Summary

Bongus

2018 10 6

# 한국 금리 예측

방법: 정량분석으로 결정  
1. 정성적 분석은 많은 대부분 분들이 해올 것으로 예상  
2. 그간 자료를 다 찾아보는건 시간적으로 어려움이 있다.  
3. 재밌다.  
  
방향: 각 변수들의 추세를 파악 후 회귀분석  
1. 변수들의 추세는 prophet을 사용하자.  
2. 변수들은 기사를 통해 찾아내자.  
  
변수 :   
1. 미국기준금리ㅇ  
2. 한국기준금리 ㅇ  
3. 경기동행지표 ㅇ  
4. 물가상승률 ㅇ  
5. 수입물가지수 ㅇ  
6. 설비투자 ㅇ   
7. 수출금액지수 ㅇ  
8. 고용 ㅇ  
9. WTI\_price ㅇ  
10. 해외자본흐름 - 외국인주식매도 ㅇ

# 데이터 수집 및 가공

# 1. korea interest rate  
interest\_rate <- read.csv('./data/korea\_interest\_rate.csv', header=F, stringsAsFactors = F)  
class(interest\_rate)

## [1] "data.frame"

head(interest\_rate)

## V1 V2  
## 1 1999/05 4.75  
## 2 1999/06 4.75  
## 3 1999/07 4.75  
## 4 1999/08 4.75  
## 5 1999/09 4.75  
## 6 1999/10 4.75

str(interest\_rate)

## 'data.frame': 232 obs. of 2 variables:  
## $ V1: chr "1999/05" "1999/06" "1999/07" "1999/08" ...  
## $ V2: num 4.75 4.75 4.75 4.75 4.75 4.75 4.75 4.75 4.75 5 ...

colnames(interest\_rate) <- c('DATE', 'RATE')  
  
date <- paste0(interest\_rate$year,"/01")  
date

## [1] "/01"

interest\_rate$year <- as.Date(date, "%Y/%m/%d")  
  
# 2. us interest rate  
interest\_rate\_us <- read.csv('./data/us\_interest\_rate.csv', stringsAsFactors = F)  
interest\_rate\_us <- interest\_rate\_us[-1,]  
head(interest\_rate\_us)

## DATE FEDFUNDS  
## 2 1999-05-01 4.74  
## 3 1999-06-01 4.76  
## 4 1999-07-01 4.99  
## 5 1999-08-01 5.07  
## 6 1999-09-01 5.22  
## 7 1999-10-01 5.20

str(interest\_rate\_us)

## 'data.frame': 232 obs. of 2 variables:  
## $ DATE : chr "1999-05-01" "1999-06-01" "1999-07-01" "1999-08-01" ...  
## $ FEDFUNDS: num 4.74 4.76 4.99 5.07 5.22 5.2 5.42 5.3 5.45 5.73 ...

class(interest\_rate\_us)

## [1] "data.frame"

interest\_rate\_us$DATE <- as.Date(interest\_rate\_us$DATE, "%Y-%m-%d")  
  
# 3. korea Facility investment index  
facility\_investing <- read.csv('./data/korea\_investing.csv', header=F, stringsAsFactors = F)  
class(facility\_investing)

## [1] "data.frame"

head(facility\_investing)

## V1 V2  
## 1 1995/02 51.5  
## 2 1995/03 63.5  
## 3 1995/04 59.9  
## 4 1995/05 57.9  
## 5 1995/06 56.1  
## 6 1995/07 55.6

str(facility\_investing)

## 'data.frame': 283 obs. of 2 variables:  
## $ V1: chr "1995/02" "1995/03" "1995/04" "1995/05" ...  
## $ V2: num 51.5 63.5 59.9 57.9 56.1 55.6 53.7 56.4 55.4 55.3 ...

colnames(facility\_investing) <- c('DATE', 'INVESTMENT\_INDEX')  
  
date <- paste0(facility\_investing$DATE,"/01")  
date

## [1] "1995/02/01" "1995/03/01" "1995/04/01" "1995/05/01" "1995/06/01"  
## [6] "1995/07/01" "1995/08/01" "1995/09/01" "1995/10/01" "1995/11/01"  
## [11] "1995/12/01" "1996/01/01" "1996/02/01" "1996/03/01" "1996/04/01"  
## [16] "1996/05/01" "1996/06/01" "1996/07/01" "1996/08/01" "1996/09/01"  
## [21] "1996/10/01" "1996/11/01" "1996/12/01" "1997/01/01" "1997/02/01"  
## [26] "1997/03/01" "1997/04/01" "1997/05/01" "1997/06/01" "1997/07/01"  
## [31] "1997/08/01" "1997/09/01" "1997/10/01" "1997/11/01" "1997/12/01"  
## [36] "1998/01/01" "1998/02/01" "1998/03/01" "1998/04/01" "1998/05/01"  
## [41] "1998/06/01" "1998/07/01" "1998/08/01" "1998/09/01" "1998/10/01"  
## [46] "1998/11/01" "1998/12/01" "1999/01/01" "1999/02/01" "1999/03/01"  
## [51] "1999/04/01" "1999/05/01" "1999/06/01" "1999/07/01" "1999/08/01"  
## [56] "1999/09/01" "1999/10/01" "1999/11/01" "1999/12/01" "2000/01/01"  
## [61] "2000/02/01" "2000/03/01" "2000/04/01" "2000/05/01" "2000/06/01"  
## [66] "2000/07/01" "2000/08/01" "2000/09/01" "2000/10/01" "2000/11/01"  
## [71] "2000/12/01" "2001/01/01" "2001/02/01" "2001/03/01" "2001/04/01"  
## [76] "2001/05/01" "2001/06/01" "2001/07/01" "2001/08/01" "2001/09/01"  
## [81] "2001/10/01" "2001/11/01" "2001/12/01" "2002/01/01" "2002/02/01"  
## [86] "2002/03/01" "2002/04/01" "2002/05/01" "2002/06/01" "2002/07/01"  
## [91] "2002/08/01" "2002/09/01" "2002/10/01" "2002/11/01" "2002/12/01"  
## [96] "2003/01/01" "2003/02/01" "2003/03/01" "2003/04/01" "2003/05/01"  
## [101] "2003/06/01" "2003/07/01" "2003/08/01" "2003/09/01" "2003/10/01"  
## [106] "2003/11/01" "2003/12/01" "2004/01/01" "2004/02/01" "2004/03/01"  
## [111] "2004/04/01" "2004/05/01" "2004/06/01" "2004/07/01" "2004/08/01"  
## [116] "2004/09/01" "2004/10/01" "2004/11/01" "2004/12/01" "2005/01/01"  
## [121] "2005/02/01" "2005/03/01" "2005/04/01" "2005/05/01" "2005/06/01"  
## [126] "2005/07/01" "2005/08/01" "2005/09/01" "2005/10/01" "2005/11/01"  
## [131] "2005/12/01" "2006/01/01" "2006/02/01" "2006/03/01" "2006/04/01"  
## [136] "2006/05/01" "2006/06/01" "2006/07/01" "2006/08/01" "2006/09/01"  
## [141] "2006/10/01" "2006/11/01" "2006/12/01" "2007/01/01" "2007/02/01"  
## [146] "2007/03/01" "2007/04/01" "2007/05/01" "2007/06/01" "2007/07/01"  
## [151] "2007/08/01" "2007/09/01" "2007/10/01" "2007/11/01" "2007/12/01"  
## [156] "2008/01/01" "2008/02/01" "2008/03/01" "2008/04/01" "2008/05/01"  
## [161] "2008/06/01" "2008/07/01" "2008/08/01" "2008/09/01" "2008/10/01"  
## [166] "2008/11/01" "2008/12/01" "2009/01/01" "2009/02/01" "2009/03/01"  
## [171] "2009/04/01" "2009/05/01" "2009/06/01" "2009/07/01" "2009/08/01"  
## [176] "2009/09/01" "2009/10/01" "2009/11/01" "2009/12/01" "2010/01/01"  
## [181] "2010/02/01" "2010/03/01" "2010/04/01" "2010/05/01" "2010/06/01"  
## [186] "2010/07/01" "2010/08/01" "2010/09/01" "2010/10/01" "2010/11/01"  
## [191] "2010/12/01" "2011/01/01" "2011/02/01" "2011/03/01" "2011/04/01"  
## [196] "2011/05/01" "2011/06/01" "2011/07/01" "2011/08/01" "2011/09/01"  
## [201] "2011/10/01" "2011/11/01" "2011/12/01" "2012/01/01" "2012/02/01"  
## [206] "2012/03/01" "2012/04/01" "2012/05/01" "2012/06/01" "2012/07/01"  
## [211] "2012/08/01" "2012/09/01" "2012/10/01" "2012/11/01" "2012/12/01"  
## [216] "2013/01/01" "2013/02/01" "2013/03/01" "2013/04/01" "2013/05/01"  
## [221] "2013/06/01" "2013/07/01" "2013/08/01" "2013/09/01" "2013/10/01"  
## [226] "2013/11/01" "2013/12/01" "2014/01/01" "2014/02/01" "2014/03/01"  
## [231] "2014/04/01" "2014/05/01" "2014/06/01" "2014/07/01" "2014/08/01"  
## [236] "2014/09/01" "2014/10/01" "2014/11/01" "2014/12/01" "2015/01/01"  
## [241] "2015/02/01" "2015/03/01" "2015/04/01" "2015/05/01" "2015/06/01"  
## [246] "2015/07/01" "2015/08/01" "2015/09/01" "2015/10/01" "2015/11/01"  
## [251] "2015/12/01" "2016/01/01" "2016/02/01" "2016/03/01" "2016/04/01"  
## [256] "2016/05/01" "2016/06/01" "2016/07/01" "2016/08/01" "2016/09/01"  
## [261] "2016/10/01" "2016/11/01" "2016/12/01" "2017/01/01" "2017/02/01"  
## [266] "2017/03/01" "2017/04/01" "2017/05/01" "2017/06/01" "2017/07/01"  
## [271] "2017/08/01" "2017/09/01" "2017/10/01" "2017/11/01" "2017/12/01"  
## [276] "2018/01/01" "2018/02/01" "2018/03/01" "2018/04/01" "2018/05/01"  
## [281] "2018/06/01" "2018/07/01" "2018/08/01"

facility\_investing$DATE <- as.Date(date, "%Y/%m/%d")  
  
# 4. korea cci index  
cci\_index <- read.csv('./data/korea\_cci.csv', header=F, stringsAsFactors = F)  
class(cci\_index)

## [1] "data.frame"

head(cci\_index)

## V1 V2  
## 1 1970/01 100.6  
## 2 1970/02 101.5  
## 3 1970/03 101.9  
## 4 1970/04 103.2  
## 5 1970/05 103.2  
## 6 1970/06 103.2

str(cci\_index)

## 'data.frame': 584 obs. of 2 variables:  
## $ V1: chr "1970/01" "1970/02" "1970/03" "1970/04" ...  
## $ V2: num 101 102 102 103 103 ...

colnames(cci\_index) <- c('DATE', 'CCI\_INDEX')  
  
