Real Variables in R

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This is a simple calculation of U.S. real GDP, as well as the ratio of exports to GDP. We can calculate summary statistics and/or plot the new series.

Procedure

We begin by pulling the sample data from the course website. I often collect data from FRED and other sources in advance, although one major goal of the course is to learn to to find and organize your own data.

```
data<-read.csv("https://sites.google.com/site/swhegerty/macroeconomic-data-analysis/MacroDataExample.csv",header=TRUE)
```

Always make sure you check your data to make sure it looks the way you expect it to:

```
head(data)
```

```
##     ï..DATE      X      M     GDP      CPI     DATE P_EDUC CPI.1
## 1  1/1/1947 18.394  7.519 243.164 21.70000 1/1/1993   76.1 142.8
## 2  4/1/1947 19.497  8.203 245.968 22.01000 2/1/1993   76.5 143.1
## 3  7/1/1947 19.433  7.663 249.585 22.49000 3/1/1993   77.0 143.3
## 4 10/1/1947 17.636  8.347 259.745 23.12667 4/1/1993   77.4 143.8
## 5  1/1/1948 16.917  9.624 265.742 23.61667 5/1/1993   77.8 144.2
## 6  4/1/1948 15.241 10.036 272.567 23.99333 6/1/1993   78.3 144.3
```

```
tail(data)
```

```
##     ï..DATE  X  M GDP CPI      DATE  P_EDUC   CPI.1
## 322         NA NA  NA  NA 10/1/2019 267.042 257.229
## 323         NA NA  NA  NA 11/1/2019 267.482 257.824
## 324         NA NA  NA  NA 12/1/2019 267.873 258.444
## 325         NA NA  NA  NA  1/1/2020 268.685 258.820
## 326         NA NA  NA  NA  2/1/2020 269.513 259.050
## 327         NA NA  NA  NA  3/1/2020 270.221 257.953
```

This dataset is used elsewhere for two different examples, so it has some other variables. We only need the first few columns. Since they were included with longer series, we need to make sure we remove any “NA”s as well.

```
data<-na.omit(data[,2:5])
tail(data)
```

```
##            X        M      GDP      CPI
## 287 2510.294 3181.647 20749.75 251.8827
## 288 2510.517 3194.665 20897.80 252.6973
## 289 2520.278 3154.126 21098.83 253.2753
## 290 2504.031 3166.691 21340.27 255.1707
## 291 2495.136 3148.168 21542.54 256.3247
## 292 2497.726 3075.592 21729.12 257.8323
```

Now we calculate real GDP using the Consumer Price Index as a deflator:

```
attach(data)
RGDP<-100*GDP/CPI
```

We can also calculate the ratio of exports to GDP. Make sure you divide (nominal) exports by nominal GDP. Multiplying by 100 gives a percentage.

```
Xshare<-100*X/GDP
```

We can collect our new variables in a new dataframe. We also need to rename the first column:

```
data2<-cbind(data$GDP,RGDP,Xshare)
colnames(data2)[1]<-"NGDP"
head(data2)
```

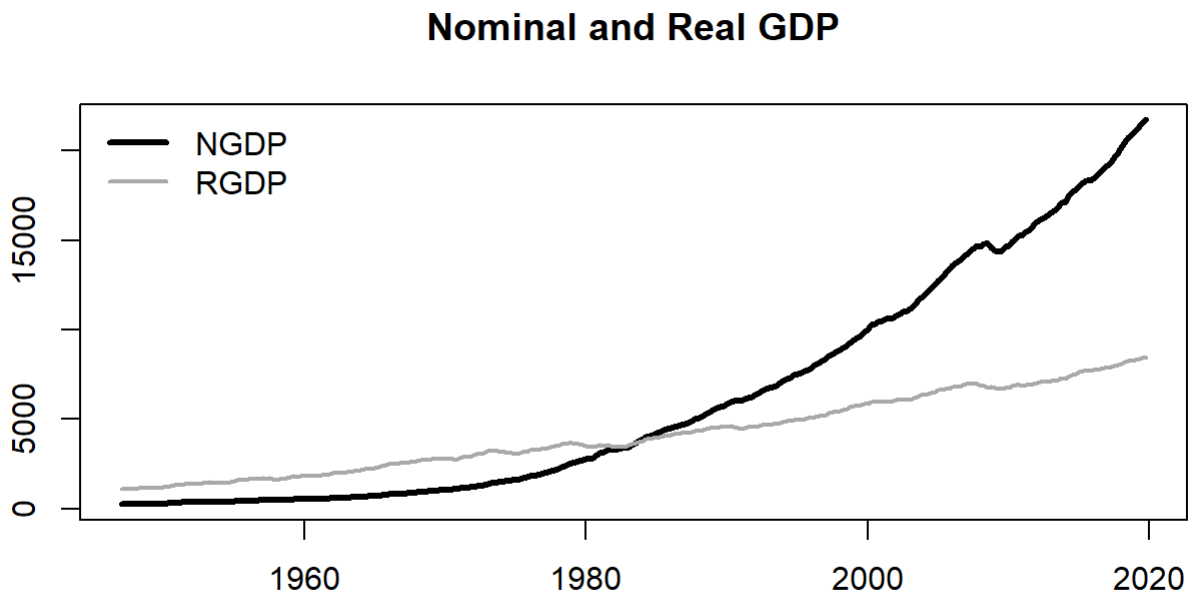
```
##         NGDP     RGDP   Xshare
## [1,] 243.164 1120.571 7.564442
## [2,] 245.968 1117.528 7.926641
## [3,] 249.585 1109.760 7.786125
## [4,] 259.745 1123.141 6.789736
## [5,] 265.742 1125.231 6.365949
## [6,] 272.567 1136.011 5.591653
```

