Homework4

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1)

```
#install.packages("plyr")
library(plyr)
debt <- read.csv("debt.csv", as.is = TRUE)

mean.growth <- function(df){
  return(mean(df$growth))
}
#?daply
each_country<- split(debt, debt$Country)
signif(daply(debt, "Country", mean.growth), 3)
```

```
##   Australia     Austria     Belgium      Canada     Denmark     Finland
##        3.72        4.44        3.18        3.65        2.66        3.57
##      France     Germany      Greece     Ireland       Italy       Japan
##        3.78        3.31        2.93        3.93        3.25        4.45
## Netherlands New Zealand      Norway    Portugal       Spain      Sweden
##        3.03        3.07        3.83        4.00        3.20        3.07
##          UK          US
##        2.41        3.00
```

```
head(debt)
```

```
##     Country Year    growth     ratio
## 1 Australia 1946 -3.557951 190.41908
## 2 Australia 1947  2.459475 177.32137
## 3 Australia 1948  6.437534 148.92981
## 4 Australia 1949  6.611994 125.82870
## 5 Australia 1950  6.920201 109.80940
## 6 Australia 1951  4.272612  87.09448
```

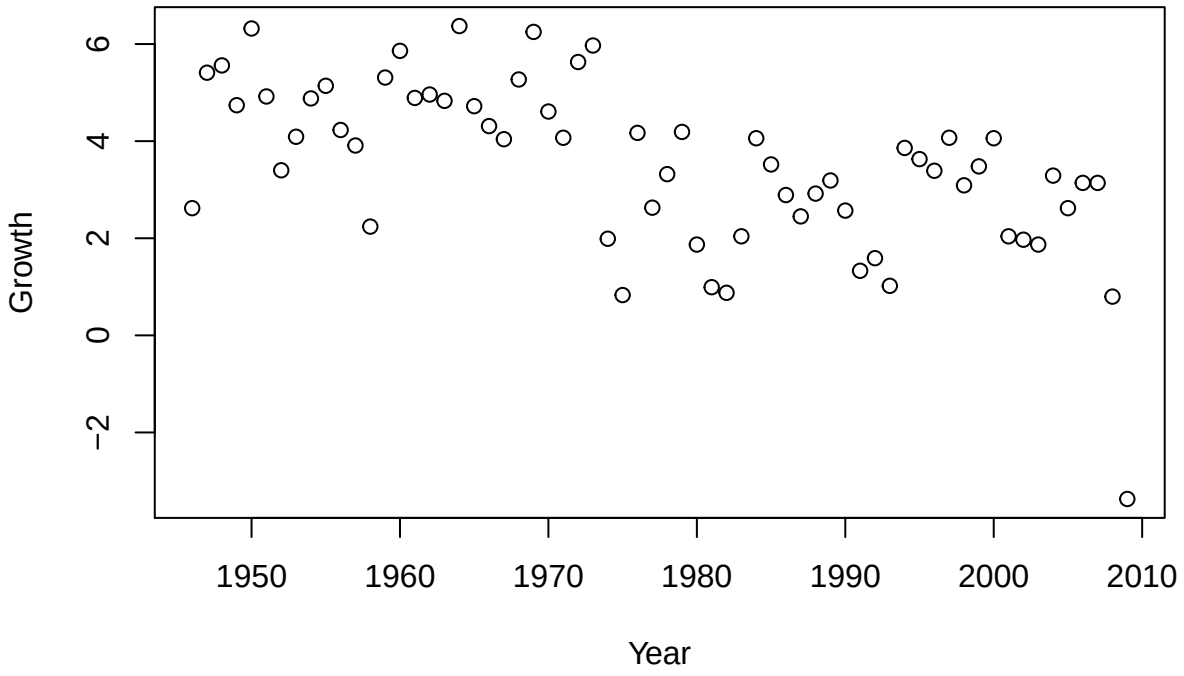
2)

```
growth.year<-signif(daply(debt, "Year", mean.growth), 3)
growth.year
```

```
##   1946   1947   1948   1949   1950   1951   1952   1953   1954   1955
##  2.620  5.410  5.560  4.740  6.320  4.920  3.400  4.090  4.880  5.140
##   1956   1957   1958   1959   1960   1961   1962   1963   1964   1965
##  4.230  3.910  2.240  5.310  5.860  4.890  4.960  4.830  6.370  4.720
##   1966   1967   1968   1969   1970   1971   1972   1973   1974   1975
##  4.310  4.040  5.270  6.250  4.610  4.070  5.630  5.970  1.990  0.830
##   1976   1977   1978   1979   1980   1981   1982   1983   1984   1985
##  4.170  2.630  3.320  4.190  1.870  0.992  0.876  2.040  4.060  3.520
##   1986   1987   1988   1989   1990   1991   1992   1993   1994   1995
##  2.890  2.450  2.920  3.190  2.570  1.330  1.590  1.020  3.860  3.630
##   1996   1997   1998   1999   2000   2001   2002   2003   2004   2005
##  3.390  4.070  3.090  3.480  4.060  2.040  1.970  1.870  3.290  2.620
##   2006   2007   2008   2009
```

```
##  3.140  3.140  0.798 -3.370
```

```
plot(unique(debt$Year),growth.year, xlab = "Year", ylab = "Growth")
```

