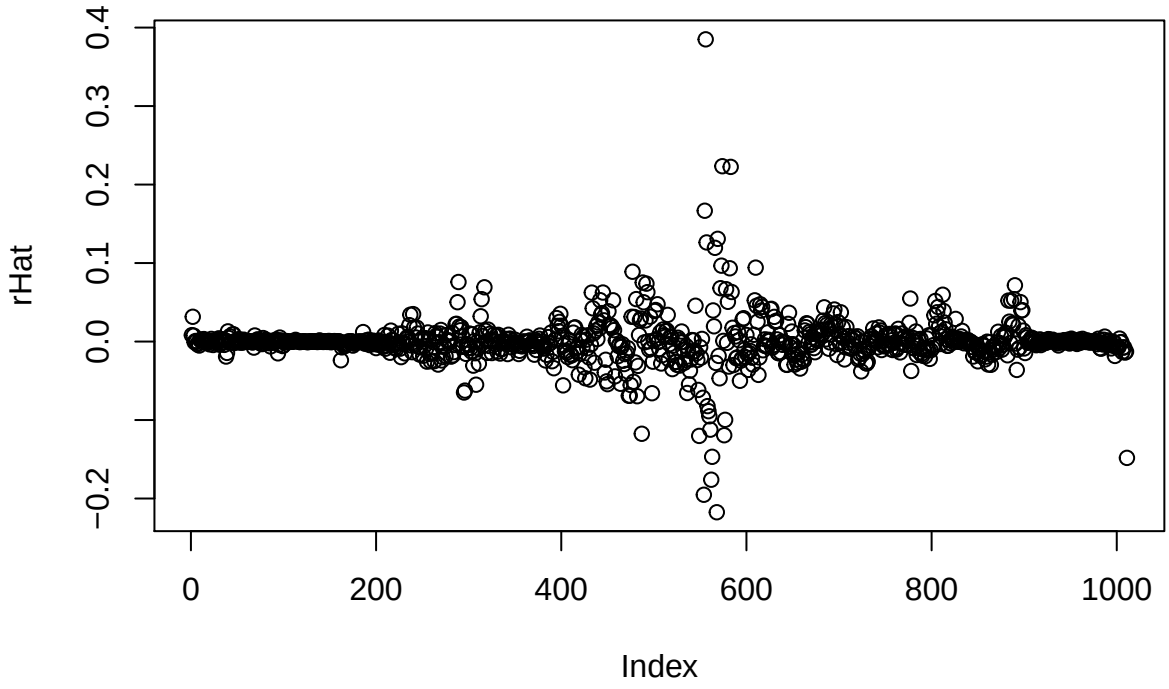

```
for (i in 1:1010){pHat[i]<- pHat[i] - pHat[i+1] }
plot(pHat)
```




```
rHat <- Rt - R_
plot(rHat)
```




```
for (i in 1:1010){rHat[i]<- rHat[i] - rHat[i+1] }
plot(rHat)
```



Initialize g and normalize S&P500 data

```
EconData$AdjustedSP <- EconData$S.P.500.Real.Price.by.Month/EconData$AdjInf
SP <- EconData$AdjustedSP[1:1014]
g <- (1/1010)*log(SP[1]/SP[1011])
gmat <- matrix(nrow = 1011, ncol = 1)
for (i in 1:1011){
  gmat[i] <- g
}
```

Initialize Δ_t

```
delT <- matrix(nrow = 1012, ncol = 1)
for(i in 1:1012){delT[i] = log(SP[i]/SP[i+1])}
delT = delT[-1012,]
```

Fitting the Linear Model

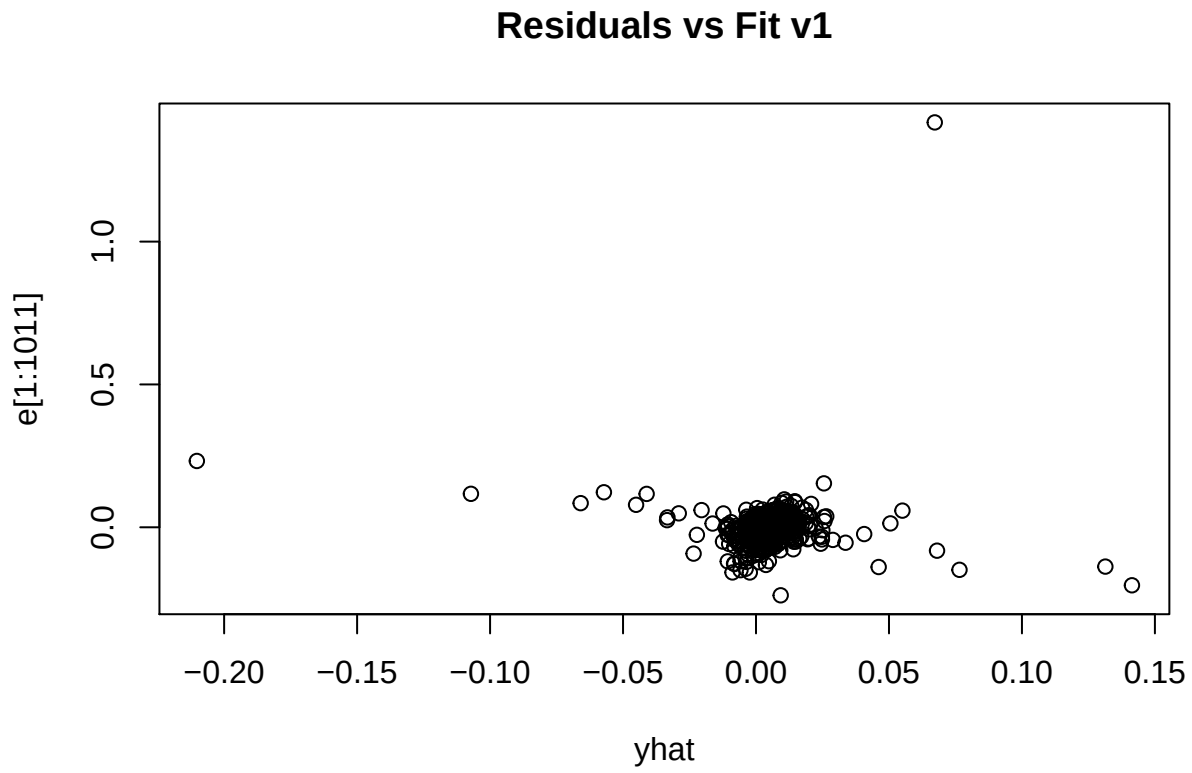
```
mod <- lm(delT ~ gmat + (pHat) + (rHat))
summary(mod)
```

```
##
## Call:
## lm(formula = delT ~ gmat + (pHat) + (rHat))
##
```

