[Example10-4] FDL Model

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Finite Distributed Lag Model

```
load("~/計量経済学演習/R data sets for 5e/fertil3.RData")
fertil3<-data

library(dynlm);library(lmtest);library(car)

## Loading required package: zoo

##
## Attaching package: 'zoo'

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

## Loading required package: carData
```

Define Yearly time series beginning in 1913

```
tsdata <- ts(fertil3, start=1913)
#fertil3 にyear のデータあるけどts だとこの情報全く使っていないことになる。
```

Linear regression of model with lags

```
res <- dynlm(gfr ~ pe + L(pe) + L(pe,2) + ww2 + pill, data=tsdata)
coeftest(res)

##
## t test of coefficients:
##
##                Estimate  Std. Error t value  Pr(>|t|)
## (Intercept)  95.8704975   3.2819571 29.2114 < 2.2e-16 ***
## pe            0.0726718   0.1255331  0.5789    0.5647
## L(pe)        -0.0057796   0.1556629 -0.0371    0.9705
## L(pe, 2)      0.0338268   0.1262574  0.2679    0.7896
## ww2         -22.1264975  10.7319716 -2.0617    0.0433 *
## pill        -31.3049888   3.9815591 -7.8625 5.634e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

zoodata<-zoo(fertil3,order.by=fertil3$year) #fertil3$ は必須。year だけだと参照できてない。
```

OLS Estimate FDL Model

```
res2<-dynlm(gfr ~ pe + L(pe) + L(pe,2) + ww2 + pill, data=zoodata)
coeftest(res2)
```

```
##
## t test of coefficients:
##
##                Estimate  Std. Error t value  Pr(>|t|)
## (Intercept)  95.8704975   3.2819571 29.2114 < 2.2e-16 ***
## pe            0.0726718   0.1255331  0.5789    0.5647
## L(pe)        -0.0057796   0.1556629 -0.0371    0.9705
## L(pe, 2)      0.0338268   0.1262574  0.2679    0.7896
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## pill        -31.3049888   3.9815591 -7.8625 5.634e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

ts でも zoo でもどっちでもできる。

F test. H0: all “pe” coefficients are=0

```
linearHypothesis(res, matchCoefs(res,"pe"))
```

```
## Linear hypothesis test
##
## Hypothesis:
## pe = 0
## L(pe) = 0
## L(pe, 2) = 0
##
## Model 1: restricted model
## Model 2: gfr ~ pe + L(pe) + L(pe, 2) + ww2 + pill
##
##   Res.Df   RSS Df Sum of Sq     F  Pr(>F)
## 1     67 15460
## 2     64 13033  3    2427.1 3.973 0.01165 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

impact propensity とそれぞれの dynamic causal effect 全部 0 説は 5%だと significant だけど 1%だとギリ reject できない。

Long Run Propensity(Cumulative Dynamic Causal Effect)=0 かどうかの test。

restriction must be made by myself

Calculating the LRP

```
b<-coef(res)
b["pe"]+b["L(pe)"]+b["L(pe, 2)"]
```

```
##        pe
## 0.1007191
```

F test. H0: LRP=0

```
linearHypothesis(res,"pe + L(pe) + L(pe, 2) = 0")
```

```
## Linear hypothesis test
##
## Hypothesis:
## pe  + L(pe)  + L(pe, 2) = 0
##
## Model 1: restricted model
## Model 2: gfr ~ pe + L(pe) + L(pe, 2) + ww2 + pill
##
##   Res.Df   RSS Df Sum of Sq      F   Pr(>F)
## 1     65 15358
## 2     64 13033  1    2325.8 11.421 0.001241 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

cumulative なんだから dynamic causal effect が積み上がってるから、さっきよりは当然有意に出てくれないと困る。