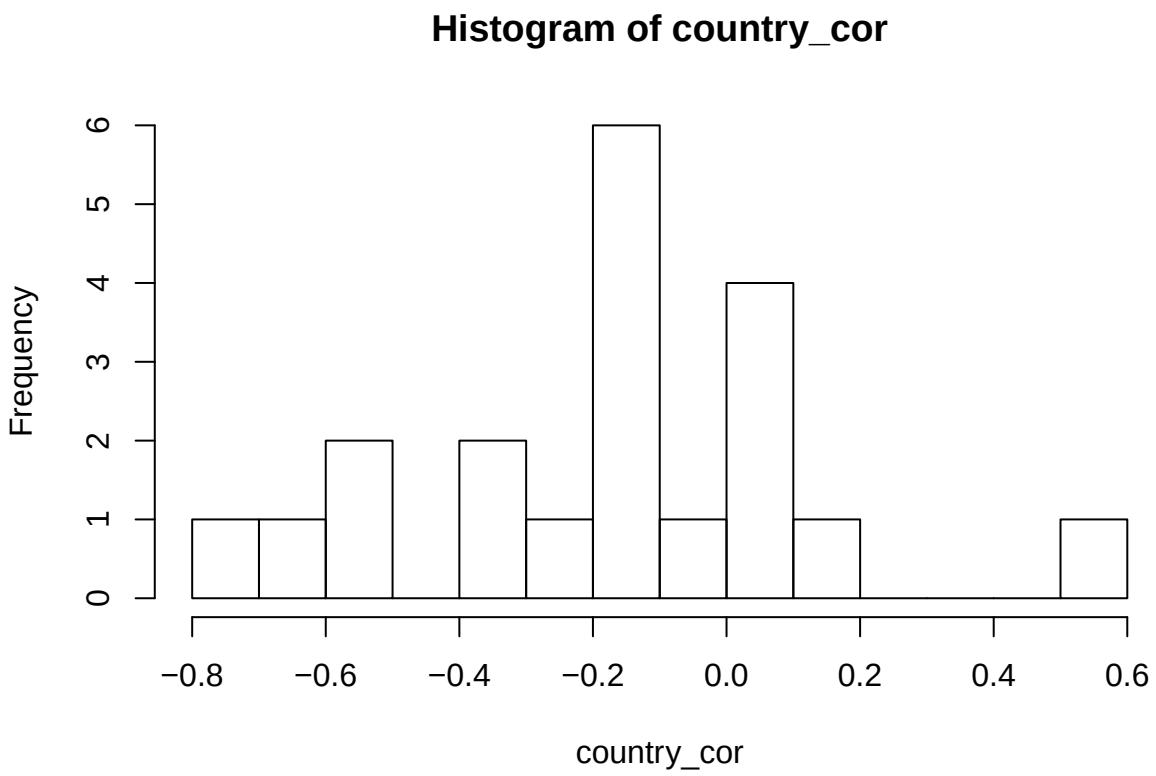


3)

```
signif(cor(debt$growth, debt$ratio), 4)
```

```
## [1] -0.1995
```

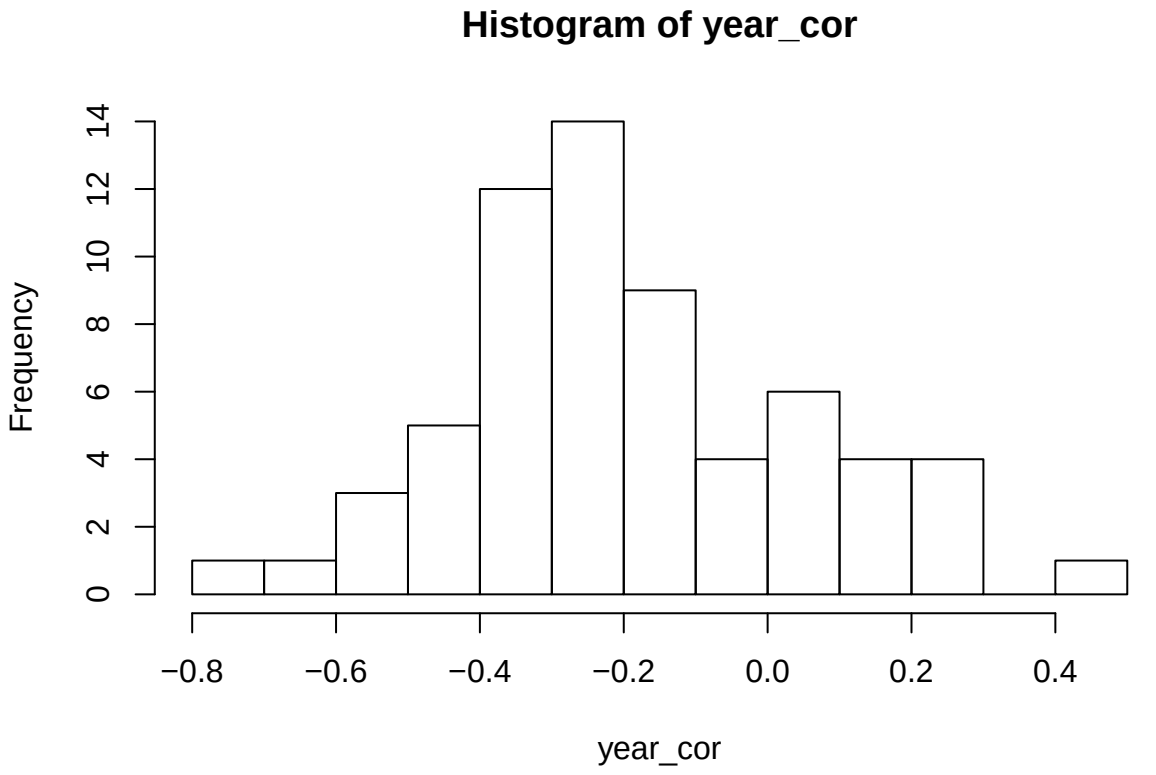
```
cor_function <- function(df){
  return(cor(df$growth, df$ratio))
}
#correlation of each country
country_cor<-daply(debt, "Country", cor_function)
hist(country_cor, breaks=10)
```




```
signif(mean(country_cor),4)
