Macro Economic Time Series Analysis

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```
library("mFilter")
library("ggplot2")
library("ggfortify")
library("zoo")
```

```
FALSE
FALSE Attaching package: 'zoo'

FALSE The following objects are masked from 'package:base':
FALSE
FALSE     as.Date, as.Date.numeric
```

Ques 1: Business Cycle Facts

Transforming the data

```
## Uploading and Transforming Data
data = read.csv("C:/Users/arora/Desktop/Second Year/Quarter 3/Macroeconomics 3/HW1/Final Data.csv")

## data for Y
loggdp = round(log(data[,2]/data[,9]),2) ## log of GDP per capita
tloggdp = ts(loggdp, start = c(1960,1),frequency = 4) ## transforming into a time series
hpgdp = hpfilter(tloggdp) ## applying hp filter
Yc = hpgdp$cycle*100 ## cyclical part obtain from HP filter

## data for C
pce = round(log(data[,3]/(data[,8]*data[,9])),2) ## transforming personal expenditure data
tpce = ts(pce, start = c(1960,1),frequency = 4) ## transforming into a time series
hppce = hpfilter(tpce) ## applying hp filter
Cc = hppce$cycle*100 ## cyclical part obtain from HP filter

## data for I
inv = round(log(data[,4]/(data[,9])),2) ## transforming investment data
tinv = ts(inv, start = c(1960,1),frequency = 4) ## transforming into a time series
hpinv = hpfilter(tinv) ## applying hp filter
Ic = hpinv$cycle*100 ## cyclical part obtain from HP filter

## data for H
hours = round(log(data[,5]*10000/(data[,9])),2) ## transforming number of hours data
thours = ts(hours, start = c(1960,1),frequency = 4) ## transforming into a time series
hphours = hpfilter(thours) ## applying hp filter
```

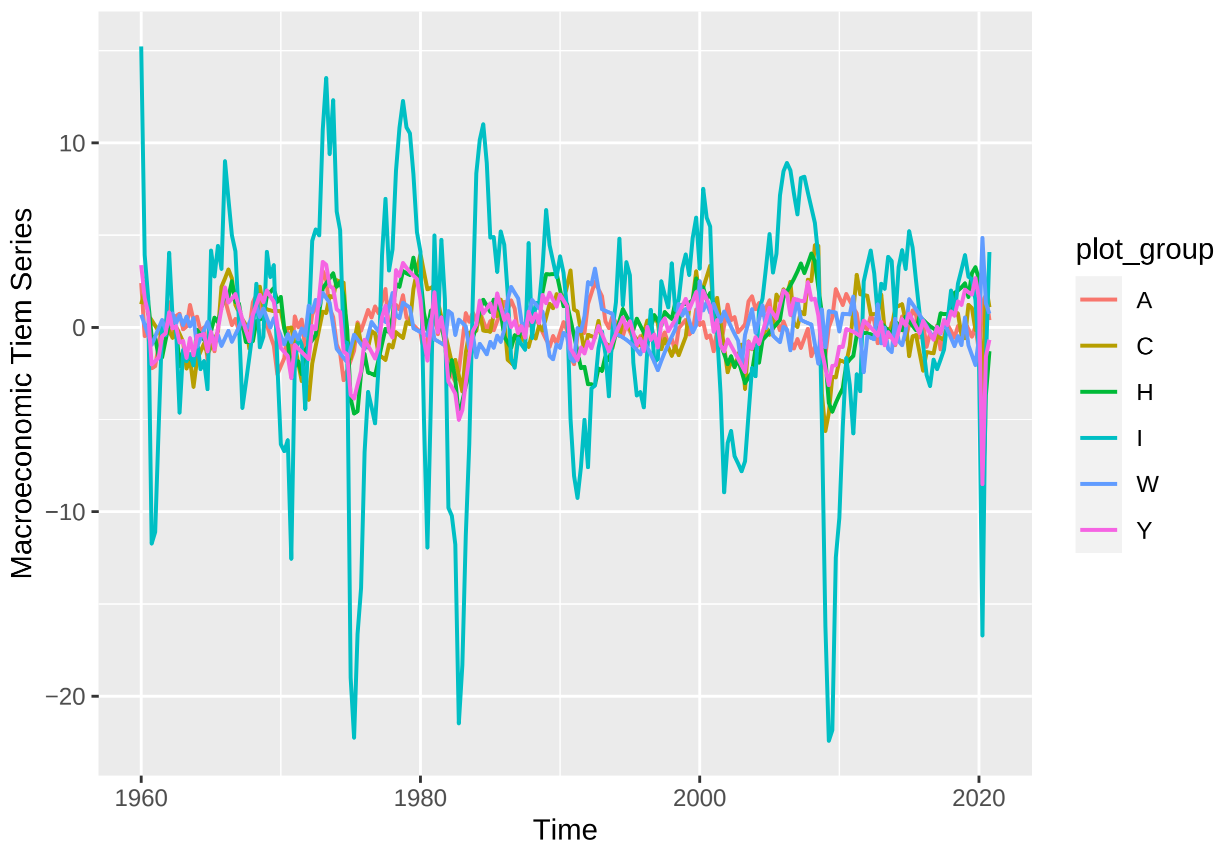
```
Hc = hphours$cycle*100 ## cyclical part obtain from HP filter

