its_with_control

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R code Example 1

Effect of hospital infection control programme on gram-negative rod bacteraemia

Control: community-acquired bacteraemia

Data from Goto et al. 2016

Surveillance in 130 VHA hospitals from Jan 2003 to Dec 2013

Roll out Mar 2007 - Oct 2007

```
library(sandwich)
```

Post intervention period Nov 2007-Dec 2013

```
## Warning: package 'sandwich' was built under R version 4.4.1
```

```
dat <- read.csv("gram_neg_bacteraemia_data.csv", header = T)
dat$timec <- dat$time - 131 #time centred at study end
dat$mon <- factor(dat$mon)
```

Models

```
#### Model 1 - no adjustment for trend
lm1 <- lm(yI ~ roll + interv + interv:timec, data=dat)

 #### Model 2 - segmented regression
lm2 <- lm(yI ~ time + mon + roll + interv + interv:timec, data=dat)

#### Model 3 - common trend model fitted using differencing method
dat$d <- dat$yI - dat$yC
lm3 <- lm(d ~ roll + interv + interv:timec, data=dat)

#### Table of estimates
est <- c(coef(lm1)["interv"], coef(lm2)["interv"], coef(lm3)["interv"])
se1 <- sqrt(diag(NeweyWest(lm1, prewhite = F, lag = 3)))["interv"]
se2 <- sqrt(diag(NeweyWest(lm2, prewhite = F, lag = 3)))["interv"]
se3 <- sqrt(diag(NeweyWest(lm3, prewhite = F, lag = 3)))["interv"]
lb <- est - 1.96 * c(se1, se2, se3)
```

```
ub <- est + 1.96 * c(se1, se2, se3)
table <- cbind(round(est, digits = 2), round(lb, digits = 2), round(ub, digits = 2))
table
```

Newey-West standard errors used to account for autocorrelation up to lag 3

```
##         [,1]  [,2] [,3]
## interv -1.09 -1.38 -0.8
## interv -1.98 -2.67 -1.3
## interv -0.81 -1.23 -0.4
```

```
lm4 <- lm(d ~ time, data = dat[dat$interv == 0 & dat$roll == 0, ])
se_trend <- sqrt(diag(NeweyWest(lm4, prewhite = F, lag = 2)))["time"]
z <- coef(lm4)["time"]/se_trend
p_trend <- 2 * (1 - pnorm(abs(z)))
p_trend
```

Test common trend assumption

```
##     time
## 0.867437
```

R code Example 2

Impact of rotavirus vaccination on rotavirus diarrhoea #### Control: rotavirus negative diarrhoea

Data from Armah et al. 2016

Study period Jan 2010 - Dec 2014

```
library(sandwich)
dat <- read.csv("rotavirus_data.csv", header = T)
dat$timec <- dat$time - 27 #time centred at vaccine introduction dat$mon <- factor(dat$mon)
```

Vaccine introduced Apr 2012

Models

Poisson regression models fitted using glm

```
#### Model 1 - no adjustment
glm1 <- glm(yI ~ vacc:timec, family = "poisson", data = dat)

#### Model 2 - segmented regression with seasonality
glm2 <- glm(yI ~ vacc:timec + time + mon, family = "poisson", data = dat)

#### Model 3 - common trend model fitted by including control series as an offset
glm3 <- glm(yI ~ vacc:timec,
            family = "poisson",
            offset = log(yC),
```

```
            data = dat)

#### Table of estimates
est <- exp(c(coef(glm1)["vacc:timec"], coef(glm2)["vacc:timec"], coef(glm3)["vacc:timec"]))
se1 <- sqrt(diag(NeweyWest(glm1, prewhite = F, lag = 2)))["vacc:timec"]
se2 <- sqrt(diag(NeweyWest(glm2, prewhite = F, lag = 2)))["vacc:timec"]
se3 <- sqrt(diag(NeweyWest(glm3, prewhite = F, lag = 2)))["vacc:timec"]
lb <- est * exp(-1.96 * c(se1, se2, se3))
ub <- est * exp(1.96 * c(se1, se2, se3))
table <- cbind(round(est, digits = 3), round(lb, digits = 3), round(ub, digits = 3))
table
```

Newey West standard errors used to account for autocorrelation up to lag 2

```
##             [,1]  [,2]  [,3]
## vacc:timec 0.939 0.919 0.959
## vacc:timec 0.963 0.918 1.010
## vacc:timec 0.964 0.951 0.977
```

```
glm4 <- glm(yI ~ time, family = "poisson", offset = log(yC), data = dat[dat$vacc == 0, ])
se_trend <- sqrt(diag(NeweyWest(glm4, prewhite = F, lag = 2)))["time"]
z <- coef(glm4)["time"]/se_trend
p_trend <- 2 * (1 - pnorm(abs(z)))
p_trend
```

Test common trend assumption

```
##         time
## 4.450131e-05
```