```

```
## [1] -0.1778
```

```
year_cor<-daply(debt, "Year", cor_function)
hist(year_cor, breaks = 10)
```



```r
signif(mean(year_cor),4)
```

```
## [1] -0.1906
```

```r
countries<- unique(debt$Country)
#length(country_cor)
```

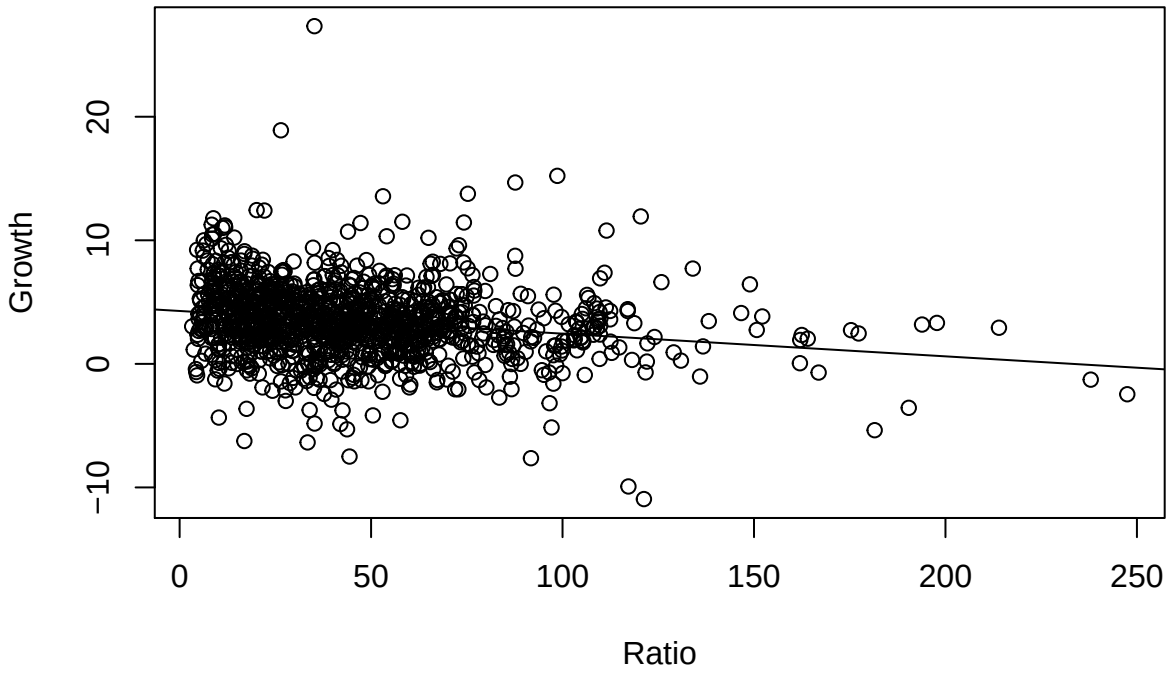
d. None of the countries or years have a corrrlation that goes against the general trend.