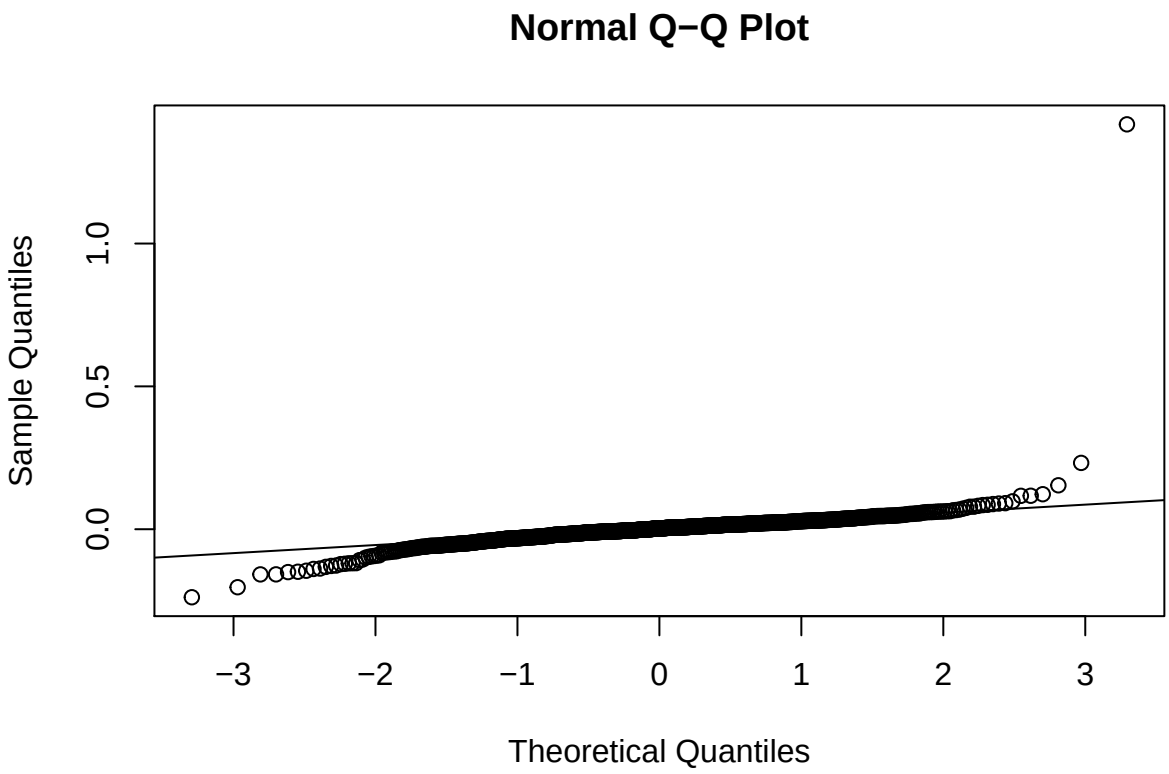
```
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.23809 -0.01788  0.00293  0.02028  1.41721
##
## Coefficients: (1 not defined because of singularities)
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0054516  0.0018358   2.970  0.00305 **
## gmat                NA         NA      NA       NA
## pHat         0.0052486  0.0008344   6.291 4.71e-10 ***
## rHat        -0.1743874  0.0597325  -2.919  0.00358 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.05837 on 1008 degrees of freedom
## Multiple R-squared:  0.04539,    Adjusted R-squared:  0.0435
## F-statistic: 23.96 on 2 and 1008 DF,  p-value: 6.798e-11
```

$\alpha = -0.0052486$ and $\beta = 0.1743874$ Residual standard error $= 0.05837$ $(P_t - \bar{P})$ standard error $= 0.0008344$ $(R_t - \bar{R})$ standard error $= 0.0597325$ #Testing residuals

```
yhat <- fitted(mod)
e <- delT - yhat
plot(yhat, e[1:1011], main = "Residuals vs Fit v1")
```




```
qqnorm(e)
qqline(e)
```


Normal Q−Q Plot
Sample Quantiles
0.0
0.5
1.0
−3
−2
−1
0
1
2
3
Theoretical Quantiles