date <- paste0(cci\_index$DATE,"/01")  
date

## [1] "1970/01/01" "1970/02/01" "1970/03/01" "1970/04/01" "1970/05/01"  
## [6] "1970/06/01" "1970/07/01" "1970/08/01" "1970/09/01" "1970/10/01"  
## [11] "1970/11/01" "1970/12/01" "1971/01/01" "1971/02/01" "1971/03/01"  
## [16] "1971/04/01" "1971/05/01" "1971/06/01" "1971/07/01" "1971/08/01"  
## [21] "1971/09/01" "1971/10/01" "1971/11/01" "1971/12/01" "1972/01/01"  
## [26] "1972/02/01" "1972/03/01" "1972/04/01" "1972/05/01" "1972/06/01"  
## [31] "1972/07/01" "1972/08/01" "1972/09/01" "1972/10/01" "1972/11/01"  
## [36] "1972/12/01" "1973/01/01" "1973/02/01" "1973/03/01" "1973/04/01"  
## [41] "1973/05/01" "1973/06/01" "1973/07/01" "1973/08/01" "1973/09/01"  
## [46] "1973/10/01" "1973/11/01" "1973/12/01" "1974/01/01" "1974/02/01"  
## [51] "1974/03/01" "1974/04/01" "1974/05/01" "1974/06/01" "1974/07/01"  
## [56] "1974/08/01" "1974/09/01" "1974/10/01" "1974/11/01" "1974/12/01"  
## [61] "1975/01/01" "1975/02/01" "1975/03/01" "1975/04/01" "1975/05/01"  
## [66] "1975/06/01" "1975/07/01" "1975/08/01" "1975/09/01" "1975/10/01"  
## [71] "1975/11/01" "1975/12/01" "1976/01/01" "1976/02/01" "1976/03/01"  
## [76] "1976/04/01" "1976/05/01" "1976/06/01" "1976/07/01" "1976/08/01"  
## [81] "1976/09/01" "1976/10/01" "1976/11/01" "1976/12/01" "1977/01/01"  
## [86] "1977/02/01" "1977/03/01" "1977/04/01" "1977/05/01" "1977/06/01"  
## [91] "1977/07/01" "1977/08/01" "1977/09/01" "1977/10/01" "1977/11/01"  
## [96] "1977/12/01" "1978/01/01" "1978/02/01" "1978/03/01" "1978/04/01"  
## [101] "1978/05/01" "1978/06/01" "1978/07/01" "1978/08/01" "1978/09/01"  
## [106] "1978/10/01" "1978/11/01" "1978/12/01" "1979/01/01" "1979/02/01"  
## [111] "1979/03/01" "1979/04/01" "1979/05/01" "1979/06/01" "1979/07/01"  
## [116] "1979/08/01" "1979/09/01" "1979/10/01" "1979/11/01" "1979/12/01"  
## [121] "1980/01/01" "1980/02/01" "1980/03/01" "1980/04/01" "1980/05/01"  
## [126] "1980/06/01" "1980/07/01" "1980/08/01" "1980/09/01" "1980/10/01"  
## [131] "1980/11/01" "1980/12/01" "1981/01/01" "1981/02/01" "1981/03/01"  
## [136] "1981/04/01" "1981/05/01" "1981/06/01" "1981/07/01" "1981/08/01"  
## [141] "1981/09/01" "1981/10/01" "1981/11/01" "1981/12/01" "1982/01/01"  
## [146] "1982/02/01" "1982/03/01" "1982/04/01" "1982/05/01" "1982/06/01"  
## [151] "1982/07/01" "1982/08/01" "1982/09/01" "1982/10/01" "1982/11/01"  
## [156] "1982/12/01" "1983/01/01" "1983/02/01" "1983/03/01" "1983/04/01"  
## [161] "1983/05/01" "1983/06/01" "1983/07/01" "1983/08/01" "1983/09/01"  
## [166] "1983/10/01" "1983/11/01" "1983/12/01" "1984/01/01" "1984/02/01"  
## [171] "1984/03/01" "1984/04/01" "1984/05/01" "1984/06/01" "1984/07/01"  
## [176] "1984/08/01" "1984/09/01" "1984/10/01" "1984/11/01" "1984/12/01"  
## [181] "1985/01/01" "1985/02/01" "1985/03/01" "1985/04/01" "1985/05/01"  
## [186] "1985/06/01" "1985/07/01" "1985/08/01" "1985/09/01" "1985/10/01"  
## [191] "1985/11/01" "1985/12/01" "1986/01/01" "1986/02/01" "1986/03/01"  
## [196] "1986/04/01" "1986/05/01" "1986/06/01" "1986/07/01" "1986/08/01"  
## [201] "1986/09/01" "1986/10/01" "1986/11/01" "1986/12/01" "1987/01/01"  
## [206] "1987/02/01" "1987/03/01" "1987/04/01" "1987/05/01" "1987/06/01"  
## [211] "1987/07/01" "1987/08/01" "1987/09/01" "1987/10/01" "1987/11/01"  
## [216] "1987/12/01" "1988/01/01" "1988/02/01" "1988/03/01" "1988/04/01"  
## [221] "1988/05/01" "1988/06/01" "1988/07/01" "1988/08/01" "1988/09/01"  
## [226] "1988/10/01" "1988/11/01" "1988/12/01" "1989/01/01" "1989/02/01"  
## [231] "1989/03/01" "1989/04/01" "1989/05/01" "1989/06/01" "1989/07/01"  
## [236] "1989/08/01" "1989/09/01" "1989/10/01" "1989/11/01" "1989/12/01"  
## [241] "1990/01/01" "1990/02/01" "1990/03/01" "1990/04/01" "1990/05/01"  
## [246] "1990/06/01" "1990/07/01" "1990/08/01" "1990/09/01" "1990/10/01"  
## [251] "1990/11/01" "1990/12/01" "1991/01/01" "1991/02/01" "1991/03/01"  
## [256] "1991/04/01" "1991/05/01" "1991/06/01" "1991/07/01" "1991/08/01"  
## [261] "1991/09/01" "1991/10/01" "1991/11/01" "1991/12/01" "1992/01/01"  
## [266] "1992/02/01" "1992/03/01" "1992/04/01" "1992/05/01" "1992/06/01"  
## [271] "1992/07/01" "1992/08/01" "1992/09/01" "1992/10/01" "1992/11/01"  
## [276] "1992/12/01" "1993/01/01" "1993/02/01" "1993/03/01" "1993/04/01"  
## [281] "1993/05/01" "1993/06/01" "1993/07/01" "1993/08/01" "1993/09/01"  
## [286] "1993/10/01" "1993/11/01" "1993/12/01" "1994/01/01" "1994/02/01"  
## [291] "1994/03/01" "1994/04/01" "1994/05/01" "1994/06/01" "1994/07/01"  
## [296] "1994/08/01" "1994/09/01" "1994/10/01" "1994/11/01" "1994/12/01"  
## [301] "1995/01/01" "1995/02/01" "1995/03/01" "1995/04/01" "1995/05/01"  
## [306] "1995/06/01" "1995/07/01" "1995/08/01" "1995/09/01" "1995/10/01"  
## [311] "1995/11/01" "1995/12/01" "1996/01/01" "1996/02/01" "1996/03/01"  
## [316] "1996/04/01" "1996/05/01" "1996/06/01" "1996/07/01" "1996/08/01"  
## [321] "1996/09/01" "1996/10/01" "1996/11/01" "1996/12/01" "1997/01/01"  
## [326] "1997/02/01" "1997/03/01" "1997/04/01" "1997/05/01" "1997/06/01"  
## [331] "1997/07/01" "1997/08/01" "1997/09/01" "1997/10/01" "1997/11/01"  
## [336] "1997/12/01" "1998/01/01" "1998/02/01" "1998/03/01" "1998/04/01"  
## [341] "1998/05/01" "1998/06/01" "1998/07/01" "1998/08/01" "1998/09/01"  
## [346] "1998/10/01" "1998/11/01" "1998/12/01" "1999/01/01" "1999/02/01"  
## [351] "1999/03/01" "1999/04/01" "1999/05/01" "1999/06/01" "1999/07/01"  
## [356] "1999/08/01" "1999/09/01" "1999/10/01" "1999/11/01" "1999/12/01"  
## [361] "2000/01/01" "2000/02/01" "2000/03/01" "2000/04/01" "2000/05/01"  
## [366] "2000/06/01" "2000/07/01" "2000/08/01" "2000/09/01" "2000/10/01"  
## [371] "2000/11/01" "2000/12/01" "2001/01/01" "2001/02/01" "2001/03/01"  
## [376] "2001/04/01" "2001/05/01" "2001/06/01" "2001/07/01" "2001/08/01"  
## [381] "2001/09/01" "2001/10/01" "2001/11/01" "2001/12/01" "2002/01/01"  
## [386] "2002/02/01" "2002/03/01" "2002/04/01" "2002/05/01" "2002/06/01"  
## [391] "2002/07/01" "2002/08/01" "2002/09/01" "2002/10/01" "2002/11/01"  
## [396] "2002/12/01" "2003/01/01" "2003/02/01" "2003/03/01" "2003/04/01"  
## [401] "2003/05/01" "2003/06/01" "2003/07/01" "2003/08/01" "2003/09/01"  
## [406] "2003/10/01" "2003/11/01" "2003/12/01" "2004/01/01" "2004/02/01"  
## [411] "2004/03/01" "2004/04/01" "2004/05/01" "2004/06/01" "2004/07/01"  
## [416] "2004/08/01" "2004/09/01" "2004/10/01" "2004/11/01" "2004/12/01"  
## [421] "2005/01/01" "2005/02/01" "2005/03/01" "2005/04/01" "2005/05/01"  
## [426] "2005/06/01" "2005/07/01" "2005/08/01" "2005/09/01" "2005/10/01"  
## [431] "2005/11/01" "2005/12/01" "2006/01/01" "2006/02/01" "2006/03/01"  
## [436] "2006/04/01" "2006/05/01" "2006/06/01" "2006/07/01" "2006/08/01"  
## [441] "2006/09/01" "2006/10/01" "2006/11/01" "2006/12/01" "2007/01/01"  
## [446] "2007/02/01" "2007/03/01" "2007/04/01" "2007/05/01" "2007/06/01"  
## [451] "2007/07/01" "2007/08/01" "2007/09/01" "2007/10/01" "2007/11/01"  
## [456] "2007/12/01" "2008/01/01" "2008/02/01" "2008/03/01" "2008/04/01"  
## [461] "2008/05/01" "2008/06/01" "2008/07/01" "2008/08/01" "2008/09/01"  
## [466] "2008/10/01" "2008/11/01" "2008/12/01" "2009/01/01" "2009/02/01"  
## [471] "2009/03/01" "2009/04/01" "2009/05/01" "2009/06/01" "2009/07/01"  
## [476] "2009/08/01" "2009/09/01" "2009/10/01" "2009/11/01" "2009/12/01"  
## [481] "2010/01/01" "2010/02/01" "2010/03/01" "2010/04/01" "2010/05/01"  
## [486] "2010/06/01" "2010/07/01" "2010/08/01" "2010/09/01" "2010/10/01"  
## [491] "2010/11/01" "2010/12/01" "2011/01/01" "2011/02/01" "2011/03/01"  
## [496] "2011/04/01" "2011/05/01" "2011/06/01" "2011/07/01" "2011/08/01"  
## [501] "2011/09/01" "2011/10/01" "2011/11/01" "2011/12/01" "2012/01/01"  
## [506] "2012/02/01" "2012/03/01" "2012/04/01" "2012/05/01" "2012/06/01"  
## [511] "2012/07/01" "2012/08/01" "2012/09/01" "2012/10/01" "2012/11/01"  
## [516] "2012/12/01" "2013/01/01" "2013/02/01" "2013/03/01" "2013/04/01"  
## [521] "2013/05/01" "2013/06/01" "2013/07/01" "2013/08/01" "2013/09/01"  
## [526] "2013/10/01" "2013/11/01" "2013/12/01" "2014/01/01" "2014/02/01"  
## [531] "2014/03/01" "2014/04/01" "2014/05/01" "2014/06/01" "2014/07/01"  
## [536] "2014/08/01" "2014/09/01" "2014/10/01" "2014/11/01" "2014/12/01"  
## [541] "2015/01/01" "2015/02/01" "2015/03/01" "2015/04/01" "2015/05/01"  
## [546] "2015/06/01" "2015/07/01" "2015/08/01" "2015/09/01" "2015/10/01"  
## [551] "2015/11/01" "2015/12/01" "2016/01/01" "2016/02/01" "2016/03/01"  
## [556] "2016/04/01" "2016/05/01" "2016/06/01" "2016/07/01" "2016/08/01"  
## [561] "2016/09/01" "2016/10/01" "2016/11/01" "2016/12/01" "2017/01/01"  
## [566] "2017/02/01" "2017/03/01" "2017/04/01" "2017/05/01" "2017/06/01"  
## [571] "2017/07/01" "2017/08/01" "2017/09/01" "2017/10/01" "2017/11/01"  
## [576] "2017/12/01" "2018/01/01" "2018/02/01" "2018/03/01" "2018/04/01"  
## [581] "2018/05/01" "2018/06/01" "2018/07/01" "2018/08/01"

cci\_index$DATE <- as.Date(date, "%Y/%m/%d")  
  
# 5. unemploymenet  
unemployment <- read.csv('./data/unemploymenet.csv', header=F, stringsAsFactors = F)  
class(unemployment)

## [1] "data.frame"

head(unemployment)

## V1 V2  
## 1 2000/01 5.2  
## 2 2000/02 4.8  
## 3 2000/03 4.5  
## 4 2000/04 4.4  
## 5 2000/05 4.3  
## 6 2000/06 4.1

str(unemployment)

## 'data.frame': 224 obs. of 2 variables:  
## $ V1: chr "2000/01" "2000/02" "2000/03" "2000/04" ...  
## $ V2: num 5.2 4.8 4.5 4.4 4.3 4.1 4.1 4.2 4.4 4.1 ...

colnames(unemployment) <- c('DATE', 'UNEMPLOYMENT')  
  
date <- paste0(unemployment$DATE,"/01")  
date

## [1] "2000/01/01" "2000/02/01" "2000/03/01" "2000/04/01" "2000/05/01"  
## [6] "2000/06/01" "2000/07/01" "2000/08/01" "2000/09/01" "2000/10/01"  
## [11] "2000/11/01" "2000/12/01" "2001/01/01" "2001/02/01" "2001/03/01"  
## [16] "2001/04/01" "2001/05/01" "2001/06/01" "2001/07/01" "2001/08/01"  
## [21] "2001/09/01" "2001/10/01" "2001/11/01" "2001/12/01" "2002/01/01"  
## [26] "2002/02/01" "2002/03/01" "2002/04/01" "2002/05/01" "2002/06/01"  
## [31] "2002/07/01" "2002/08/01" "2002/09/01" "2002/10/01" "2002/11/01"  
## [36] "2002/12/01" "2003/01/01" "2003/02/01" "2003/03/01" "2003/04/01"  
## [41] "2003/05/01" "2003/06/01" "2003/07/01" "2003/08/01" "2003/09/01"  
## [46] "2003/10/01" "2003/11/01" "2003/12/01" "2004/01/01" "2004/02/01"  
## [51] "2004/03/01" "2004/04/01" "2004/05/01" "2004/06/01" "2004/07/01"  
## [56] "2004/08/01" "2004/09/01" "2004/10/01" "2004/11/01" "2004/12/01"  
## [61] "2005/01/01" "2005/02/01" "2005/03/01" "2005/04/01" "2005/05/01"  
## [66] "2005/06/01" "2005/07/01" "2005/08/01" "2005/09/01" "2005/10/01"  
## [71] "2005/11/01" "2005/12/01" "2006/01/01" "2006/02/01" "2006/03/01"  
## [76] "2006/04/01" "2006/05/01" "2006/06/01" "2006/07/01" "2006/08/01"  
## [81] "2006/09/01" "2006/10/01" "2006/11/01" "2006/12/01" "2007/01/01"  
## [86] "2007/02/01" "2007/03/01" "2007/04/01" "2007/05/01" "2007/06/01"  
## [91] "2007/07/01" "2007/08/01" "2007/09/01" "2007/10/01" "2007/11/01"  
## [96] "2007/12/01" "2008/01/01" "2008/02/01" "2008/03/01" "2008/04/01"  
## [101] "2008/05/01" "2008/06/01" "2008/07/01" "2008/08/01" "2008/09/01"  
## [106] "2008/10/01" "2008/11/01" "2008/12/01" "2009/01/01" "2009/02/01"  
## [111] "2009/03/01" "2009/04/01" "2009/05/01" "2009/06/01" "2009/07/01"  
## [116] "2009/08/01" "2009/09/01" "2009/10/01" "2009/11/01" "2009/12/01"  
## [121] "2010/01/01" "2010/02/01" "2010/03/01" "2010/04/01" "2010/05/01"  
## [126] "2010/06/01" "2010/07/01" "2010/08/01" "2010/09/01" "2010/10/01"  
## [131] "2010/11/01" "2010/12/01" "2011/01/01" "2011/02/01" "2011/03/01"  
## [136] "2011/04/01" "2011/05/01" "2011/06/01" "2011/07/01" "2011/08/01"  
## [141] "2011/09/01" "2011/10/01" "2011/11/01" "2011/12/01" "2012/01/01"  
## [146] "2012/02/01" "2012/03/01" "2012/04/01" "2012/05/01" "2012/06/01"  
## [151] "2012/07/01" "2012/08/01" "2012/09/01" "2012/10/01" "2012/11/01"  
## [156] "2012/12/01" "2013/01/01" "2013/02/01" "2013/03/01" "2013/04/01"  
## [161] "2013/05/01" "2013/06/01" "2013/07/01" "2013/08/01" "2013/09/01"  
## [166] "2013/10/01" "2013/11/01" "2013/12/01" "2014/01/01" "2014/02/01"  
## [171] "2014/03/01" "2014/04/01" "2014/05/01" "2014/06/01" "2014/07/01"  
## [176] "2014/08/01" "2014/09/01" "2014/10/01" "2014/11/01" "2014/12/01"  
## [181] "2015/01/01" "2015/02/01" "2015/03/01" "2015/04/01" "2015/05/01"  
## [186] "2015/06/01" "2015/07/01" "2015/08/01" "2015/09/01" "2015/10/01"  
## [191] "2015/11/01" "2015/12/01" "2016/01/01" "2016/02/01" "2016/03/01"  
## [196] "2016/04/01" "2016/05/01" "2016/06/01" "2016/07/01" "2016/08/01"  
## [201] "2016/09/01" "2016/10/01" "2016/11/01" "2016/12/01" "2017/01/01"  
## [206] "2017/02/01" "2017/03/01" "2017/04/01" "2017/05/01" "2017/06/01"  
## [211] "2017/07/01" "2017/08/01" "2017/09/01" "2017/10/01" "2017/11/01"  
## [216] "2017/12/01" "2018/01/01" "2018/02/01" "2018/03/01" "2018/04/01"  
## [221] "2018/05/01" "2018/06/01" "2018/07/01" "2018/08/01"

unemployment$DATE <- as.Date(date, "%Y/%m/%d")  
  