4)

```r
linear_mod<-lm(debt$growth~debt$ratio)
linear_mod
```

```
##
## Call:
## lm(formula = debt$growth ~ debt$ratio)
##
## Coefficients:
## (Intercept)   debt$ratio
##     4.27929     -0.01836
```

```r
plot(debt$ratio, debt$growth, xlab="Ratio", ylab="Growth")
abline(linear_mod)
```




```r
?scale
?apply
pmin(cor(debt$growth, debt$ratio))
```

```
## [1] -0.199468
```

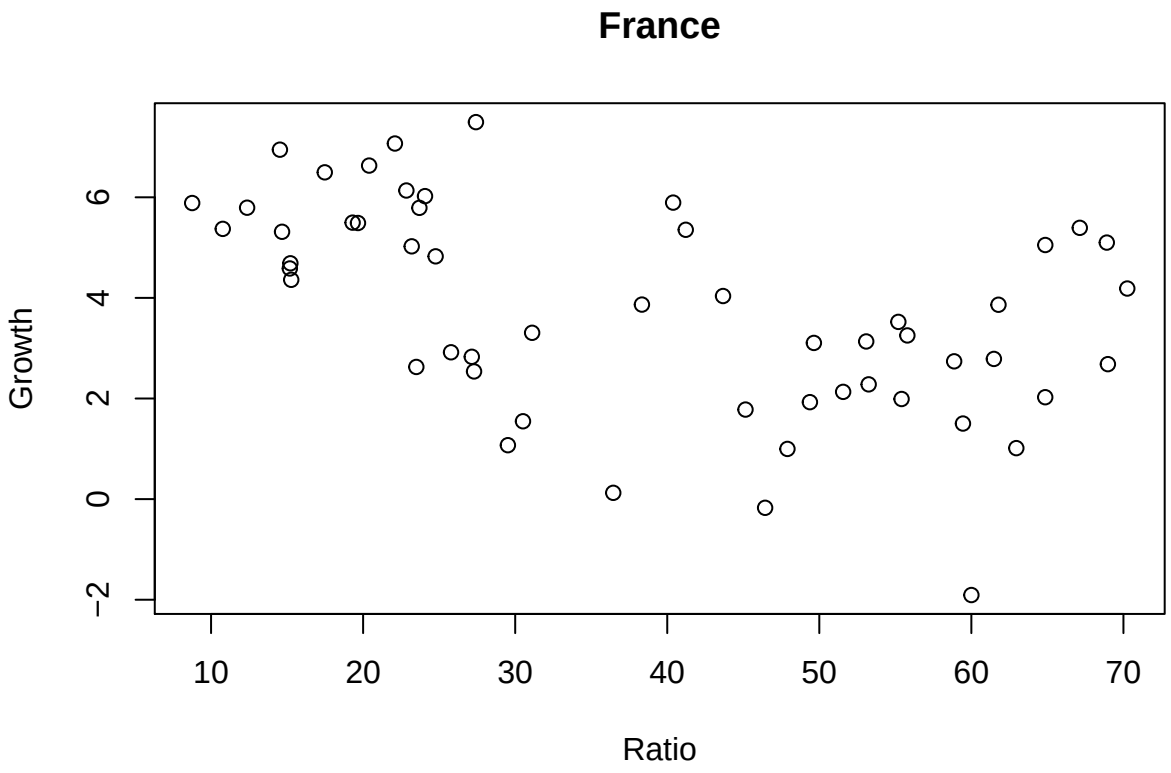
5)

```r
countries<- unique(debt$Country)
print(length(countries))
```

