[Example10-11] Seasonality

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```
load("~/計量経済学演習/R data sets for 5e/barium.RData")
barium<- data
```

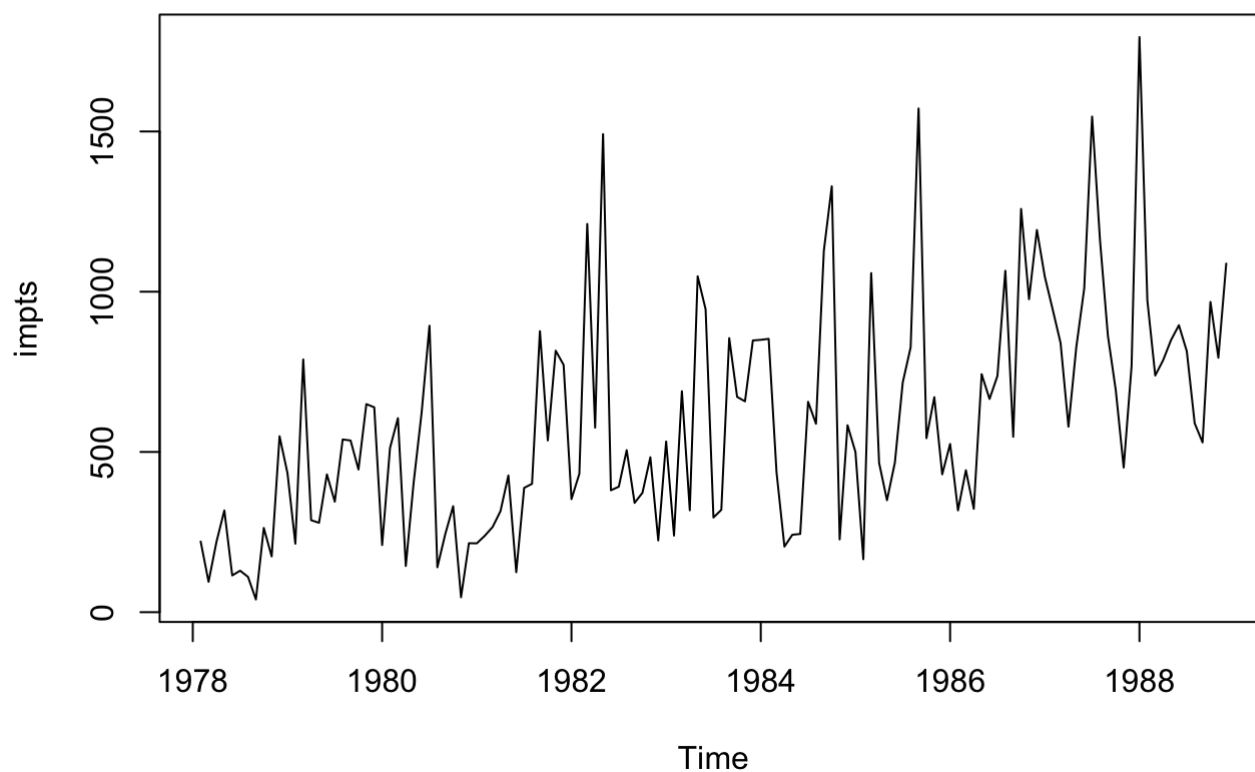## Seasonalityへの対処は、seasonal dummyを入れればいいだけ。簡単。

```
library(dynlm);library(lmtest)
```

```
## Loading required package: zoo
```

```
##
## Attaching package: 'zoo'
```

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

```
impts<- ts(barium$chnimp, start=c(1978,2), frequency=12)
plot(impts)
```

Define monthly time series beginning in Feb 1978

```
tsdata <- ts(barium, start=c(1978,2), frequency=12)
```

```
summary(res <- dynlm(log(chnimp) ~ log(chempi)+log(gas)+log(rtwex)+befile6+
                affile6+afdec6+ season(tsdata) , data=tsdata ))
```

```
##
## Time series regression with "ts" data:
## Start = 1978(2), End = 1988(12)
##
## Call:
## dynlm(formula = log(chnimp) ~ log(chempi) + log(gas) + log(rtwex) +
##     befile6 + affile6 + afdec6 + season(tsdata), data = tsdata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.98535 -0.36207  0.07366  0.41786  1.37734
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)     16.779215 32.428645   0.517   0.6059
## log(chempi)      3.265062  0.492930   6.624 1.24e-09 ***
## log(gas)        -1.278140  1.389008  -0.920   0.3594
## log(rtwex)       0.663045  0.471304   1.407   0.1622
## befile6          0.139703  0.266808   0.524   0.6016
## affile6          0.012632  0.278687   0.045   0.9639
## afdec6          -0.521300  0.301950  -1.726   0.0870 .
## season(tsdata)Feb -0.417711  0.304444  -1.372   0.1728
## season(tsdata)Mar 0.059052  0.264731   0.223   0.8239
## season(tsdata)Apr -0.451483  0.268386  -1.682   0.0953 .
## season(tsdata)May 0.033309  0.269242   0.124   0.9018
## season(tsdata)Jun -0.206332  0.269252  -0.766   0.4451
## season(tsdata)Jul 0.003837  0.278767   0.014   0.9890
## season(tsdata)Aug -0.157064  0.277993  -0.565   0.5732
## season(tsdata)Sep -0.134161  0.267656  -0.501   0.6172
## season(tsdata)Oct 0.051693  0.266851   0.194   0.8467
## season(tsdata)Nov -0.246260  0.262827  -0.937   0.3508
## season(tsdata)Dec 0.132838  0.271423   0.489   0.6255
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6012 on 113 degrees of freedom
## Multiple R-squared:  0.3583, Adjusted R-squared:  0.2618
## F-statistic: 3.712 on 17 and 113 DF,  p-value: 1.282e-05
```

defaultでJanuaryは抜いてある。seasonalityを入れない時よりもregressorかなり増えてるのでやはりseが少し大きくなってるが致し方なし。

ちなみにseasonality入れないパターン

```
summary(res <- dynlm(log(chnimp) ~ log(chempi)+log(gas)+log(rtwex)+befile6+
            affile6+afdec6 , data=tsdata ))
```

```
##
## Time series regression with "ts" data:
## Start = 1978(2), End = 1988(12)
##
## Call:
## dynlm(formula = log(chnimp) ~ log(chempi) + log(gas) + log(rtwex) +
##     befile6 + affile6 + afdec6, data = tsdata)
##
## Residuals:
##     Min    1Q  Median    3Q    Max
## -2.03356 -0.39080  0.03048  0.40248  1.51720
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -17.80277  21.04537  -0.846  0.3992
## log(chempi)  3.11719   0.47920   6.505 1.72e-09 ***
## log(gas)     0.19634   0.90662   0.217  0.8289
## log(rtwex)   0.98302   0.40015   2.457  0.0154 *
## befile6      0.05957   0.26097   0.228  0.8198
## affile6     -0.03241   0.26430  -0.123  0.9026
## afdec6      -0.56524   0.28584  -1.978  0.0502 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5974 on 124 degrees of freedom
## Multiple R-squared:  0.3049, Adjusted R-squared:  0.2712
## F-statistic: 9.064 on 6 and 124 DF,  p-value: 3.255e-08
```

seasonality入れても入れなくても**log(chempi)**が**significant**なのは変わらない。がやはり入れてない時の方がその**causal effect** はやや**over estimate**されている。