# 6. inflation  
inflation <- read.csv('./data/inflation.csv', header=F, stringsAsFactors = F)  
class(inflation)

## [1] "data.frame"

head(inflation)

## V1 V2  
## 1 1980/01 25.4  
## 2 1980/02 26.4  
## 3 1980/03 28.8  
## 4 1980/04 26.6  
## 5 1980/05 26.6  
## 6 1980/06 27.0

str(inflation)

## 'data.frame': 465 obs. of 2 variables:  
## $ V1: chr "1980/01" "1980/02" "1980/03" "1980/04" ...  
## $ V2: num 25.4 26.4 28.8 26.6 26.6 27 27.5 29.2 29.8 32.5 ...

colnames(inflation) <- c('DATE', 'INFLATION')  
  
date <- paste0(inflation$DATE,"/01")  
date

## [1] "1980/01/01" "1980/02/01" "1980/03/01" "1980/04/01" "1980/05/01"  
## [6] "1980/06/01" "1980/07/01" "1980/08/01" "1980/09/01" "1980/10/01"  
## [11] "1980/11/01" "1980/12/01" "1981/01/01" "1981/02/01" "1981/03/01"  
## [16] "1981/04/01" "1981/05/01" "1981/06/01" "1981/07/01" "1981/08/01"  
## [21] "1981/09/01" "1981/10/01" "1981/11/01" "1981/12/01" "1982/01/01"  
## [26] "1982/02/01" "1982/03/01" "1982/04/01" "1982/05/01" "1982/06/01"  
## [31] "1982/07/01" "1982/08/01" "1982/09/01" "1982/10/01" "1982/11/01"  
## [36] "1982/12/01" "1983/01/01" "1983/02/01" "1983/03/01" "1983/04/01"  
## [41] "1983/05/01" "1983/06/01" "1983/07/01" "1983/08/01" "1983/09/01"  
## [46] "1983/10/01" "1983/11/01" "1983/12/01" "1984/01/01" "1984/02/01"  
## [51] "1984/03/01" "1984/04/01" "1984/05/01" "1984/06/01" "1984/07/01"  
## [56] "1984/08/01" "1984/09/01" "1984/10/01" "1984/11/01" "1984/12/01"  
## [61] "1985/01/01" "1985/02/01" "1985/03/01" "1985/04/01" "1985/05/01"  
## [66] "1985/06/01" "1985/07/01" "1985/08/01" "1985/09/01" "1985/10/01"  
## [71] "1985/11/01" "1985/12/01" "1986/01/01" "1986/02/01" "1986/03/01"  
## [76] "1986/04/01" "1986/05/01" "1986/06/01" "1986/07/01" "1986/08/01"  
## [81] "1986/09/01" "1986/10/01" "1986/11/01" "1986/12/01" "1987/01/01"  
## [86] "1987/02/01" "1987/03/01" "1987/04/01" "1987/05/01" "1987/06/01"  
## [91] "1987/07/01" "1987/08/01" "1987/09/01" "1987/10/01" "1987/11/01"  
## [96] "1987/12/01" "1988/01/01" "1988/02/01" "1988/03/01" "1988/04/01"  
## [101] "1988/05/01" "1988/06/01" "1988/07/01" "1988/08/01" "1988/09/01"  
## [106] "1988/10/01" "1988/11/01" "1988/12/01" "1989/01/01" "1989/02/01"  
## [111] "1989/03/01" "1989/04/01" "1989/05/01" "1989/06/01" "1989/07/01"  
## [116] "1989/08/01" "1989/09/01" "1989/10/01" "1989/11/01" "1989/12/01"  
## [121] "1990/01/01" "1990/02/01" "1990/03/01" "1990/04/01" "1990/05/01"  
## [126] "1990/06/01" "1990/07/01" "1990/08/01" "1990/09/01" "1990/10/01"  
## [131] "1990/11/01" "1990/12/01" "1991/01/01" "1991/02/01" "1991/03/01"  
## [136] "1991/04/01" "1991/05/01" "1991/06/01" "1991/07/01" "1991/08/01"  
## [141] "1991/09/01" "1991/10/01" "1991/11/01" "1991/12/01" "1992/01/01"  
## [146] "1992/02/01" "1992/03/01" "1992/04/01" "1992/05/01" "1992/06/01"  
## [151] "1992/07/01" "1992/08/01" "1992/09/01" "1992/10/01" "1992/11/01"  
## [156] "1992/12/01" "1993/01/01" "1993/02/01" "1993/03/01" "1993/04/01"  
## [161] "1993/05/01" "1993/06/01" "1993/07/01" "1993/08/01" "1993/09/01"  
## [166] "1993/10/01" "1993/11/01" "1993/12/01" "1994/01/01" "1994/02/01"  
## [171] "1994/03/01" "1994/04/01" "1994/05/01" "1994/06/01" "1994/07/01"  
## [176] "1994/08/01" "1994/09/01" "1994/10/01" "1994/11/01" "1994/12/01"  
## [181] "1995/01/01" "1995/02/01" "1995/03/01" "1995/04/01" "1995/05/01"  
## [186] "1995/06/01" "1995/07/01" "1995/08/01" "1995/09/01" "1995/10/01"  
## [191] "1995/11/01" "1995/12/01" "1996/01/01" "1996/02/01" "1996/03/01"  
## [196] "1996/04/01" "1996/05/01" "1996/06/01" "1996/07/01" "1996/08/01"  
## [201] "1996/09/01" "1996/10/01" "1996/11/01" "1996/12/01" "1997/01/01"  
## [206] "1997/02/01" "1997/03/01" "1997/04/01" "1997/05/01" "1997/06/01"  
## [211] "1997/07/01" "1997/08/01" "1997/09/01" "1997/10/01" "1997/11/01"  
## [216] "1997/12/01" "1998/01/01" "1998/02/01" "1998/03/01" "1998/04/01"  
## [221] "1998/05/01" "1998/06/01" "1998/07/01" "1998/08/01" "1998/09/01"  
## [226] "1998/10/01" "1998/11/01" "1998/12/01" "1999/01/01" "1999/02/01"  
## [231] "1999/03/01" "1999/04/01" "1999/05/01" "1999/06/01" "1999/07/01"  
## [236] "1999/08/01" "1999/09/01" "1999/10/01" "1999/11/01" "1999/12/01"  
## [241] "2000/01/01" "2000/02/01" "2000/03/01" "2000/04/01" "2000/05/01"  
## [246] "2000/06/01" "2000/07/01" "2000/08/01" "2000/09/01" "2000/10/01"  
## [251] "2000/11/01" "2000/12/01" "2001/01/01" "2001/02/01" "2001/03/01"  
## [256] "2001/04/01" "2001/05/01" "2001/06/01" "2001/07/01" "2001/08/01"  
## [261] "2001/09/01" "2001/10/01" "2001/11/01" "2001/12/01" "2002/01/01"  
## [266] "2002/02/01" "2002/03/01" "2002/04/01" "2002/05/01" "2002/06/01"  
## [271] "2002/07/01" "2002/08/01" "2002/09/01" "2002/10/01" "2002/11/01"  
## [276] "2002/12/01" "2003/01/01" "2003/02/01" "2003/03/01" "2003/04/01"  
## [281] "2003/05/01" "2003/06/01" "2003/07/01" "2003/08/01" "2003/09/01"  
## [286] "2003/10/01" "2003/11/01" "2003/12/01" "2004/01/01" "2004/02/01"  
## [291] "2004/03/01" "2004/04/01" "2004/05/01" "2004/06/01" "2004/07/01"  
## [296] "2004/08/01" "2004/09/01" "2004/10/01" "2004/11/01" "2004/12/01"  
## [301] "2005/01/01" "2005/02/01" "2005/03/01" "2005/04/01" "2005/05/01"  
## [306] "2005/06/01" "2005/07/01" "2005/08/01" "2005/09/01" "2005/10/01"  
## [311] "2005/11/01" "2005/12/01" "2006/01/01" "2006/02/01" "2006/03/01"  
## [316] "2006/04/01" "2006/05/01" "2006/06/01" "2006/07/01" "2006/08/01"  
## [321] "2006/09/01" "2006/10/01" "2006/11/01" "2006/12/01" "2007/01/01"  
## [326] "2007/02/01" "2007/03/01" "2007/04/01" "2007/05/01" "2007/06/01"  
## [331] "2007/07/01" "2007/08/01" "2007/09/01" "2007/10/01" "2007/11/01"  
## [336] "2007/12/01" "2008/01/01" "2008/02/01" "2008/03/01" "2008/04/01"  
## [341] "2008/05/01" "2008/06/01" "2008/07/01" "2008/08/01" "2008/09/01"  
## [346] "2008/10/01" "2008/11/01" "2008/12/01" "2009/01/01" "2009/02/01"  
## [351] "2009/03/01" "2009/04/01" "2009/05/01" "2009/06/01" "2009/07/01"  
## [356] "2009/08/01" "2009/09/01" "2009/10/01" "2009/11/01" "2009/12/01"  
## [361] "2010/01/01" "2010/02/01" "2010/03/01" "2010/04/01" "2010/05/01"  
## [366] "2010/06/01" "2010/07/01" "2010/08/01" "2010/09/01" "2010/10/01"  
## [371] "2010/11/01" "2010/12/01" "2011/01/01" "2011/02/01" "2011/03/01"  
## [376] "2011/04/01" "2011/05/01" "2011/06/01" "2011/07/01" "2011/08/01"  
## [381] "2011/09/01" "2011/10/01" "2011/11/01" "2011/12/01" "2012/01/01"  
## [386] "2012/02/01" "2012/03/01" "2012/04/01" "2012/05/01" "2012/06/01"  
## [391] "2012/07/01" "2012/08/01" "2012/09/01" "2012/10/01" "2012/11/01"  
## [396] "2012/12/01" "2013/01/01" "2013/02/01" "2013/03/01" "2013/04/01"  
## [401] "2013/05/01" "2013/06/01" "2013/07/01" "2013/08/01" "2013/09/01"  
## [406] "2013/10/01" "2013/11/01" "2013/12/01" "2014/01/01" "2014/02/01"  
## [411] "2014/03/01" "2014/04/01" "2014/05/01" "2014/06/01" "2014/07/01"  
## [416] "2014/08/01" "2014/09/01" "2014/10/01" "2014/11/01" "2014/12/01"  
## [421] "2015/01/01" "2015/02/01" "2015/03/01" "2015/04/01" "2015/05/01"  
## [426] "2015/06/01" "2015/07/01" "2015/08/01" "2015/09/01" "2015/10/01"  
## [431] "2015/11/01" "2015/12/01" "2016/01/01" "2016/02/01" "2016/03/01"  
## [436] "2016/04/01" "2016/05/01" "2016/06/01" "2016/07/01" "2016/08/01"  
## [441] "2016/09/01" "2016/10/01" "2016/11/01" "2016/12/01" "2017/01/01"  
## [446] "2017/02/01" "2017/03/01" "2017/04/01" "2017/05/01" "2017/06/01"  
## [451] "2017/07/01" "2017/08/01" "2017/09/01" "2017/10/01" "2017/11/01"  
## [456] "2017/12/01" "2018/01/01" "2018/02/01" "2018/03/01" "2018/04/01"  
## [461] "2018/05/01" "2018/06/01" "2018/07/01" "2018/08/01" "2018/09/01"

inflation$DATE <- as.Date(date, "%Y/%m/%d")  
  
# 7. import pirce index  
korea\_import\_price\_index <- read.csv('./data/korea\_import\_price\_index.csv', header=F, stringsAsFactors = F)  
class(korea\_import\_price\_index)

## [1] "data.frame"

head(korea\_import\_price\_index)

## V1 V2  
## 1 1991/01 65.73  
## 2 1991/02 64.31  
## 3 1991/03 62.38  
## 4 1991/04 62.12  
## 5 1991/05 61.68  
## 6 1991/06 61.20

str(korea\_import\_price\_index)

## 'data.frame': 332 obs. of 2 variables:  
## $ V1: chr "1991/01" "1991/02" "1991/03" "1991/04" ...  
## $ V2: num 65.7 64.3 62.4 62.1 61.7 ...