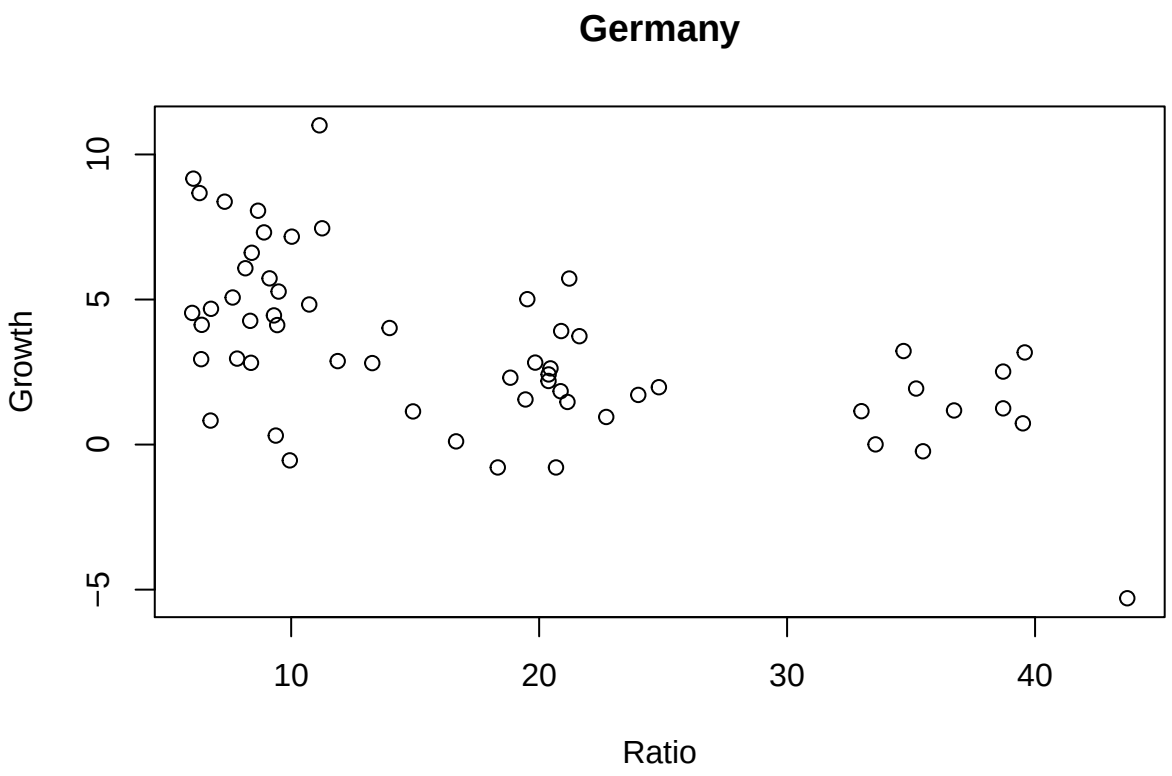
```
## [1] 20
```

```
for(i in 1:length(country_cor)){
  if (country_cor[i] < -1*0.5){
    print(countries[i])
    con<-debt[debt$Country==countries[i],]
    #par(mfrow=c(2,2))
    plot(con$ratio,con$growth, main = countries[i], xlab="Ratio", ylab="Growth")

    }

  }
```