## data for W
comp = round(log(data[,6]),2) ## transforming compensation per hour data
tcomp = ts(comp, start = c(1960,1),frequency = 4) ## transforming into a time series
hpcomp = hpfilter(tcomp) ## applying hp filter
Wc = hpcomp$cycle*100 ## cyclical part obtain from HP filter

## data for A
tech = round(log(data[,7]),2) ## transforming compensation per hour data
ttech = ts(tech, start = c(1960,1),frequency = 4) ## transforming into a time series
hptech = hpfilter(ttech) ## applying hp filter
Ac = hptech$cycle*100 ## cyclical part obtain from HP filter

## converting back time series into dataframe for the plots
Y = data.frame(Y=as.matrix(Yc), date=time(Yc))
C = data.frame(C=as.matrix(Cc), date=time(Cc))
I = data.frame(I=as.matrix(Ic), date=time(Ic))
H = data.frame(H=as.matrix(Hc), date=time(Hc))
W = data.frame(W=as.matrix(Wc), date=time(Wc))
A = data.frame(A=as.matrix(Ac), date=time(Ac))
```

The plot for part a)



Calculating the statistics for all the variables

```r
## Autocorrelations
autoY = cor(Y[1:nrow(Y)-1,1],Y[2:nrow(Y),1])
autoC = cor(C[1:nrow(C)-1,1],Y[2:nrow(C),1])
autoI = cor(I[1:nrow(I)-1,1],Y[2:nrow(I),1])
autoH = cor(H[1:nrow(H)-1,1],Y[2:nrow(H),1])
autoW = cor(W[1:nrow(W)-1,1],Y[2:nrow(W),1])
autoA = cor(A[1:nrow(A)-1,1],Y[2:nrow(A),1])

## Correlations with Y
CY = cor(Y[,1],C[,1])
IY = cor(Y[,1],I[,1])
HY = cor(Y[,1],H[,1])
WY = cor(Y[,1],W[,1])
AY = cor(Y[,1],A[,1])

## Standard deviations
sdY = sd(Y[,1])
sdC = sd(C[,1])
sdI = sd(I[,1])
sdH = sd(H[,1])
sdW = sd(W[,1])
sdA = sd(A[,1])

## Relative standard deviation with respect to Output
sdCY = sdC/sdY
sdIY = sdI/sdY
sdHY = sdH/sdY
sdWY = sdW/sdY
sdAY = sdA/sdY
```

Table for part b) of question 1

```
##   variable Autocorr St_Dev Corr_with_Y Rel_St_Dev
## 1        Y     0.71   1.58        1.00       1.00
## 2        C     0.35   1.61        0.56       1.02
## 3        I     0.71   6.51        0.85       4.13
## 4        H     0.59   2.00        0.86       1.27
## 5        W     0.16   1.03       -0.02       0.65
## 6        A     0.37   1.04        0.29       0.66
```

Part c) The main stylized facts that RBC model should aim to explain are

1) output and consumption have the same volatility.
2) Investment is at least 4 times as volatile as the output
3) consumption does not show one to one correlation with output signaling that agents do consumption smoothing
4) Wages are not at all correlated with output may be because of contracts as they are predetermined
5) working hours and investments are significantly correlated with output.