colnames(korea\_import\_price\_index) <- c('DATE', 'IMPORT')  
  
date <- paste0(korea\_import\_price\_index$DATE,"/01")  
date

## [1] "1991/01/01" "1991/02/01" "1991/03/01" "1991/04/01" "1991/05/01"  
## [6] "1991/06/01" "1991/07/01" "1991/08/01" "1991/09/01" "1991/10/01"  
## [11] "1991/11/01" "1991/12/01" "1992/01/01" "1992/02/01" "1992/03/01"  
## [16] "1992/04/01" "1992/05/01" "1992/06/01" "1992/07/01" "1992/08/01"  
## [21] "1992/09/01" "1992/10/01" "1992/11/01" "1992/12/01" "1993/01/01"  
## [26] "1993/02/01" "1993/03/01" "1993/04/01" "1993/05/01" "1993/06/01"  
## [31] "1993/07/01" "1993/08/01" "1993/09/01" "1993/10/01" "1993/11/01"  
## [36] "1993/12/01" "1994/01/01" "1994/02/01" "1994/03/01" "1994/04/01"  
## [41] "1994/05/01" "1994/06/01" "1994/07/01" "1994/08/01" "1994/09/01"  
## [46] "1994/10/01" "1994/11/01" "1994/12/01" "1995/01/01" "1995/02/01"  
## [51] "1995/03/01" "1995/04/01" "1995/05/01" "1995/06/01" "1995/07/01"  
## [56] "1995/08/01" "1995/09/01" "1995/10/01" "1995/11/01" "1995/12/01"  
## [61] "1996/01/01" "1996/02/01" "1996/03/01" "1996/04/01" "1996/05/01"  
## [66] "1996/06/01" "1996/07/01" "1996/08/01" "1996/09/01" "1996/10/01"  
## [71] "1996/11/01" "1996/12/01" "1997/01/01" "1997/02/01" "1997/03/01"  
## [76] "1997/04/01" "1997/05/01" "1997/06/01" "1997/07/01" "1997/08/01"  
## [81] "1997/09/01" "1997/10/01" "1997/11/01" "1997/12/01" "1998/01/01"  
## [86] "1998/02/01" "1998/03/01" "1998/04/01" "1998/05/01" "1998/06/01"  
## [91] "1998/07/01" "1998/08/01" "1998/09/01" "1998/10/01" "1998/11/01"  
## [96] "1998/12/01" "1999/01/01" "1999/02/01" "1999/03/01" "1999/04/01"  
## [101] "1999/05/01" "1999/06/01" "1999/07/01" "1999/08/01" "1999/09/01"  
## [106] "1999/10/01" "1999/11/01" "1999/12/01" "2000/01/01" "2000/02/01"  
## [111] "2000/03/01" "2000/04/01" "2000/05/01" "2000/06/01" "2000/07/01"  
## [116] "2000/08/01" "2000/09/01" "2000/10/01" "2000/11/01" "2000/12/01"  
## [121] "2001/01/01" "2001/02/01" "2001/03/01" "2001/04/01" "2001/05/01"  
## [126] "2001/06/01" "2001/07/01" "2001/08/01" "2001/09/01" "2001/10/01"  
## [131] "2001/11/01" "2001/12/01" "2002/01/01" "2002/02/01" "2002/03/01"  
## [136] "2002/04/01" "2002/05/01" "2002/06/01" "2002/07/01" "2002/08/01"  
## [141] "2002/09/01" "2002/10/01" "2002/11/01" "2002/12/01" "2003/01/01"  
## [146] "2003/02/01" "2003/03/01" "2003/04/01" "2003/05/01" "2003/06/01"  
## [151] "2003/07/01" "2003/08/01" "2003/09/01" "2003/10/01" "2003/11/01"  
## [156] "2003/12/01" "2004/01/01" "2004/02/01" "2004/03/01" "2004/04/01"  
## [161] "2004/05/01" "2004/06/01" "2004/07/01" "2004/08/01" "2004/09/01"  
## [166] "2004/10/01" "2004/11/01" "2004/12/01" "2005/01/01" "2005/02/01"  
## [171] "2005/03/01" "2005/04/01" "2005/05/01" "2005/06/01" "2005/07/01"  
## [176] "2005/08/01" "2005/09/01" "2005/10/01" "2005/11/01" "2005/12/01"  
## [181] "2006/01/01" "2006/02/01" "2006/03/01" "2006/04/01" "2006/05/01"  
## [186] "2006/06/01" "2006/07/01" "2006/08/01" "2006/09/01" "2006/10/01"  
## [191] "2006/11/01" "2006/12/01" "2007/01/01" "2007/02/01" "2007/03/01"  
## [196] "2007/04/01" "2007/05/01" "2007/06/01" "2007/07/01" "2007/08/01"  
## [201] "2007/09/01" "2007/10/01" "2007/11/01" "2007/12/01" "2008/01/01"  
## [206] "2008/02/01" "2008/03/01" "2008/04/01" "2008/05/01" "2008/06/01"  
## [211] "2008/07/01" "2008/08/01" "2008/09/01" "2008/10/01" "2008/11/01"  
## [216] "2008/12/01" "2009/01/01" "2009/02/01" "2009/03/01" "2009/04/01"  
## [221] "2009/05/01" "2009/06/01" "2009/07/01" "2009/08/01" "2009/09/01"  
## [226] "2009/10/01" "2009/11/01" "2009/12/01" "2010/01/01" "2010/02/01"  
## [231] "2010/03/01" "2010/04/01" "2010/05/01" "2010/06/01" "2010/07/01"  
## [236] "2010/08/01" "2010/09/01" "2010/10/01" "2010/11/01" "2010/12/01"  
## [241] "2011/01/01" "2011/02/01" "2011/03/01" "2011/04/01" "2011/05/01"  
## [246] "2011/06/01" "2011/07/01" "2011/08/01" "2011/09/01" "2011/10/01"  
## [251] "2011/11/01" "2011/12/01" "2012/01/01" "2012/02/01" "2012/03/01"  
## [256] "2012/04/01" "2012/05/01" "2012/06/01" "2012/07/01" "2012/08/01"  
## [261] "2012/09/01" "2012/10/01" "2012/11/01" "2012/12/01" "2013/01/01"  
## [266] "2013/02/01" "2013/03/01" "2013/04/01" "2013/05/01" "2013/06/01"  
## [271] "2013/07/01" "2013/08/01" "2013/09/01" "2013/10/01" "2013/11/01"  
## [276] "2013/12/01" "2014/01/01" "2014/02/01" "2014/03/01" "2014/04/01"  
## [281] "2014/05/01" "2014/06/01" "2014/07/01" "2014/08/01" "2014/09/01"  
## [286] "2014/10/01" "2014/11/01" "2014/12/01" "2015/01/01" "2015/02/01"  
## [291] "2015/03/01" "2015/04/01" "2015/05/01" "2015/06/01" "2015/07/01"  
## [296] "2015/08/01" "2015/09/01" "2015/10/01" "2015/11/01" "2015/12/01"  
## [301] "2016/01/01" "2016/02/01" "2016/03/01" "2016/04/01" "2016/05/01"  
## [306] "2016/06/01" "2016/07/01" "2016/08/01" "2016/09/01" "2016/10/01"  
## [311] "2016/11/01" "2016/12/01" "2017/01/01" "2017/02/01" "2017/03/01"  
## [316] "2017/04/01" "2017/05/01" "2017/06/01" "2017/07/01" "2017/08/01"  
## [321] "2017/09/01" "2017/10/01" "2017/11/01" "2017/12/01" "2018/01/01"  
## [326] "2018/02/01" "2018/03/01" "2018/04/01" "2018/05/01" "2018/06/01"  
## [331] "2018/07/01" "2018/08/01"

korea\_import\_price\_index$DATE <- as.Date(date, "%Y/%m/%d")  
  
# 8. wti\_price  
wti\_price <- read.csv('./data/wti\_price.csv', header=F, stringsAsFactors = F)  
class(wti\_price)

## [1] "data.frame"

head(wti\_price)

## V1 V2  
## 1 1986-01-01 22.92545  
## 2 1986-02-01 15.45474  
## 3 1986-03-01 12.61250  
## 4 1986-04-01 12.84364  
## 5 1986-05-01 15.37762  
## 6 1986-06-01 13.42571

str(wti\_price)

## 'data.frame': 393 obs. of 2 variables:  
## $ V1: chr "1986-01-01" "1986-02-01" "1986-03-01" "1986-04-01" ...  
## $ V2: num 22.9 15.5 12.6 12.8 15.4 ...

colnames(wti\_price) <- c('DATE', 'WTI\_PRICE')  
  
wti\_price$DATE <- as.Date(wti\_price$DATE, "%Y-%m-%d")  
  
# 9. foreign\_selling  
foreign\_selling <- read.csv('./data/foreign\_selling.csv', header=F, stringsAsFactors = F)  
class(foreign\_selling)

## [1] "data.frame"

head(foreign\_selling)

## V1 V2  
## 1 2004/01 8,627,254  
## 2 2004/02 9,318,221  
## 3 2004/03 9,779,445  
## 4 2004/04 12,065,303  
## 5 2004/05 11,141,908  
## 6 2004/06 10,700,866

str(foreign\_selling)

## 'data.frame': 176 obs. of 2 variables:  
## $ V1: chr "2004/01" "2004/02" "2004/03" "2004/04" ...  
## $ V2: chr "8,627,254" "9,318,221" "9,779,445" "12,065,303" ...

colnames(foreign\_selling) <- c('DATE', 'SELLING')  
  
date <- paste0(foreign\_selling$DATE,"/01")  
date

## [1] "2004/01/01" "2004/02/01" "2004/03/01" "2004/04/01" "2004/05/01"  
## [6] "2004/06/01" "2004/07/01" "2004/08/01" "2004/09/01" "2004/10/01"  
## [11] "2004/11/01" "2004/12/01" "2005/01/01" "2005/02/01" "2005/03/01"  
## [16] "2005/04/01" "2005/05/01" "2005/06/01" "2005/07/01" "2005/08/01"  
## [21] "2005/09/01" "2005/10/01" "2005/11/01" "2005/12/01" "2006/01/01"  
## [26] "2006/02/01" "2006/03/01" "2006/04/01" "2006/05/01" "2006/06/01"  
## [31] "2006/07/01" "2006/08/01" "2006/09/01" "2006/10/01" "2006/11/01"  
## [36] "2006/12/01" "2007/01/01" "2007/02/01" "2007/03/01" "2007/04/01"  
## [41] "2007/05/01" "2007/06/01" "2007/07/01" "2007/08/01" "2007/09/01"  
## [46] "2007/10/01" "2007/11/01" "2007/12/01" "2008/01/01" "2008/02/01"  
## [51] "2008/03/01" "2008/04/01" "2008/05/01" "2008/06/01" "2008/07/01"  
## [56] "2008/08/01" "2008/09/01" "2008/10/01" "2008/11/01" "2008/12/01"  
## [61] "2009/01/01" "2009/02/01" "2009/03/01" "2009/04/01" "2009/05/01"  
## [66] "2009/06/01" "2009/07/01" "2009/08/01" "2009/09/01" "2009/10/01"  
## [71] "2009/11/01" "2009/12/01" "2010/01/01" "2010/02/01" "2010/03/01"  
## [76] "2010/04/01" "2010/05/01" "2010/06/01" "2010/07/01" "2010/08/01"  
## [81] "2010/09/01" "2010/10/01" "2010/11/01" "2010/12/01" "2011/01/01"  
## [86] "2011/02/01" "2011/03/01" "2011/04/01" "2011/05/01" "2011/06/01"  
## [91] "2011/07/01" "2011/08/01" "2011/09/01" "2011/10/01" "2011/11/01"  
## [96] "2011/12/01" "2012/01/01" "2012/02/01" "2012/03/01" "2012/04/01"  
## [101] "2012/05/01" "2012/06/01" "2012/07/01" "2012/08/01" "2012/09/01"  
## [106] "2012/10/01" "2012/11/01" "2012/12/01" "2013/01/01" "2013/02/01"  
## [111] "2013/03/01" "2013/04/01" "2013/05/01" "2013/06/01" "2013/07/01"  
## [116] "2013/08/01" "2013/09/01" "2013/10/01" "2013/11/01" "2013/12/01"  
## [121] "2014/01/01" "2014/02/01" "2014/03/01" "2014/04/01" "2014/05/01"  
## [126] "2014/06/01" "2014/07/01" "2014/08/01" "2014/09/01" "2014/10/01"  
## [131] "2014/11/01" "2014/12/01" "2015/01/01" "2015/02/01" "2015/03/01"  
## [136] "2015/04/01" "2015/05/01" "2015/06/01" "2015/07/01" "2015/08/01"  
## [141] "2015/09/01" "2015/10/01" "2015/11/01" "2015/12/01" "2016/01/01"  
## [146] "2016/02/01" "2016/03/01" "2016/04/01" "2016/05/01" "2016/06/01"  
## [151] "2016/07/01" "2016/08/01" "2016/09/01" "2016/10/01" "2016/11/01"  
## [156] "2016/12/01" "2017/01/01" "2017/02/01" "2017/03/01" "2017/04/01"  
## [161] "2017/05/01" "2017/06/01" "2017/07/01" "2017/08/01" "2017/09/01"  
## [166] "2017/10/01" "2017/11/01" "2017/12/01" "2018/01/01" "2018/02/01"  
## [171] "2018/03/01" "2018/04/01" "2018/05/01" "2018/06/01" "2018/07/01"  
## [176] "2018/08/01"

foreign\_selling$DATE <- as.Date(date, "%Y/%m/%d")  
foreign\_selling$SELLING <- as.numeric(gsub(",","",foreign\_selling$SELLING))  
  
# 10. korea\_export\_price\_index  
korea\_export\_price\_index <- read.csv('./data/korea\_export\_price\_index.csv', header=F, stringsAsFactors = F)  
class(korea\_export\_price\_index)

## [1] "data.frame"

head(korea\_export\_price\_index)

## V1 V2  
## 1 1989/01 10.4  
## 2 1989/02 4.7  
## 3 1989/03 11.0  
## 4 1989/04 2.5  
## 5 1989/05 5.5  
## 6 1989/06 7.2

str(korea\_export\_price\_index)

## 'data.frame': 356 obs. of 2 variables:  
## $ V1: chr "1989/01" "1989/02" "1989/03" "1989/04" ...  
## $ V2: num 10.4 4.7 11 2.5 5.5 7.2 -2 3.9 1.9 0.1 ...