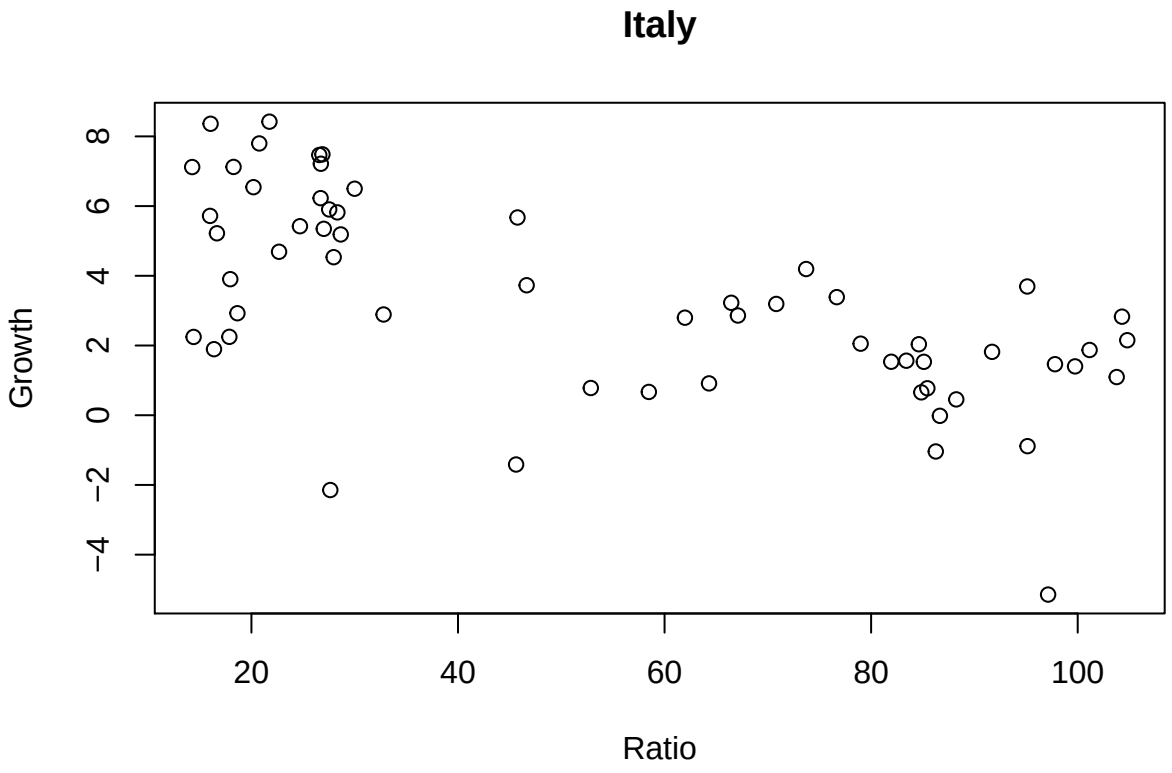
```
## [1] "France"
```



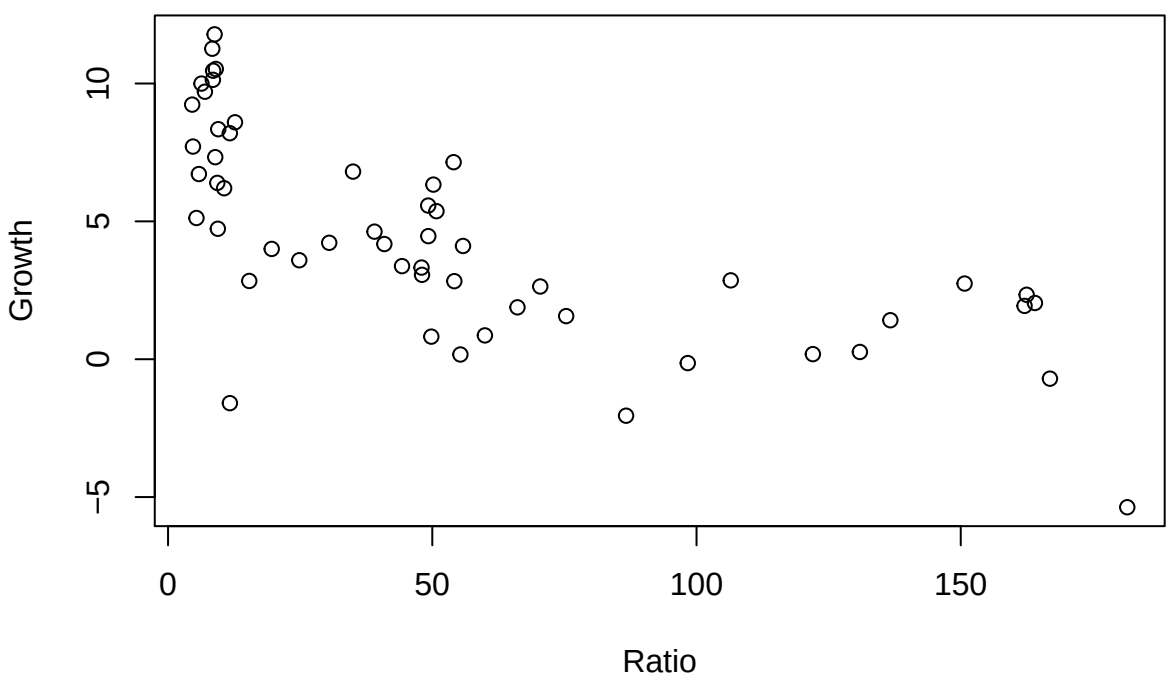

```
## [1] "Germany"
```




```
## [1] "Italy"
```




```
## [1] "Japan"
```