Next, we can set this as a quarterly time series, which begins in 1947 quarter 1.

```
tsdata<-ts(data2,start = c(1947,1),freq=4)
```

Now, we can plot nominal and real GDP together in one graph. It is important to note which part of the code is *customization*; the code would work without it. This plots columns 1 and 2 (which is necessary to specify), but much of the rest is line color, line width, etc. I also made a legend for the graph.

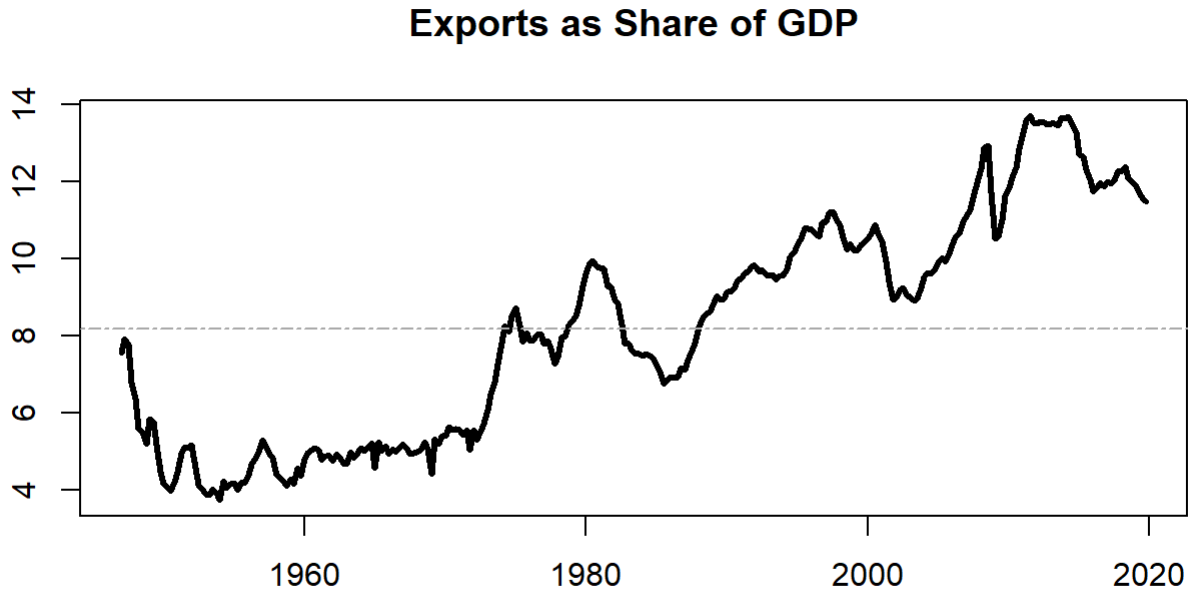
```
ts.plot(tsdata[,c(1,2)],col=c("black","dark grey"),lwd=c(3,2),xlab="",main="Nominal and Real GD
P")
legend("topleft",legend=c(colnames(data2)[c(1,2)]),col=c("black","dark grey"),lwd=c(3,2),bty="n"
)
```



We see that the lines cross in the “base year,” which is often an average over the period from 1982 to 1984. As prices rise, nominal GDP exceeds real GDP.

Finally, we can plot the export share, which is column 3. An extra line shows the average value over the period; exports have grown in recent years.

```
plot(tsdata[,3],lwd=3,xlab="",ylab="",main="Exports as Share of GDP")
abline(h=mean(tsdata[,3]),lty=6,col="dark grey")
```



We can also show some summary statistics for the export share:

```
summary(Xshare)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   3.743   5.170   8.281   8.195  10.433  13.717
```

The mean value is the horizontal line above.

I also like to include the standard deviation:

```
sd(Xshare)
```

```
## [1] 2.884743
```

We could even make a table with our five summary statistics:

	Statistic
Mean	8.20
SD	2.88
Median	8.28
Min	3.74
Max	13.72