colnames(korea\_export\_price\_index) <- c('DATE', 'EXPORT')  
  
date <- paste0(korea\_export\_price\_index$DATE,"/01")  
date

## [1] "1989/01/01" "1989/02/01" "1989/03/01" "1989/04/01" "1989/05/01"  
## [6] "1989/06/01" "1989/07/01" "1989/08/01" "1989/09/01" "1989/10/01"  
## [11] "1989/11/01" "1989/12/01" "1990/01/01" "1990/02/01" "1990/03/01"  
## [16] "1990/04/01" "1990/05/01" "1990/06/01" "1990/07/01" "1990/08/01"  
## [21] "1990/09/01" "1990/10/01" "1990/11/01" "1990/12/01" "1991/01/01"  
## [26] "1991/02/01" "1991/03/01" "1991/04/01" "1991/05/01" "1991/06/01"  
## [31] "1991/07/01" "1991/08/01" "1991/09/01" "1991/10/01" "1991/11/01"  
## [36] "1991/12/01" "1992/01/01" "1992/02/01" "1992/03/01" "1992/04/01"  
## [41] "1992/05/01" "1992/06/01" "1992/07/01" "1992/08/01" "1992/09/01"  
## [46] "1992/10/01" "1992/11/01" "1992/12/01" "1993/01/01" "1993/02/01"  
## [51] "1993/03/01" "1993/04/01" "1993/05/01" "1993/06/01" "1993/07/01"  
## [56] "1993/08/01" "1993/09/01" "1993/10/01" "1993/11/01" "1993/12/01"  
## [61] "1994/01/01" "1994/02/01" "1994/03/01" "1994/04/01" "1994/05/01"  
## [66] "1994/06/01" "1994/07/01" "1994/08/01" "1994/09/01" "1994/10/01"  
## [71] "1994/11/01" "1994/12/01" "1995/01/01" "1995/02/01" "1995/03/01"  
## [76] "1995/04/01" "1995/05/01" "1995/06/01" "1995/07/01" "1995/08/01"  
## [81] "1995/09/01" "1995/10/01" "1995/11/01" "1995/12/01" "1996/01/01"  
## [86] "1996/02/01" "1996/03/01" "1996/04/01" "1996/05/01" "1996/06/01"  
## [91] "1996/07/01" "1996/08/01" "1996/09/01" "1996/10/01" "1996/11/01"  
## [96] "1996/12/01" "1997/01/01" "1997/02/01" "1997/03/01" "1997/04/01"  
## [101] "1997/05/01" "1997/06/01" "1997/07/01" "1997/08/01" "1997/09/01"  
## [106] "1997/10/01" "1997/11/01" "1997/12/01" "1998/01/01" "1998/02/01"  
## [111] "1998/03/01" "1998/04/01" "1998/05/01" "1998/06/01" "1998/07/01"  
## [116] "1998/08/01" "1998/09/01" "1998/10/01" "1998/11/01" "1998/12/01"  
## [121] "1999/01/01" "1999/02/01" "1999/03/01" "1999/04/01" "1999/05/01"  
## [126] "1999/06/01" "1999/07/01" "1999/08/01" "1999/09/01" "1999/10/01"  
## [131] "1999/11/01" "1999/12/01" "2000/01/01" "2000/02/01" "2000/03/01"  
## [136] "2000/04/01" "2000/05/01" "2000/06/01" "2000/07/01" "2000/08/01"  
## [141] "2000/09/01" "2000/10/01" "2000/11/01" "2000/12/01" "2001/01/01"  
## [146] "2001/02/01" "2001/03/01" "2001/04/01" "2001/05/01" "2001/06/01"  
## [151] "2001/07/01" "2001/08/01" "2001/09/01" "2001/10/01" "2001/11/01"  
## [156] "2001/12/01" "2002/01/01" "2002/02/01" "2002/03/01" "2002/04/01"  
## [161] "2002/05/01" "2002/06/01" "2002/07/01" "2002/08/01" "2002/09/01"  
## [166] "2002/10/01" "2002/11/01" "2002/12/01" "2003/01/01" "2003/02/01"  
## [171] "2003/03/01" "2003/04/01" "2003/05/01" "2003/06/01" "2003/07/01"  
## [176] "2003/08/01" "2003/09/01" "2003/10/01" "2003/11/01" "2003/12/01"  
## [181] "2004/01/01" "2004/02/01" "2004/03/01" "2004/04/01" "2004/05/01"  
## [186] "2004/06/01" "2004/07/01" "2004/08/01" "2004/09/01" "2004/10/01"  
## [191] "2004/11/01" "2004/12/01" "2005/01/01" "2005/02/01" "2005/03/01"  
## [196] "2005/04/01" "2005/05/01" "2005/06/01" "2005/07/01" "2005/08/01"  
## [201] "2005/09/01" "2005/10/01" "2005/11/01" "2005/12/01" "2006/01/01"  
## [206] "2006/02/01" "2006/03/01" "2006/04/01" "2006/05/01" "2006/06/01"  
## [211] "2006/07/01" "2006/08/01" "2006/09/01" "2006/10/01" "2006/11/01"  
## [216] "2006/12/01" "2007/01/01" "2007/02/01" "2007/03/01" "2007/04/01"  
## [221] "2007/05/01" "2007/06/01" "2007/07/01" "2007/08/01" "2007/09/01"  
## [226] "2007/10/01" "2007/11/01" "2007/12/01" "2008/01/01" "2008/02/01"  
## [231] "2008/03/01" "2008/04/01" "2008/05/01" "2008/06/01" "2008/07/01"  
## [236] "2008/08/01" "2008/09/01" "2008/10/01" "2008/11/01" "2008/12/01"  
## [241] "2009/01/01" "2009/02/01" "2009/03/01" "2009/04/01" "2009/05/01"  
## [246] "2009/06/01" "2009/07/01" "2009/08/01" "2009/09/01" "2009/10/01"  
## [251] "2009/11/01" "2009/12/01" "2010/01/01" "2010/02/01" "2010/03/01"  
## [256] "2010/04/01" "2010/05/01" "2010/06/01" "2010/07/01" "2010/08/01"  
## [261] "2010/09/01" "2010/10/01" "2010/11/01" "2010/12/01" "2011/01/01"  
## [266] "2011/02/01" "2011/03/01" "2011/04/01" "2011/05/01" "2011/06/01"  
## [271] "2011/07/01" "2011/08/01" "2011/09/01" "2011/10/01" "2011/11/01"  
## [276] "2011/12/01" "2012/01/01" "2012/02/01" "2012/03/01" "2012/04/01"  
## [281] "2012/05/01" "2012/06/01" "2012/07/01" "2012/08/01" "2012/09/01"  
## [286] "2012/10/01" "2012/11/01" "2012/12/01" "2013/01/01" "2013/02/01"  
## [291] "2013/03/01" "2013/04/01" "2013/05/01" "2013/06/01" "2013/07/01"  
## [296] "2013/08/01" "2013/09/01" "2013/10/01" "2013/11/01" "2013/12/01"  
## [301] "2014/01/01" "2014/02/01" "2014/03/01" "2014/04/01" "2014/05/01"  
## [306] "2014/06/01" "2014/07/01" "2014/08/01" "2014/09/01" "2014/10/01"  
## [311] "2014/11/01" "2014/12/01" "2015/01/01" "2015/02/01" "2015/03/01"  
## [316] "2015/04/01" "2015/05/01" "2015/06/01" "2015/07/01" "2015/08/01"  
## [321] "2015/09/01" "2015/10/01" "2015/11/01" "2015/12/01" "2016/01/01"  
## [326] "2016/02/01" "2016/03/01" "2016/04/01" "2016/05/01" "2016/06/01"  
## [331] "2016/07/01" "2016/08/01" "2016/09/01" "2016/10/01" "2016/11/01"  
## [336] "2016/12/01" "2017/01/01" "2017/02/01" "2017/03/01" "2017/04/01"  
## [341] "2017/05/01" "2017/06/01" "2017/07/01" "2017/08/01" "2017/09/01"  
## [346] "2017/10/01" "2017/11/01" "2017/12/01" "2018/01/01" "2018/02/01"  
## [351] "2018/03/01" "2018/04/01" "2018/05/01" "2018/06/01" "2018/07/01"  
## [356] "2018/08/01"

korea\_export\_price\_index$DATE <- as.Date(date, "%Y/%m/%d")  
  
  
#2004년 1월1일 기준으로 데이터 통일  
# cci  
head(cci\_index)

## DATE CCI\_INDEX  
## 1 1970-01-01 100.6  
## 2 1970-02-01 101.5  
## 3 1970-03-01 101.9  
## 4 1970-04-01 103.2  
## 5 1970-05-01 103.2  
## 6 1970-06-01 103.2

tail(cci\_index)

## DATE CCI\_INDEX  
## 579 2018-03-01 99.8  
## 580 2018-04-01 99.7  
## 581 2018-05-01 99.6  
## 582 2018-06-01 99.4  
## 583 2018-07-01 99.1  
## 584 2018-08-01 98.9

cci\_index[cci\_index$DATE >= '2004-01-01',]

## DATE CCI\_INDEX  
## 409 2004-01-01 100.9  
## 410 2004-02-01 101.4  
## 411 2004-03-01 101.5  
## 412 2004-04-01 101.4  
## 413 2004-05-01 101.0  
## 414 2004-06-01 100.8  
## 415 2004-07-01 100.4  
## 416 2004-08-01 100.0  
## 417 2004-09-01 99.8  
## 418 2004-10-01 99.7  
## 419 2004-11-01 99.7  
## 420 2004-12-01 99.3  
## 421 2005-01-01 99.0  
## 422 2005-02-01 98.7  
## 423 2005-03-01 98.8  
## 424 2005-04-01 98.5  
## 425 2005-05-01 98.6  
## 426 2005-06-01 98.6  
## 427 2005-07-01 98.7  
## 428 2005-08-01 98.7  
## 429 2005-09-01 98.8  
## 430 2005-10-01 98.9  
## 431 2005-11-01 99.3  
## 432 2005-12-01 99.6  
## 433 2006-01-01 99.9  
## 434 2006-02-01 99.7  
## 435 2006-03-01 99.9  
## 436 2006-04-01 99.8  
## 437 2006-05-01 100.0  
## 438 2006-06-01 99.9  
## 439 2006-07-01 99.3  
## 440 2006-08-01 99.3  
## 441 2006-09-01 99.5  
## 442 2006-10-01 100.6  
## 443 2006-11-01 100.9  
## 444 2006-12-01 101.1  
## 445 2007-01-01 100.9  
## 446 2007-02-01 101.0  
## 447 2007-03-01 101.1  
## 448 2007-04-01 101.3  
## 449 2007-05-01 101.4  
## 450 2007-06-01 101.4  
## 451 2007-07-01 101.5  
## 452 2007-08-01 101.6  
## 453 2007-09-01 101.5  
## 454 2007-10-01 101.7  
## 455 2007-11-01 101.9  
## 456 2007-12-01 102.1  
## 457 2008-01-01 102.4  
## 458 2008-02-01 102.3  
## 459 2008-03-01 102.3  
## 460 2008-04-01 102.0  
## 461 2008-05-01 101.7  
## 462 2008-06-01 101.2  
## 463 2008-07-01 100.9  
## 464 2008-08-01 100.8  
## 465 2008-09-01 100.8  
## 466 2008-10-01 100.5  
## 467 2008-11-01 99.7  
## 468 2008-12-01 98.5  
## 469 2009-01-01 97.8  
## 470 2009-02-01 97.7  
## 471 2009-03-01 97.8  
## 472 2009-04-01 97.9  
## 473 2009-05-01 97.9  
## 474 2009-06-01 98.5  
## 475 2009-07-01 98.7  
## 476 2009-08-01 98.8  
## 477 2009-09-01 98.9  
## 478 2009-10-01 99.2  
## 479 2009-11-01 99.3  
## 480 2009-12-01 99.2  
## 481 2010-01-01 99.3  
## 482 2010-02-01 99.6  
## 483 2010-03-01 100.0  
## 484 2010-04-01 100.3  
## 485 2010-05-01 100.8  
## 486 2010-06-01 100.8  
## 487 2010-07-01 101.0  
## 488 2010-08-01 100.7  
## 489 2010-09-01 100.3  
## 490 2010-10-01 99.8  
## 491 2010-11-01 99.8  
## 492 2010-12-01 99.9  
## 493 2011-01-01 100.7  
## 494 2011-02-01 100.5  
## 495 2011-03-01 100.7  
## 496 2011-04-01 100.4  
## 497 2011-05-01 100.7  
## 498 2011-06-01 101.0  
## 499 2011-07-01 101.1  
## 500 2011-08-01 101.2  
## 501 2011-09-01 100.8  
## 502 2011-10-01 100.9  
## 503 2011-11-01 100.5  
## 504 2011-12-01 100.5  
## 505 2012-01-01 100.2  
## 506 2012-02-01 100.6  
## 507 2012-03-01 100.6  
## 508 2012-04-01 100.6  
## 509 2012-05-01 100.5  
## 510 2012-06-01 100.6  
## 511 2012-07-01 100.7  
## 512 2012-08-01 100.2  
## 513 2012-09-01 100.1  
## 514 2012-10-01 99.9  
## 515 2012-11-01 100.0  
## 516 2012-12-01 100.0  
## 517 2013-01-01 99.9  
## 518 2013-02-01 99.9  
## 519 2013-03-01 99.7  
## 520 2013-04-01 99.8  
## 521 2013-05-01 99.8  
## 522 2013-06-01 100.0  
## 523 2013-07-01 99.9  
## 524 2013-08-01 99.9  
## 525 2013-09-01 99.8  
## 526 2013-10-01 100.0  
## 527 2013-11-01 100.0  
## 528 2013-12-01 100.1  
## 529 2014-01-01 100.3  
## 530 2014-02-01 100.4  
## 531 2014-03-01 100.6  
## 532 2014-04-01 100.5  
## 533 2014-05-01 100.2  
## 534 2014-06-01 100.1  
## 535 2014-07-01 100.1  
## 536 2014-08-01 100.3  
## 537 2014-09-01 100.1  
## 538 2014-10-01 99.8  
## 539 2014-11-01 99.6  
## 540 2014-12-01 99.9  
## 541 2015-01-01 99.9  
## 542 2015-02-01 100.2  
## 543 2015-03-01 100.1  
## 544 2015-04-01 100.1  
## 545 2015-05-01 99.7  
## 546 2015-06-01 99.5  
## 547 2015-07-01 99.5  
## 548 2015-08-01 99.8  
## 549 2015-09-01 100.3  
## 550 2015-10-01 100.7  
## 551 2015-11-01 100.5  
## 552 2015-12-01 100.4  
## 553 2016-01-01 100.1  
## 554 2016-02-01 99.9  
## 555 2016-03-01 99.8  
## 556 2016-04-01 99.7  
## 557 2016-05-01 99.9  
## 558 2016-06-01 100.1  
## 559 2016-07-01 100.3  
## 560 2016-08-01 100.3  
## 561 2016-09-01 100.1  
## 562 2016-10-01 99.9  
## 563 2016-11-01 100.0  
## 564 2016-12-01 100.2  
## 565 2017-01-01 100.5  
## 566 2017-02-01 100.5  
## 567 2017-03-01 100.7  
## 568 2017-04-01 100.7  
## 569 2017-05-01 100.7  
## 570 2017-06-01 100.6  
## 571 2017-07-01 100.5  
## 572 2017-08-01 100.4  
## 573 2017-09-01 100.4  
## 574 2017-10-01 100.2  
## 575 2017-11-01 100.2  
## 576 2017-12-01 99.8  
## 577 2018-01-01 99.8  
## 578 2018-02-01 99.8  
## 579 2018-03-01 99.8  
## 580 2018-04-01 99.7  
## 581 2018-05-01 99.6  
## 582 2018-06-01 99.4  
## 583 2018-07-01 99.1  
## 584 2018-08-01 98.9

cci\_index\_2004 <- cci\_index[cci\_index$DATE >= '2004-01-01', ]  
  
