Read data from consumption.data and pretreatment————————————-

```
consumption_data <- read.table(file = "data.txt")
consumption_data <- consumption_data[, - 1]
colnames(consumption_data) <- c("Year", "quarter", "YD", "CE")
consumption_data[, 3:4] <- log(consumption_data[, 3:4])
```

Run the first regression of function

(1)————————————————

```
library("car")
attach(consumption_data)
reg_data1 <- data.frame(CE = CE[-1], CE_lag = CE[-200], YD = YD[-1], YD_lag = YD[-200])
reg_lm1 <- lm(CE~., data = reg_data1)
summary(reg_lm1)
```

```
##
## Call:
## lm(formula = CE ~ ., data = reg_data1)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.059279 -0.006501  0.001284  0.007275  0.054031
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.04092    0.02110   1.939   0.0539 .
## CE_lag       0.95253    0.02633  36.180  < 2e-16 ***
## YD           0.36360    0.06661   5.458 1.45e-07 ***
## YD_lag      -0.31943    0.06761  -4.725 4.40e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01292 on 195 degrees of freedom
## Multiple R-squared:  0.9995, Adjusted R-squared:  0.9995
## F-statistic: 1.415e+05 on 3 and 195 DF,  p-value: < 2.2e-16
```

```
linearHypothesis(reg_lm1, "YD + YD_lag = 0")
```

```
## Linear hypothesis test
##
```

```
## Hypothesis:
## YD  + YD_lag = 0
##
## Model 1: restricted model
## Model 2: CE ~ CE_lag + YD + YD_lag
##
##   Res.Df      RSS Df  Sum of Sq      F Pr(>F)
## 1    196 0.033065
## 2    195 0.032554  1 0.00051089 3.0602 0.0818 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Under the 95% confidenct level, we could not reject the null hypothesis———— Another method to test null hypothesis of "gamma0 + gamma1 = 0"

```
reg_data2 <- data.frame(CE = CE[-1], CE_lag = CE[-200], Delta_YD = diff(YD), YD_lag = YD[-200])
reg_lm2 <- lm(CE~., data = reg_data2)
summary(reg_lm2)  #Just check the significance of YD_lag
```

```
##
## Call:
## lm(formula = CE ~ ., data = reg_data2)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.059279 -0.006501  0.001284  0.007275  0.054031
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.04092    0.02110   1.939   0.0539 .
## CE_lag       0.95253    0.02633  36.180  < 2e-16 ***
## Delta_YD     0.36360    0.06661   5.458 1.45e-07 ***
## YD_lag       0.04418    0.02525   1.749   0.0818 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01292 on 195 degrees of freedom
## Multiple R-squared:  0.9995, Adjusted R-squared:  0.9995
## F-statistic: 1.415e+05 on 3 and 195 DF,  p-value: < 2.2e-16
```

Run the second regression of function

(2)

```
reg_data3 <- data.frame(Delta_CE = diff(CE), CE_lag = CE[-200], Delta_YD = diff(YD), YD_lag = YD[-200])
reg_lm3 <- lm(Delta_CE~., data = reg_data3)
coef2 <- reg_lm3$coefficients
new_coefficients <- c(coef2[1], 1 + coef2[2], coef2[3], coef2[4] - coef2[3])
names(new_coefficients) <- c("alpha", "beta", "gamma0", "gamma1")
new_coefficients
```

```
##       alpha        beta      gamma0      gamma1
##  0.04091648  0.95252775  0.36360182 -0.31942579
```

```
detach(consumption_data)
```