

Tutorial 13: Autocorrelation, Fixed Effects, and Causal Inference Techniques

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Today's Agenda

1. Autocorrelation
2. Fixed-effects regression
3. Spatial lag models
4. Differences-in-differences
5. Regression discontinuity designs

1. Autocorrelation

Create lags with DataCombine.

```
install.packages("DataCombine")
```

```
library(DataCombine)
```

```
## Warning: package 'DataCombine' was built under R version 3.2.2
```

```
which()
```

```
## Error in which(): argument "x" is missing, with no default
```

```
toLag = c()
```

```
for (lagVar in toLag) {  
  combi1 = slide(combi1, Var = lagVar, TimeVar = "year", GroupVar = "stcode",  
    NewVar = paste0("lag1_", lagVar), slideBy = -1, keepInvalid = FALSE,  
    reminder = TRUE)  
}
```

```
for (lagVar in toLag) {  
  combi1 = slide(combi1, Var = lagVar, TimeVar = "year", GroupVar = "stcode",  
    NewVar = paste0("lag2_", lagVar), slideBy = -2, keepInvalid = FALSE,  
    reminder = TRUE)  
}
```

```
for (lagVar in toLag) {  
  combi1 = slide(combi1, Var = lagVar, TimeVar = "year", GroupVar = "stcode",  
    NewVar = paste0("lag3_", lagVar), slideBy = -3, keepInvalid = FALSE,  
    reminder = TRUE)  
}
```

2. Fixed-effects regression

3. Spatial lag models

4. Differences-in-differences

Differences-in-differences analysis makes use of parallel time trends.

5. Regression discontinuity designs

Regression discontinuity designs are powerful tools for causal inference.

```
install.packages("rdd")
```

```
library(rdd)
```

```
## Warning: package 'rdd' was built under R version 3.2.2

## Loading required package: sandwich
## Loading required package: lmtest

## Warning: package 'lmtest' was built under R version 3.2.2

## Loading required package: zoo
##
## Attaching package: 'zoo'
##
## The following objects are masked from 'package:base':
##
##      as.Date, as.Date.numeric
##
## Loading required package: AER

## Warning: package 'AER' was built under R version 3.2.2

## Loading required package: car

## Warning: package 'car' was built under R version 3.2.2

## Loading required package: survival
## Loading required package: Formula
```

Remember

```
fun = c("R", "is", "fun")
paste(fun, collapse = " ")
```

```
## [1] "R is fun"
```