# facility\_investing  
head(facility\_investing)

## DATE INVESTMENT\_INDEX  
## 1 1995-02-01 51.5  
## 2 1995-03-01 63.5  
## 3 1995-04-01 59.9  
## 4 1995-05-01 57.9  
## 5 1995-06-01 56.1  
## 6 1995-07-01 55.6

tail(facility\_investing)

## DATE INVESTMENT\_INDEX  
## 278 2018-03-01 139.4  
## 279 2018-04-01 129.0  
## 280 2018-05-01 128.2  
## 281 2018-06-01 122.6  
## 282 2018-07-01 117.8  
## 283 2018-08-01 109.7

facility\_investing\_2004 <- facility\_investing[facility\_investing$DATE >= '2004-01-01',]  
  
#foreign\_selling  
  
# inflation  
inflation\_2004 <- inflation[inflation$DATE >= '2004-01-01',]  
inflation\_2004 <- inflation\_2004[1:length(inflation\_2004$DATE)-1, ]  
inflation\_2004

## DATE INFLATION  
## 289 2004-01-01 3.4  
## 290 2004-02-01 3.3  
## 291 2004-03-01 3.1  
## 292 2004-04-01 3.3  
## 293 2004-05-01 3.3  
## 294 2004-06-01 3.6  
## 295 2004-07-01 4.4  
## 296 2004-08-01 4.8  
## 297 2004-09-01 3.9  
## 298 2004-10-01 3.8  
## 299 2004-11-01 3.3  
## 300 2004-12-01 3.0  
## 301 2005-01-01 3.4  
## 302 2005-02-01 3.4  
## 303 2005-03-01 3.0  
## 304 2005-04-01 3.1  
## 305 2005-05-01 3.1  
## 306 2005-06-01 2.8  
## 307 2005-07-01 2.6  
## 308 2005-08-01 2.0  
## 309 2005-09-01 2.5  
## 310 2005-10-01 2.3  
## 311 2005-11-01 2.5  
## 312 2005-12-01 2.6  
## 313 2006-01-01 2.2  
## 314 2006-02-01 2.0  
## 315 2006-03-01 2.0  
## 316 2006-04-01 2.0  
## 317 2006-05-01 2.3  
## 318 2006-06-01 2.4  
## 319 2006-07-01 2.4  
## 320 2006-08-01 2.7  
## 321 2006-09-01 2.5  
## 322 2006-10-01 2.2  
## 323 2006-11-01 2.1  
## 324 2006-12-01 2.1  
## 325 2007-01-01 1.7  
## 326 2007-02-01 2.2  
## 327 2007-03-01 2.2  
## 328 2007-04-01 2.4  
## 329 2007-05-01 2.3  
## 330 2007-06-01 2.5  
## 331 2007-07-01 2.5  
## 332 2007-08-01 2.0  
## 333 2007-09-01 2.3  
## 334 2007-10-01 3.0  
## 335 2007-11-01 3.5  
## 336 2007-12-01 3.6  
## 337 2008-01-01 3.9  
## 338 2008-02-01 3.6  
## 339 2008-03-01 3.9  
## 340 2008-04-01 4.1  
## 341 2008-05-01 4.9  
## 342 2008-06-01 5.5  
## 343 2008-07-01 5.9  
## 344 2008-08-01 5.6  
## 345 2008-09-01 5.1  
## 346 2008-10-01 4.8  
## 347 2008-11-01 4.5  
## 348 2008-12-01 4.1  
## 349 2009-01-01 3.7  
## 350 2009-02-01 4.1  
## 351 2009-03-01 3.9  
## 352 2009-04-01 3.6  
## 353 2009-05-01 2.7  
## 354 2009-06-01 2.0  
## 355 2009-07-01 1.6  
## 356 2009-08-01 2.2  
## 357 2009-09-01 2.2  
## 358 2009-10-01 2.0  
## 359 2009-11-01 2.4  
## 360 2009-12-01 2.8  
## 361 2010-01-01 3.5  
## 362 2010-02-01 3.0  
## 363 2010-03-01 2.5  
## 364 2010-04-01 2.6  
## 365 2010-05-01 2.7  
## 366 2010-06-01 2.7  
## 367 2010-07-01 2.5  
## 368 2010-08-01 2.7  
## 369 2010-09-01 3.4  
## 370 2010-10-01 3.7  
## 371 2010-11-01 3.0  
## 372 2010-12-01 3.0  
## 373 2011-01-01 3.4  
## 374 2011-02-01 3.9  
## 375 2011-03-01 4.1  
## 376 2011-04-01 3.8  
## 377 2011-05-01 3.9  
## 378 2011-06-01 4.2  
## 379 2011-07-01 4.5  
## 380 2011-08-01 4.7  
## 381 2011-09-01 3.8  
## 382 2011-10-01 3.6  
## 383 2011-11-01 4.2  
## 384 2011-12-01 4.2  
## 385 2012-01-01 3.3  
## 386 2012-02-01 3.0  
## 387 2012-03-01 2.7  
## 388 2012-04-01 2.6  
## 389 2012-05-01 2.5  
## 390 2012-06-01 2.2  
## 391 2012-07-01 1.5  
## 392 2012-08-01 1.3  
## 393 2012-09-01 2.1  
## 394 2012-10-01 2.1  
## 395 2012-11-01 1.6  
## 396 2012-12-01 1.4  
## 397 2013-01-01 1.6  
## 398 2013-02-01 1.6  
## 399 2013-03-01 1.5  
## 400 2013-04-01 1.3  
## 401 2013-05-01 1.1  
## 402 2013-06-01 1.2  
## 403 2013-07-01 1.6  
## 404 2013-08-01 1.5  
## 405 2013-09-01 1.0  
## 406 2013-10-01 0.9  
## 407 2013-11-01 1.2  
## 408 2013-12-01 1.1  
## 409 2014-01-01 1.1  
## 410 2014-02-01 1.0  
## 411 2014-03-01 1.3  
## 412 2014-04-01 1.5  
## 413 2014-05-01 1.7  
## 414 2014-06-01 1.7  
## 415 2014-07-01 1.6  
## 416 2014-08-01 1.4  
## 417 2014-09-01 1.1  
## 418 2014-10-01 1.1  
## 419 2014-11-01 1.0  
## 420 2014-12-01 0.8  
## 421 2015-01-01 1.0  
## 422 2015-02-01 0.6  
## 423 2015-03-01 0.5  
## 424 2015-04-01 0.4  
## 425 2015-05-01 0.6  
## 426 2015-06-01 0.7  
## 427 2015-07-01 0.7  
## 428 2015-08-01 0.7  
## 429 2015-09-01 0.5  
## 430 2015-10-01 0.8  
## 431 2015-11-01 0.8  
## 432 2015-12-01 1.1  
## 433 2016-01-01 0.6  
## 434 2016-02-01 1.1  
## 435 2016-03-01 0.8  
## 436 2016-04-01 1.0  
## 437 2016-05-01 0.8  
## 438 2016-06-01 0.7  
## 439 2016-07-01 0.4  
## 440 2016-08-01 0.5  
## 441 2016-09-01 1.3  
## 442 2016-10-01 1.5  
## 443 2016-11-01 1.5  
## 444 2016-12-01 1.3  
## 445 2017-01-01 2.0  
## 446 2017-02-01 1.9  
## 447 2017-03-01 2.2  
## 448 2017-04-01 1.9  
## 449 2017-05-01 2.0  
## 450 2017-06-01 1.9  
## 451 2017-07-01 2.2  
## 452 2017-08-01 2.6  
## 453 2017-09-01 2.1  
## 454 2017-10-01 1.8  
## 455 2017-11-01 1.3  
## 456 2017-12-01 1.5  
## 457 2018-01-01 1.0  
## 458 2018-02-01 1.4  
## 459 2018-03-01 1.3  
## 460 2018-04-01 1.6  
## 461 2018-05-01 1.5  
## 462 2018-06-01 1.5  
## 463 2018-07-01 1.5  
## 464 2018-08-01 1.4

head(inflation\_2004)

## DATE INFLATION  
## 289 2004-01-01 3.4  
## 290 2004-02-01 3.3  
## 291 2004-03-01 3.1  
## 292 2004-04-01 3.3  
## 293 2004-05-01 3.3  
## 294 2004-06-01 3.6

tail(inflation\_2004)

## DATE INFLATION  
## 459 2018-03-01 1.3  
## 460 2018-04-01 1.6  
## 461 2018-05-01 1.5  
## 462 2018-06-01 1.5  
## 463 2018-07-01 1.5  
## 464 2018-08-01 1.4

# interest\_rate  
head(interest\_rate)

## DATE RATE year  
## 1 1999/05 4.75 <NA>  
## 2 1999/06 4.75 <NA>  
## 3 1999/07 4.75 <NA>  
## 4 1999/08 4.75 <NA>  
## 5 1999/09 4.75 <NA>  
## 6 1999/10 4.75 <NA>

tail(interest\_rate)

## DATE RATE year  
## 227 2018/03 1.5 <NA>  
## 228 2018/04 1.5 <NA>  
## 229 2018/05 1.5 <NA>  
## 230 2018/06 1.5 <NA>  
## 231 2018/07 1.5 <NA>  
## 232 2018/08 1.5 <NA>

interest\_rate\_2004 <- interest\_rate[interest\_rate$DATE >= '2004-01-01', ]  
head(interest\_rate\_2004)

## DATE RATE year  
## 57 2004/01 3.75 <NA>  
## 58 2004/02 3.75 <NA>  
## 59 2004/03 3.75 <NA>  
## 60 2004/04 3.75 <NA>  
## 61 2004/05 3.75 <NA>  
## 62 2004/06 3.75 <NA>

tail(interest\_rate\_2004)

## DATE RATE year  
## 227 2018/03 1.5 <NA>  
## 228 2018/04 1.5 <NA>  
## 229 2018/05 1.5 <NA>  
## 230 2018/06 1.5 <NA>  
## 231 2018/07 1.5 <NA>  
## 232 2018/08 1.5 <NA>

# interest\_rate\_us  
head(interest\_rate\_us)

## DATE FEDFUNDS  
## 2 1999-05-01 4.74  
## 3 1999-06-01 4.76  
## 4 1999-07-01 4.99  
## 5 1999-08-01 5.07  
## 6 1999-09-01 5.22  
## 7 1999-10-01 5.20

tail(interest\_rate\_us)

## DATE FEDFUNDS  
## 228 2018-03-01 1.51  
## 229 2018-04-01 1.69  
## 230 2018-05-01 1.70  
## 231 2018-06-01 1.82  
## 232 2018-07-01 1.91  
## 233 2018-08-01 1.91

interest\_rate\_us\_2004 <- interest\_rate\_us[interest\_rate\_us$DATE >= '2004-01-01', ]  
interest\_rate\_us\_2004

## DATE FEDFUNDS  
## 58 2004-01-01 1.00  
## 59 2004-02-01 1.01  
## 60 2004-03-01 1.00  
## 61 2004-04-01 1.00  
## 62 2004-05-01 1.00  
## 63 2004-06-01 1.03  
## 64 2004-07-01 1.26  
## 65 2004-08-01 1.43  
## 66 2004-09-01 1.61  
## 67 2004-10-01 1.76  
## 68 2004-11-01 1.93  
## 69 2004-12-01 2.16  
## 70 2005-01-01 2.28  
## 71 2005-02-01 2.50  
## 72 2005-03-01 2.63  
## 73 2005-04-01 2.79  
## 74 2005-05-01 3.00  
## 75 2005-06-01 3.04  
## 76 2005-07-01 3.26  
## 77 2005-08-01 3.50  
## 78 2005-09-01 3.62  
## 79 2005-10-01 3.78  
## 80 2005-11-01 4.00  
## 81 2005-12-01 4.16  
## 82 2006-01-01 4.29  
## 83 2006-02-01 4.49  
## 84 2006-03-01 4.59  
## 85 2006-04-01 4.79  
## 86 2006-05-01 4.94  
## 87 2006-06-01 4.99  
## 88 2006-07-01 5.24  
## 89 2006-08-01 5.25  
## 90 2006-09-01 5.25  
## 91 2006-10-01 5.25  
## 92 2006-11-01 5.25  
## 93 2006-12-01 5.24  
## 94 2007-01-01 5.25  
## 95 2007-02-01 5.26  
## 96 2007-03-01 5.26  
## 97 2007-04-01 5.25  
## 98 2007-05-01 5.25  
## 99 2007-06-01 5.25  
## 100 2007-07-01 5.26  
## 101 2007-08-01 5.02  
## 102 2007-09-01 4.94  
## 103 2007-10-01 4.76  
## 104 2007-11-01 4.49  
## 105 2007-12-01 4.24  
## 106 2008-01-01 3.94  
## 107 2008-02-01 2.98  
## 108 2008-03-01 2.61  
## 109 2008-04-01 2.28  
## 110 2008-05-01 1.98  
## 111 2008-06-01 2.00  
## 112 2008-07-01 2.01  
## 113 2008-08-01 2.00  
## 114 2008-09-01 1.81  
## 115 2008-10-01 0.97  
## 116 2008-11-01 0.39  
## 117 2008-12-01 0.16  
## 118 2009-01-01 0.15  
## 119 2009-02-01 0.22  
## 120 2009-03-01 0.18  
## 121 2009-04-01 0.15  
## 122 2009-05-01 0.18  
## 123 2009-06-01 0.21  
## 124 2009-07-01 0.16  
## 125 2009-08-01 0.16  
## 126 2009-09-01 0.15  
## 127 2009-10-01 0.12  
## 128 2009-11-01 0.12  
## 129 2009-12-01 0.12  
## 130 2010-01-01 0.11  
## 131 2010-02-01 0.13  
## 132 2010-03-01 0.16  
## 133 2010-04-01 0.20  
## 134 2010-05-01 0.20  
## 135 2010-06-01 0.18  
## 136 2010-07-01 0.18  
## 137 2010-08-01 0.19  
## 138 2010-09-01 0.19  
## 139 2010-10-01 0.19  
## 140 2010-11-01 0.19  
## 141 2010-12-01 0.18  
## 142 2011-01-01 0.17  
## 143 2011-02-01 0.16  
## 144 2011-03-01 0.14  
## 145 2011-04-01 0.10  
## 146 2011-05-01 0.09  
## 147 2011-06-01 0.09  
## 148 2011-07-01 0.07  
## 149 2011-08-01 0.10  
## 150 2011-09-01 0.08  
## 151 2011-10-01 0.07  
## 152 2011-11-01 0.08  
## 153 2011-12-01 0.07  
## 154 2012-01-01 0.08  
## 155 2012-02-01 0.10  
## 156 2012-03-01 0.13  
## 157 2012-04-01 0.14  
## 158 2012-05-01 0.16  
## 159 2012-06-01 0.16  
## 160 2012-07-01 0.16  
## 161 2012-08-01 0.13  
## 162 2012-09-01 0.14  
## 163 2012-10-01 0.16  
## 164 2012-11-01 0.16  
## 165 2012-12-01 0.16  
## 166 2013-01-01 0.14  
## 167 2013-02-01 0.15  
## 168 2013-03-01 0.14  
## 169 2013-04-01 0.15  
## 170 2013-05-01 0.11  
## 171 2013-06-01 0.09  
## 172 2013-07-01 0.09  
## 173 2013-08-01 0.08  
## 174 2013-09-01 0.08  
## 175 2013-10-01 0.09  
## 176 2013-11-01 0.08  
## 177 2013-12-01 0.09  
## 178 2014-01-01 0.07  
## 179 2014-02-01 0.07  
## 180 2014-03-01 0.08  
## 181 2014-04-01 0.09  
## 182 2014-05-01 0.09  
## 183 2014-06-01 0.10  
## 184 2014-07-01 0.09  
## 185 2014-08-01 0.09  
## 186 2014-09-01 0.09  
## 187 2014-10-01 0.09  
## 188 2014-11-01 0.09  
## 189 2014-12-01 0.12  
## 190 2015-01-01 0.11  
## 191 2015-02-01 0.11  
## 192 2015-03-01 0.11  
## 193 2015-04-01 0.12  
## 194 2015-05-01 0.12  
## 195 2015-06-01 0.13  
## 196 2015-07-01 0.13  
## 197 2015-08-01 0.14  
## 198 2015-09-01 0.14  
## 199 2015-10-01 0.12  
## 200 2015-11-01 0.12  
## 201 2015-12-01 0.24  
## 202 2016-01-01 0.34  
## 203 2016-02-01 0.38  
## 204 2016-03-01 0.36  
## 205 2016-04-01 0.37  
## 206 2016-05-01 0.37  
## 207 2016-06-01 0.38  
## 208 2016-07-01 0.39  
## 209 2016-08-01 0.40  
## 210 2016-09-01 0.40  
## 211 2016-10-01 0.40  
## 212 2016-11-01 0.41  
## 213 2016-12-01 0.54  
## 214 2017-01-01 0.65  
## 215 2017-02-01 0.66  
## 216 2017-03-01 0.79  
## 217 2017-04-01 0.90  
## 218 2017-05-01 0.91  
## 219 2017-06-01 1.04  
## 220 2017-07-01 1.15  
## 221 2017-08-01 1.16  
## 222 2017-09-01 1.15  
## 223 2017-10-01 1.15  
## 224 2017-11-01 1.16  
## 225 2017-12-01 1.30  
## 226 2018-01-01 1.41  
## 227 2018-02-01 1.42  
## 228 2018-03-01 1.51  
## 229 2018-04-01 1.69  
## 230 2018-05-01 1.70  
## 231 2018-06-01 1.82  
## 232 2018-07-01 1.91  
## 233 2018-08-01 1.91