6)

```
France<-debt[debt$Country=="France",]
dim(France)
```

```
## [1] 54  4
```

```
head(France)
```

```
##     Country Year   growth    ratio
## 371  France 1950 7.494005 27.41989
## 372  France 1951 6.134969 22.84359
## 373  France 1952 2.627430 23.49749
## 374  France 1953 2.918587 25.78166
## 375  France 1954 4.825871 24.76863
## 376  France 1955 5.790223 23.70047
```

```
next.growth<-c()

for(i in 1:length(France$Year)){
  years<-France$Year[i+1]

  if(i==length(France$Year)){
    next.growth<-append(next.growth, NA)
  }

  else if(France$Year[i]+1 == years){
    next.growth<-append(next.growth, signif(France$growth[i+1],4))
  }

  else{
    next.growth<-append(next.growth, NA)
  }
```

```
}

France$next.growth<-next.growth


for (i in 1:length(France$Year)){
  France$Year[i]
  if (France$Year[i]==1971){
    print(France$next.growth[i])
  }
  if (France$Year[i]==1972){
    print(France$next.growth[i])
  }
}
```

```
## [1] 5.886
## [1] NA
```

7)

```
total.next.growth<- function(df){
  next.growth<-c()

for(i in 1:length(df$Year)){
  years<-df$Year[i+1]

  if(i==length(df$Year)){
    next.growth<-append(next.growth, NA)
  }

  else if(df$Year[i]+1 == years){
    next.growth<-append(next.growth, signif(df$growth[i+1],4))
  }

  else{
    next.growth<-append(next.growth, NA)
  }
}

df$next.growth<-next.growth
return(df)
}

debt <- ddply(debt, "Country", total.next.growth)

France<-debt[debt$Country=="France",]
for (i in 1:length(France$Year)){
  if (France$Year[i]==2009){
    print(France$next.growth[i])
  }

}
```

