Chapter 11

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Exercise 11.7

Upload packages

```
library(wooldridge)
library(lmreg)
library(car)
```

Upload database

```
data<-wooldridge::consump
attach(data)
```

Use CONSUMP.RAW for this exercise. One version of the permanent income hypothesis (PIH) of consumption is that the growth in consumption is unpredictable. [Another version is that the change in consumption itself is unpredictable; see Mankiw (1994, Chapter 15) **for discussion of the PIH.] Let $gc_t = log(c_t) - log(c_{t-1})$ be the growth in real per capita consumption (of nondurables and services). Then the PIH implies that $\mathbb{E}(gc_t \mid I_{t-1}) = \mathbb{E}(gc_t)$,where I_{t-1} denotes information known at time (t - 1); in this case, t denotes a year.**

(i) Test the PIH by estimating $gc_t = \beta_0 + \beta_1 gc_{t-1} + u_t$. Clearly state the null and alternative hypotheses. What do you conclude ?

```
summary(lm1<-lm(gc~gc_1))
```

```
##
## Call:
## lm(formula = gc ~ gc_1)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.027878 -0.005974 -0.001450  0.007142  0.020227
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 0.011431   0.003778   3.026  0.00478 **
## gc_1        0.446133   0.156047   2.859  0.00731 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01161 on 33 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.1985, Adjusted R-squared:  0.1742
## F-statistic: 8.174 on 1 and 33 DF,  p-value: 0.007311
```

The estimated equation is expressed as follows

$$\widehat{gc}_t = 0.01 + 0.44gc_{t-1}$$

The null hypothesis is that $H_0 : \beta_1 = 0$ and the alternative $H_1 : \beta_1 \neq 0$

```
linearHypothesis(lm1, c("gc_1=0"))
```

```
## Linear hypothesis test
##
## Hypothesis:
## gc_1 = 0
##
## Model 1: restricted model
## Model 2: gc ~ gc_1
##
##   Res.Df       RSS Df Sum of Sq      F   Pr(>F)
## 1     34 0.0055456
## 2     33 0.0044447  1 0.0011009 8.1737 0.007311 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Based in the p-value of F-Test we can reject the null hypothesis, so the PIH isn't corroborated.

(ii) To the regression in part (i) add the variables $gy_{t-1}, i3_{t-1}$, and inf_{t-1}. Are these new variables individually or jointly significant at the 5% level? (Be sure to report the appropriate p-values.)

```
i3_1<-append(diff(i3), NA)

inf_1<-append(diff(inf), NA)

summary(lm2<-lm(gc~gc_1+gy_1+i3_1+inf_1))
```

```
##
## Call:
## lm(formula = gc ~ gc_1 + gy_1 + i3_1 + inf_1)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.022729 -0.005809 -0.001347  0.008502  0.018728
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0164518  0.0039692   4.145  0.00027 ***
## gc_1         0.2047445  0.2884065   0.710  0.48343
## gy_1        -0.0020640  0.1822825  -0.011  0.99104
## i3_1         0.0004618  0.0015623   0.296  0.76964
## inf_1        0.0032139  0.0014309   2.246  0.03248 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01059 on 29 degrees of freedom
##   (3 observations deleted due to missingness)
## Multiple R-squared:  0.407,  Adjusted R-squared:  0.3252
## F-statistic: 4.976 on 4 and 29 DF,  p-value: 0.003534
```

```
linearHypothesis(lm2, c("gc_1=0","gy_1=0","i3_1=0","inf_1=0"))
```

```
## Linear hypothesis test
##
## Hypothesis:
## gc_1 = 0
## gy_1 = 0
## i3_1 = 0
## inf_1 = 0
##
## Model 1: restricted model
## Model 2: gc ~ gc_1 + gy_1 + i3_1 + inf_1
##
##   Res.Df       RSS Df Sum of Sq      F   Pr(>F)
## 1     33 0.0054841
## 2     29 0.0032521  4  0.002232 4.9759 0.003534 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

The explanatory variables are only jointly significant.

(iii) In the regression from part (ii), what happens to the p-value for the t statistic on gc_{t-1}? Does this mean the PIH hypothesis is now supported by the data?

The coefficient associated to gc_{t-1} is not significant at any level.

(iv) In the regression from part(ii), what is the F statistic and its associated p-value for joint significance of the four explanatory variables? Does your conclusion about the PIH now agree with what you found in part (i)?

The p-value of F-Test is equal to 0.0035, hence its possible to reject the null. However, the coefficients of the model individually dont presents significance, which means a poor capacity of explain the model.