# korea\_export\_price\_index  
head(korea\_export\_price\_index)

## DATE EXPORT  
## 1 1989-01-01 10.4  
## 2 1989-02-01 4.7  
## 3 1989-03-01 11.0  
## 4 1989-04-01 2.5  
## 5 1989-05-01 5.5  
## 6 1989-06-01 7.2

tail(korea\_export\_price\_index)

## DATE EXPORT  
## 351 2018-03-01 8.5  
## 352 2018-04-01 11.5  
## 353 2018-05-01 19.1  
## 354 2018-06-01 13.8  
## 355 2018-07-01 17.1  
## 356 2018-08-01 15.2

korea\_export\_price\_index\_2004 <- korea\_export\_price\_index[korea\_export\_price\_index$DATE >= '2004-01-01', ]  
tail(korea\_export\_price\_index\_2004)

## DATE EXPORT  
## 351 2018-03-01 8.5  
## 352 2018-04-01 11.5  
## 353 2018-05-01 19.1  
## 354 2018-06-01 13.8  
## 355 2018-07-01 17.1  
## 356 2018-08-01 15.2

# korea\_import\_price\_index  
head(korea\_import\_price\_index)

## DATE IMPORT  
## 1 1991-01-01 65.73  
## 2 1991-02-01 64.31  
## 3 1991-03-01 62.38  
## 4 1991-04-01 62.12  
## 5 1991-05-01 61.68  
## 6 1991-06-01 61.20

tail(korea\_import\_price\_index)

## DATE IMPORT  
## 327 2018-03-01 90.60  
## 328 2018-04-01 91.82  
## 329 2018-05-01 93.58  
## 330 2018-06-01 93.40  
## 331 2018-07-01 92.23  
## 332 2018-08-01 92.19

korea\_import\_price\_index\_2004 <- korea\_import\_price\_index[korea\_import\_price\_index$DATE >= '2004-01-01', ]  
tail(korea\_import\_price\_index\_2004)

## DATE IMPORT  
## 327 2018-03-01 90.60  
## 328 2018-04-01 91.82  
## 329 2018-05-01 93.58  
## 330 2018-06-01 93.40  
## 331 2018-07-01 92.23  
## 332 2018-08-01 92.19

# unemployment  
head(unemployment) ; tail(unemployment)

## DATE UNEMPLOYMENT  
## 1 2000-01-01 5.2  
## 2 2000-02-01 4.8  
## 3 2000-03-01 4.5  
## 4 2000-04-01 4.4  
## 5 2000-05-01 4.3  
## 6 2000-06-01 4.1

## DATE UNEMPLOYMENT  
## 219 2018-03-01 4.0  
## 220 2018-04-01 3.8  
## 221 2018-05-01 4.0  
## 222 2018-06-01 3.7  
## 223 2018-07-01 3.8  
## 224 2018-08-01 4.2

unemployment\_2004 <- unemployment[unemployment$DATE >= '2004-01-01', ]  
unemployment\_2004

## DATE UNEMPLOYMENT  
## 49 2004-01-01 3.6  
## 50 2004-02-01 3.6  
## 51 2004-03-01 3.6  
## 52 2004-04-01 3.6  
## 53 2004-05-01 3.7  
## 54 2004-06-01 3.5  
## 55 2004-07-01 3.7  
## 56 2004-08-01 3.7  
## 57 2004-09-01 3.7  
## 58 2004-10-01 3.7  
## 59 2004-11-01 3.8  
## 60 2004-12-01 3.8  
## 61 2005-01-01 3.9  
## 62 2005-02-01 3.7  
## 63 2005-03-01 3.7  
## 64 2005-04-01 3.7  
## 65 2005-05-01 3.7  
## 66 2005-06-01 3.8  
## 67 2005-07-01 3.7  
## 68 2005-08-01 3.7  
## 69 2005-09-01 4.0  
## 70 2005-10-01 3.9  
## 71 2005-11-01 3.6  
## 72 2005-12-01 3.6  
## 73 2006-01-01 3.4  
## 74 2006-02-01 3.6  
## 75 2006-03-01 3.5  
## 76 2006-04-01 3.4  
## 77 2006-05-01 3.4  
## 78 2006-06-01 3.5  
## 79 2006-07-01 3.5  
## 80 2006-08-01 3.5  
## 81 2006-09-01 3.5  
## 82 2006-10-01 3.6  
## 83 2006-11-01 3.5  
## 84 2006-12-01 3.4  
## 85 2007-01-01 3.4  
## 86 2007-02-01 3.2  
## 87 2007-03-01 3.2  
## 88 2007-04-01 3.3  
## 89 2007-05-01 3.3  
## 90 2007-06-01 3.2  
## 91 2007-07-01 3.3  
## 92 2007-08-01 3.2  
## 93 2007-09-01 3.2  
## 94 2007-10-01 3.3  
## 95 2007-11-01 3.3  
## 96 2007-12-01 3.2  
## 97 2008-01-01 3.0  
## 98 2008-02-01 3.0  
## 99 2008-03-01 3.0  
## 100 2008-04-01 3.1  
## 101 2008-05-01 3.2  
## 102 2008-06-01 3.1  
## 103 2008-07-01 3.1  
## 104 2008-08-01 3.2  
## 105 2008-09-01 3.2  
## 106 2008-10-01 3.3  
## 107 2008-11-01 3.3  
## 108 2008-12-01 3.4  
## 109 2009-01-01 3.3  
## 110 2009-02-01 3.3  
## 111 2009-03-01 3.6  
## 112 2009-04-01 3.7  
## 113 2009-05-01 3.9  
## 114 2009-06-01 3.9  
## 115 2009-07-01 3.8  
## 116 2009-08-01 3.8  
## 117 2009-09-01 3.6  
## 118 2009-10-01 3.5  
## 119 2009-11-01 3.7  
## 120 2009-12-01 3.6  
## 121 2010-01-01 4.7  
## 122 2010-02-01 4.1  
## 123 2010-03-01 3.7  
## 124 2010-04-01 3.6  
## 125 2010-05-01 3.2  
## 126 2010-06-01 3.5  
## 127 2010-07-01 3.8  
## 128 2010-08-01 3.5  
## 129 2010-09-01 3.7  
## 130 2010-10-01 3.7  
## 131 2010-11-01 3.3  
## 132 2010-12-01 3.7  
## 133 2011-01-01 3.6  
## 134 2011-02-01 3.7  
## 135 2011-03-01 3.8  
## 136 2011-04-01 3.5  
## 137 2011-05-01 3.3  
## 138 2011-06-01 3.3  
## 139 2011-07-01 3.3  
## 140 2011-08-01 3.2  
## 141 2011-09-01 3.3  
## 142 2011-10-01 3.2  
## 143 2011-11-01 3.2  
## 144 2011-12-01 3.2  
## 145 2012-01-01 3.3  
## 146 2012-02-01 3.4  
## 147 2012-03-01 3.3  
## 148 2012-04-01 3.3  
## 149 2012-05-01 3.2  
## 150 2012-06-01 3.2  
## 151 2012-07-01 3.1  
## 152 2012-08-01 3.1  
## 153 2012-09-01 3.2  
## 154 2012-10-01 3.1  
## 155 2012-11-01 3.1  
## 156 2012-12-01 3.1  
## 157 2013-01-01 3.2  
## 158 2013-02-01 3.2  
## 159 2013-03-01 3.1  
## 160 2013-04-01 3.0  
## 161 2013-05-01 3.1  
## 162 2013-06-01 3.1  
## 163 2013-07-01 3.2  
## 164 2013-08-01 3.1  
## 165 2013-09-01 3.0  
## 166 2013-10-01 3.1  
## 167 2013-11-01 3.0  
## 168 2013-12-01 3.2  
## 169 2014-01-01 3.3  
## 170 2014-02-01 3.6  
## 171 2014-03-01 3.4  
## 172 2014-04-01 3.6  
## 173 2014-05-01 3.6  
## 174 2014-06-01 3.5  
## 175 2014-07-01 3.5  
## 176 2014-08-01 3.5  
## 177 2014-09-01 3.4  
## 178 2014-10-01 3.6  
## 179 2014-11-01 3.5  
## 180 2014-12-01 3.6  
## 181 2015-01-01 3.6  
## 182 2015-02-01 3.6  
## 183 2015-03-01 3.5  
## 184 2015-04-01 3.6  
## 185 2015-05-01 3.8  
## 186 2015-06-01 3.8  
## 187 2015-07-01 3.7  
## 188 2015-08-01 3.6  
## 189 2015-09-01 3.5  
## 190 2015-10-01 3.5  
## 191 2015-11-01 3.5  
## 192 2015-12-01 3.5  
## 193 2016-01-01 3.5  
## 194 2016-02-01 3.8  
## 195 2016-03-01 3.7  
## 196 2016-04-01 3.6  
## 197 2016-05-01 3.7  
## 198 2016-06-01 3.6  
## 199 2016-07-01 3.6  
## 200 2016-08-01 3.8  
## 201 2016-09-01 3.9  
## 202 2016-10-01 3.8  
## 203 2016-11-01 3.6  
## 204 2016-12-01 3.5  
## 205 2017-01-01 3.6  
## 206 2017-02-01 3.8  
## 207 2017-03-01 3.6  
## 208 2017-04-01 3.9  
## 209 2017-05-01 3.6  
## 210 2017-06-01 3.8  
## 211 2017-07-01 3.5  
## 212 2017-08-01 3.7  
## 213 2017-09-01 3.7  
## 214 2017-10-01 3.6  
## 215 2017-11-01 3.7  
## 216 2017-12-01 3.7  
## 217 2018-01-01 3.6  
## 218 2018-02-01 3.6  
## 219 2018-03-01 4.0  
## 220 2018-04-01 3.8  
## 221 2018-05-01 4.0  
## 222 2018-06-01 3.7  
## 223 2018-07-01 3.8  
## 224 2018-08-01 4.2

# wti\_price  
head(wti\_price); tail(wti\_price)

## DATE WTI\_PRICE  
## 1 1986-01-01 22.92545  
## 2 1986-02-01 15.45474  
## 3 1986-03-01 12.61250  
## 4 1986-04-01 12.84364  
## 5 1986-05-01 15.37762  
## 6 1986-06-01 13.42571

## DATE WTI\_PRICE  
## 388 2018-04-01 66.25381  
## 389 2018-05-01 69.97818  
## 390 2018-06-01 67.87333  
## 391 2018-07-01 70.98143  
## 392 2018-08-01 68.05565  
## 393 2018-09-01 70.23211

wti\_price\_2004 <- wti\_price[wti\_price$DATE >= '2004-01-01', ]  
wti\_price\_2004 <- wti\_price\_2004[1:length(wti\_price\_2004$DATE)-1, ]  
  