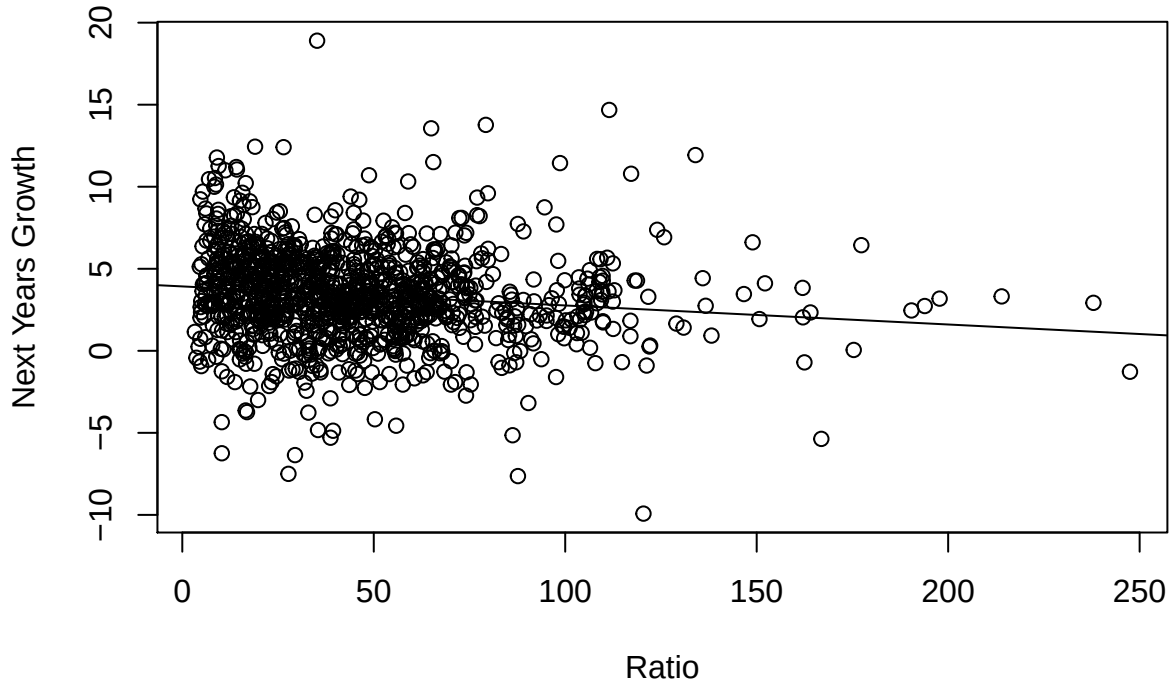
```
## [1] NA
```

8)

```
linear_mod<-lm(debt$next.growth~debt$ratio)
linear_mod
```

```
##
## Call:
## lm(formula = debt$next.growth ~ debt$ratio)
##
## Coefficients:
## (Intercept)   debt$ratio
##     3.92466     -0.01161
```

```
plot(debt$ratio, debt$next.growth, xlab="Ratio", ylab="Next Years Growth")
abline(linear_mod)
```



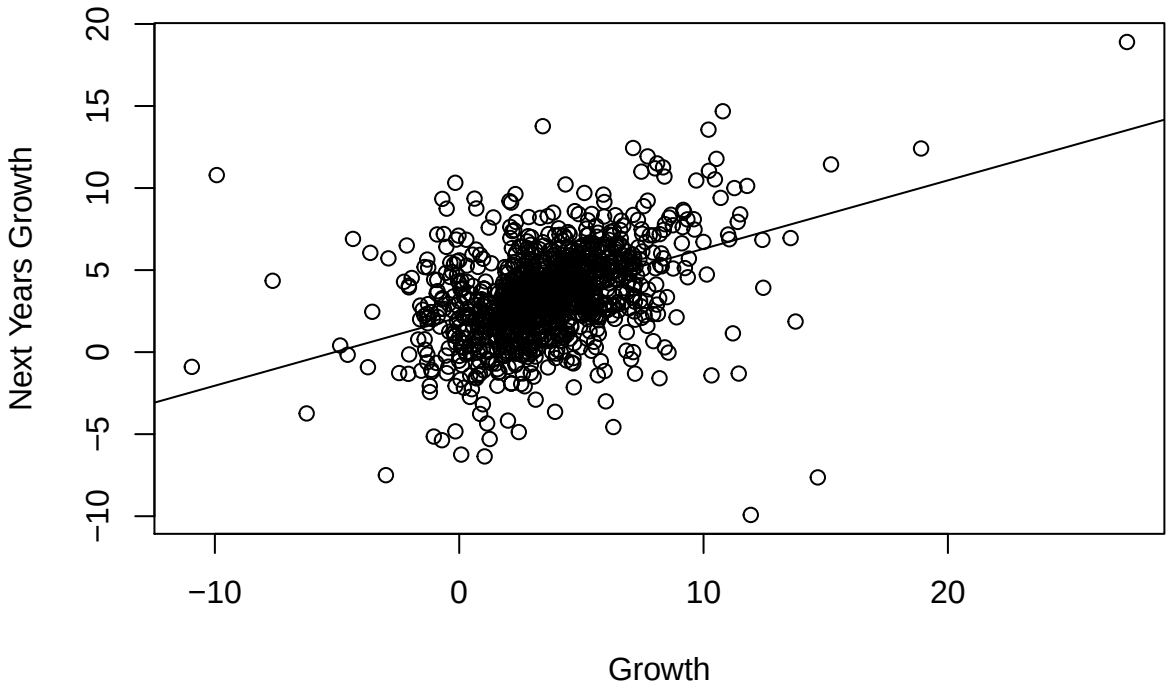
The next year regression is -0.01161 which is slightly higher than the current year's regression of -0.01836.

9)

```
linear_mod<-lm(debt$growth~debt$next.growth)
linear_mod
```

```
##
## Call:
## lm(formula = debt$growth ~ debt$next.growth)
##
## Coefficients:
##      (Intercept)  debt$next.growth
##           2.1248            0.4172
```

```
plot(debt$growth, debt$next.growth, xlab="Growth", ylab="Next Years Growth")
abline(linear_mod)
```



As shown by our plots, current growth is a better indicator for future growth because the slope is positive which make sense with the increasing growth between current and next year.