# make data frame  
df\_for\_regression <- data.frame(interest\_rate\_2004$RATE,   
 interest\_rate\_us\_2004$FEDFUNDS,   
 cci\_index\_2004$CCI\_INDEX,  
 facility\_investing\_2004$INVESTMENT\_INDEX,  
 foreign\_selling$SELLING,  
 inflation\_2004$INFLATION,  
 korea\_export\_price\_index\_2004$EXPORT,  
 korea\_import\_price\_index\_2004$IMPORT,  
 unemployment\_2004$UNEMPLOYMENT,  
 wti\_price\_2004$WTI\_PRICE  
 )  
  
colnames(df\_for\_regression) <- c("korea\_interest\_rate",  
 "us\_interest\_rate",  
 "cci\_index",  
 "facility\_investment",  
 "foreign\_selling",  
 "inflation",  
 "korea\_export\_price\_index",  
 "korea\_import\_price\_index",  
 "unemployment",  
 "wti\_price"  
 )  
  
  
data\_list <- list(interest\_rate=interest\_rate,   
 interest\_rate\_us=interest\_rate\_us,  
 cci\_index=cci\_index,  
 facility\_investing=facility\_investing,  
 foreign\_selling=foreign\_selling,  
 inflation=inflation,  
 korea\_export\_price\_index=korea\_export\_price\_index,  
 korea\_import\_price\_index=korea\_import\_price\_index,  
 unemployment=unemployment,  
 wti\_price=wti\_price  
 )  
  
data\_list\_2004 <- list(interest\_rate=interest\_rate\_2004,   
 interest\_rate\_us=interest\_rate\_us\_2004,  
 cci\_index=cci\_index\_2004,  
 facility\_investing=facility\_investing\_2004,  
 foreign\_selling=foreign\_selling,  
 inflation=inflation\_2004,  
 korea\_export\_price\_index=korea\_export\_price\_index\_2004,  
 korea\_import\_price\_index=korea\_import\_price\_index\_2004,  
 unemployment=unemployment\_2004,  
 wti\_price=wti\_price\_2004  
)  
length(data\_list)

## [1] 10

tail(df\_for\_regression)

## korea\_interest\_rate us\_interest\_rate cci\_index facility\_investment  
## 171 1.5 1.51 99.8 139.4  
## 172 1.5 1.69 99.7 129.0  
## 173 1.5 1.70 99.6 128.2  
## 174 1.5 1.82 99.4 122.6  
## 175 1.5 1.91 99.1 117.8  
## 176 1.5 1.91 98.9 109.7  
## foreign\_selling inflation korea\_export\_price\_index  
## 171 38181944 1.3 8.5  
## 172 38201043 1.6 11.5  
## 173 44684052 1.5 19.1  
## 174 39362755 1.5 13.8  
## 175 33459005 1.5 17.1  
## 176 30377712 1.4 15.2  
## korea\_import\_price\_index unemployment wti\_price  
## 171 90.60 4.0 62.72476  
## 172 91.82 3.8 66.25381  
## 173 93.58 4.0 69.97818  
## 174 93.40 3.7 67.87333  
## 175 92.23 3.8 70.98143  
## 176 92.19 4.2 68.05565

# 회귀분석

# 다중선형회귀  
head(df\_for\_regression)

## korea\_interest\_rate us\_interest\_rate cci\_index facility\_investment  
## 1 3.75 1.00 100.9 59.1  
## 2 3.75 1.01 101.4 70.3  
## 3 3.75 1.00 101.5 79.4  
## 4 3.75 1.00 101.4 72.6  
## 5 3.75 1.00 101.0 71.1  
## 6 3.75 1.03 100.8 77.5  
## foreign\_selling inflation korea\_export\_price\_index  
## 1 8627254 3.4 25.1  
## 2 9318221 3.3 42.6  
## 3 9779445 3.1 41.5  
## 4 12065303 3.3 39.6  
## 5 11141908 3.3 46.4  
## 6 10700866 3.6 38.3  
## korea\_import\_price\_index unemployment wti\_price  
## 1 63.22 3.6 34.31000  
## 2 64.10 3.6 34.68474  
## 3 65.04 3.6 36.74130  
## 4 65.90 3.6 36.75000  
## 5 66.77 3.7 40.27500  
## 6 66.70 3.5 38.02524

df\_for\_regression$inflation

## [1] 3.4 3.3 3.1 3.3 3.3 3.6 4.4 4.8 3.9 3.8 3.3 3.0 3.4 3.4 3.0 3.1 3.1  
## [18] 2.8 2.6 2.0 2.5 2.3 2.5 2.6 2.2 2.0 2.0 2.0 2.3 2.4 2.4 2.7 2.5 2.2  
## [35] 2.1 2.1 1.7 2.2 2.2 2.4 2.3 2.5 2.5 2.0 2.3 3.0 3.5 3.6 3.9 3.6 3.9  
## [52] 4.1 4.9 5.5 5.9 5.6 5.1 4.8 4.5 4.1 3.7 4.1 3.9 3.6 2.7 2.0 1.6 2.2  
## [69] 2.2 2.0 2.4 2.8 3.5 3.0 2.5 2.6 2.7 2.7 2.5 2.7 3.4 3.7 3.0 3.0 3.4  
## [86] 3.9 4.1 3.8 3.9 4.2 4.5 4.7 3.8 3.6 4.2 4.2 3.3 3.0 2.7 2.6 2.5 2.2  
## [103] 1.5 1.3 2.1 2.1 1.6 1.4 1.6 1.6 1.5 1.3 1.1 1.2 1.6 1.5 1.0 0.9 1.2  
## [120] 1.1 1.1 1.0 1.3 1.5 1.7 1.7 1.6 1.4 1.1 1.1 1.0 0.8 1.0 0.6 0.5 0.4  
## [137] 0.6 0.7 0.7 0.7 0.5 0.8 0.8 1.1 0.6 1.1 0.8 1.0 0.8 0.7 0.4 0.5 1.3  
## [154] 1.5 1.5 1.3 2.0 1.9 2.2 1.9 2.0 1.9 2.2 2.6 2.1 1.8 1.3 1.5 1.0 1.4  
## [171] 1.3 1.6 1.5 1.5 1.5 1.4

str(df\_for\_regression)

## 'data.frame': 176 obs. of 10 variables:  
## $ korea\_interest\_rate : num 3.75 3.75 3.75 3.75 3.75 3.75 3.75 3.5 3.5 3.5 ...  
## $ us\_interest\_rate : num 1 1.01 1 1 1 1.03 1.26 1.43 1.61 1.76 ...  
## $ cci\_index : num 101 101 102 101 101 ...  
## $ facility\_investment : num 59.1 70.3 79.4 72.6 71.1 77.5 69.7 70.3 68.4 70.1 ...  
## $ foreign\_selling : num 8627254 9318221 9779445 12065303 11141908 ...  
## $ inflation : num 3.4 3.3 3.1 3.3 3.3 3.6 4.4 4.8 3.9 3.8 ...  
## $ korea\_export\_price\_index: num 25.1 42.6 41.5 39.6 46.4 38.3 37.1 31.2 24.8 17.4 ...  
## $ korea\_import\_price\_index: num 63.2 64.1 65 65.9 66.8 ...  
## $ unemployment : num 3.6 3.6 3.6 3.6 3.7 3.5 3.7 3.7 3.7 3.7 ...  
## $ wti\_price : num 34.3 34.7 36.7 36.8 40.3 ...

summary(df\_for\_regression)

## korea\_interest\_rate us\_interest\_rate cci\_index facility\_investment  
## Min. :1.250 Min. :0.070 Min. : 97.7 Min. : 59.10   
## 1st Qu.:2.000 1st Qu.:0.130 1st Qu.: 99.7 1st Qu.: 84.80   
## Median :2.625 Median :0.370 Median :100.1 Median : 97.75   
## Mean :2.810 Mean :1.356 Mean :100.1 Mean : 97.36   
## 3rd Qu.:3.500 3rd Qu.:1.985 3rd Qu.:100.7 3rd Qu.:108.80   
## Max. :5.250 Max. :5.260 Max. :102.4 Max. :143.70   
## foreign\_selling inflation korea\_export\_price\_index  
## Min. : 7771114 Min. :0.400 Min. :-38.200   
## 1st Qu.:19451384 1st Qu.:1.475 1st Qu.: -1.250   
## Median :23253438 Median :2.200 Median : 10.200   
## Mean :23906162 Mean :2.375 Mean : 9.431   
## 3rd Qu.:28468496 3rd Qu.:3.300 3rd Qu.: 19.650   
## Max. :44684052 Max. :5.900 Max. : 55.500   
## korea\_import\_price\_index unemployment wti\_price   
## Min. : 63.22 Min. :3.000 Min. : 30.32   
## 1st Qu.: 80.44 1st Qu.:3.300 1st Qu.: 50.82   
## Median : 89.61 Median :3.500 Median : 68.73   
## Mean : 92.64 Mean :3.503 Mean : 71.19   
## 3rd Qu.:107.57 3rd Qu.:3.700 3rd Qu.: 92.25   
## Max. :122.68 Max. :4.700 Max. :133.88

colnames(df\_for\_regression)

## [1] "korea\_interest\_rate" "us\_interest\_rate"   
## [3] "cci\_index" "facility\_investment"   
## [5] "foreign\_selling" "inflation"   
## [7] "korea\_export\_price\_index" "korea\_import\_price\_index"  
## [9] "unemployment" "wti\_price"

multiple\_lm <- lm(korea\_interest\_rate~. ,data=df\_for\_regression)  
multiple\_lm

##   
## Call:  
## lm(formula = korea\_interest\_rate ~ ., data = df\_for\_regression)  
##   
## Coefficients:  
## (Intercept) us\_interest\_rate   
## -3.084e+01 3.363e-01   
## cci\_index facility\_investment   
## 3.616e-01 -1.701e-02   
## foreign\_selling inflation   
## -1.798e-08 2.554e-01   
## korea\_export\_price\_index korea\_import\_price\_index   
## -5.718e-03 -4.257e-03   
## unemployment wti\_price   
## -6.057e-01 1.450e-02

summary(multiple\_lm)

##   
## Call:  
## lm(formula = korea\_interest\_rate ~ ., data = df\_for\_regression)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.87846 -0.15772 -0.00364 0.17818 0.82505   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -3.084e+01 4.050e+00 -7.614 1.90e-12 \*\*\*  
## us\_interest\_rate 3.363e-01 1.702e-02 19.757 < 2e-16 \*\*\*  
## cci\_index 3.616e-01 3.790e-02 9.541 < 2e-16 \*\*\*  
## facility\_investment -1.701e-02 2.277e-03 -7.470 4.33e-12 \*\*\*  
## foreign\_selling -1.798e-08 4.397e-09 -4.089 6.73e-05 \*\*\*  
## inflation 2.554e-01 2.504e-02 10.202 < 2e-16 \*\*\*  
## korea\_export\_price\_index -5.718e-03 1.952e-03 -2.929 0.00388 \*\*   
## korea\_import\_price\_index -4.257e-03 5.515e-03 -0.772 0.44127   
## unemployment -6.057e-01 1.278e-01 -4.740 4.56e-06 \*\*\*  
## wti\_price 1.450e-02 3.273e-03 4.429 1.71e-05 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.2933 on 166 degrees of freedom  
## Multiple R-squared: 0.9389, Adjusted R-squared: 0.9356   
## F-statistic: 283.5 on 9 and 166 DF, p-value: < 2.2e-16

# make new data frame - remove korea\_import\_price\_index  
colnames(df\_for\_regression)

## [1] "korea\_interest\_rate" "us\_interest\_rate"   
## [3] "cci\_index" "facility\_investment"   
## [5] "foreign\_selling" "inflation"   
## [7] "korea\_export\_price\_index" "korea\_import\_price\_index"  
## [9] "unemployment" "wti\_price"

df\_for\_regression\_01 <- df\_for\_regression[, -8]  
colnames(df\_for\_regression\_01)

## [1] "korea\_interest\_rate" "us\_interest\_rate"   
## [3] "cci\_index" "facility\_investment"   
## [5] "foreign\_selling" "inflation"   
## [7] "korea\_export\_price\_index" "unemployment"   
## [9] "wti\_price"

multiple\_lm\_01 <- lm(korea\_interest\_rate~., data=df\_for\_regression\_01)  
summary(multiple\_lm\_01)

##   
## Call:  
## lm(formula = korea\_interest\_rate ~ ., data = df\_for\_regression\_01)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.8898 -0.1721 -0.0010 0.1663 0.8441   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -3.134e+01 3.993e+00 -7.847 4.86e-13 \*\*\*  
## us\_interest\_rate 3.419e-01 1.535e-02 22.275 < 2e-16 \*\*\*  
## cci\_index 3.640e-01 3.773e-02 9.647 < 2e-16 \*\*\*  
## facility\_investment -1.756e-02 2.160e-03 -8.129 9.29e-14 \*\*\*  
## foreign\_selling -1.821e-08 4.382e-09 -4.155 5.18e-05 \*\*\*  
## inflation 2.515e-01 2.448e-02 10.272 < 2e-16 \*\*\*  
## korea\_export\_price\_index -5.662e-03 1.949e-03 -2.906 0.00416 \*\*   
## unemployment -5.797e-01 1.231e-01 -4.709 5.22e-06 \*\*\*  
## wti\_price 1.217e-02 1.291e-03 9.428 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.2929 on 167 degrees of freedom  
## Multiple R-squared: 0.9387, Adjusted R-squared: 0.9358   
## F-statistic: 319.6 on 8 and 167 DF, p-value: < 2.2e-16

# 다중공선성 확인 -> vif 4가 넘으면 있는 걸로 판단  
library(car)

## Loading required package: carData

vif(multiple\_lm\_01)

## us\_interest\_rate cci\_index facility\_investment   
## 1.439327 2.294048 3.058754   
## foreign\_selling inflation korea\_export\_price\_index   
## 2.369333 1.777747 2.068757   
## unemployment wti\_price   
## 2.310064 1.803586

# select best model - 단계선택법  
  
LM\_step <- step(multiple\_lm\_01, direction = "both")

## Start: AIC=-423.41  
## korea\_interest\_rate ~ us\_interest\_rate + cci\_index + facility\_investment +   
## foreign\_selling + inflation + korea\_export\_price\_index +   
## unemployment + wti\_price  
##   
## Df Sum of Sq RSS AIC  
## <none> 14.332 -423.41  
## - korea\_export\_price\_index 1 0.725 15.056 -416.73  
## - foreign\_selling 1 1.482 15.813 -408.10  
## - unemployment 1 1.903 16.234 -403.47  
## - facility\_investment 1 5.671 20.002 -366.74  
## - wti\_price 1 7.628 21.960 -350.30  
## - cci\_index 1 7.986 22.318 -347.46  
## - inflation 1 9.056 23.388 -339.22  
## - us\_interest\_rate 1 42.582 56.913 -182.70

LM\_step

##   
## Call:  
## lm(formula = korea\_interest\_rate ~ us\_interest\_rate + cci\_index +   
## facility\_investment + foreign\_selling + inflation + korea\_export\_price\_index +   
## unemployment + wti\_price, data = df\_for\_regression\_01)  
##   
## Coefficients:  
## (Intercept) us\_interest\_rate   
## -3.134e+01 3.419e-01   
## cci\_index facility\_investment   
## 3.640e-01 -1.756e-02   
## foreign\_selling inflation   
## -1.821e-08 2.515e-01   
## korea\_export\_price\_index unemployment   
## -5.662e-03 -5.797e-01   
## wti\_price   
## 1.217e-02

# 다 쓰는게 최고좋은 모델