

A3_Yongyi_Lin

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Exercise 1

```
population <- read.csv('population.csv')
crime_long <- read.csv('crime_long.csv')
officers <- read.csv('officers.csv')
```

```
### Exercise 2
```

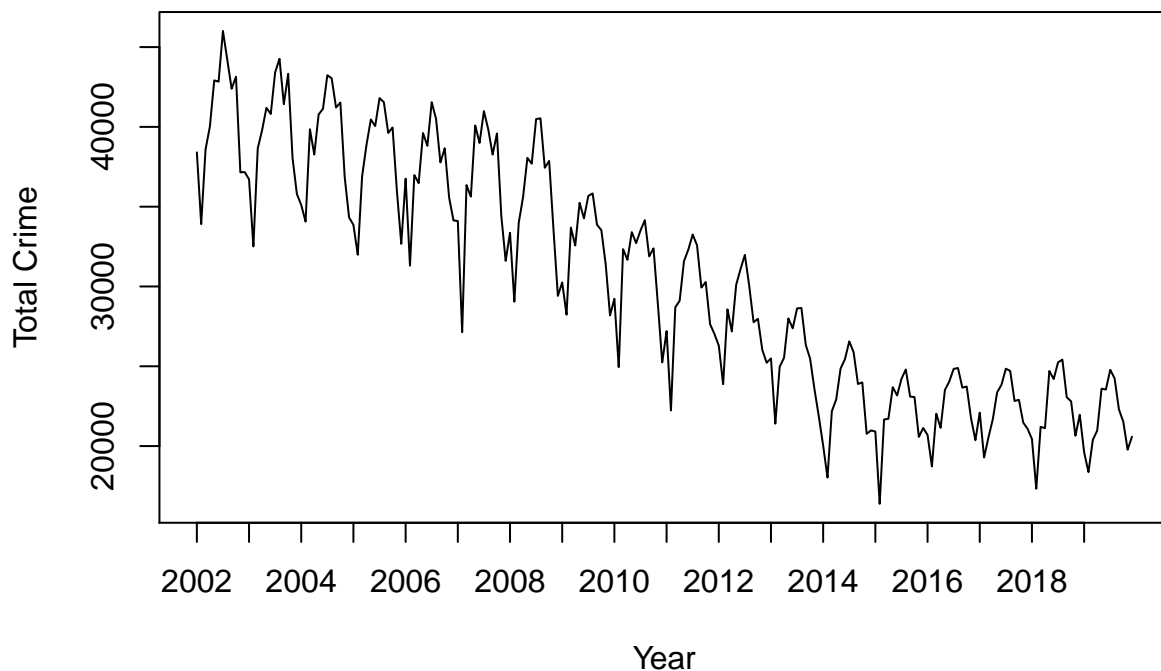
```
#### Calculate total crime per month
```

```
crime_monthly <- crime_long %>%
  group_by(crime_month) %>%
  summarize(crime_by_month = sum(crimes))
```

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
#### Plot time series of crime
```

```
crime_ts <- ts(crime_monthly$crime_by_month, frequency = 12, start = c(2002, 1))
plot.ts(crime_ts, xlab = "Year", ylab = "Total Crime", xaxt = "n")
axis(side = 1, at = 2002:2019)
```



```
#### Construct panel data
```

```
crime_popleft <- merge(population, crime_long, by.x = c("month", "district"), by.y = c("crime_month", "district"))
crime_panel <- crime_popleft %>%
```

```
mutate(property_crimes = case_when(crime_type == "property" ~ crimes, TRUE ~ 0L), violent_crimes = ca
group_by(month, district) %>%
summarize(
  total_crimes = sum(crimes),
  violent_crimes = sum(violent_crimes),
  property_crimes = sum(property_crimes),
  median_income = p50_inc,
  share_black = tot_black/tot_pop,
  share_hisp = tot_hisp/tot_pop,
  share_white = tot_white/tot_pop
) %>%
distinct()
```

```
## `summarise()` regrouping output by 'month', 'district' (override with `.groups` argument)
head(crime_panel)
```

```
## # A tibble: 6 x 9
## # Groups:   month, district [6]
##   month district total_crimes violent_crimes property_crimes median_income
##   <fct>   <int>         <int>         <int>         <int>         <dbl>
## 1 2005~     1           1549           212           784           91085.
## 2 2005~     2           1351           365           509           29890.
## 3 2005~     3           1707           533           606           28048.
## 4 2005~     4           1839           616           714           39010.
## 5 2005~     5           1411           435           467           33147.
## 6 2005~     6           1742           591           734           34672.
## # ... with 3 more variables: share_black <dbl>, share_hisp <dbl>,
## #   share_white <dbl>
```

Exercise 3

```
panel_officers <- merge(officers, crime_panel, by.y = c("month", "district"), by.x = c("month", "unit"))
lm_ex3 <- lm(formula = arrest ~ tenure + total_crimes + median_income + share_black + share_hisp + share_w
lm_ex3$coefficients
```

```
##           tenure total_crimes median_income share_black share_hisp
## 2.878869e-05 -1.364283e-05 7.210106e-07 5.028186e-01 5.172976e-01
## share_white
## 5.151714e-01
```

Exercise 4

```
fe <- lm(formula = arrest ~ tenure + total_crimes + median_income + share_black + share_hisp + share_wh
fe$coefficients
```

```
##           tenure           total_crimes           median_income
## -3.809782e-06 -6.320360e-06 -4.910055e-07
## share_black share_hisp share_white
## -9.200883e-02 -1.398480e-01 -1.012976e-01
## factor(unit)1 factor(unit)2 factor(unit)3
## 6.361725e-01 6.117946e-01 6.161604e-01
## factor(unit)4 factor(unit)5 factor(unit)6
## 6.361362e-01 6.203707e-01 6.223150e-01
## factor(unit)7 factor(unit)8 factor(unit)9
```

##	6.150872e-01	6.595989e-01	6.392821e-01
##	factor(unit)10	factor(unit)11	factor(unit)12
##	6.438540e-01	6.248365e-01	6.366138e-01
##	factor(unit)13	factor(unit)14	factor(unit)15
##	6.331086e-01	6.605815e-01	6.158985e-01
##	factor(unit)16	factor(unit)17	factor(unit)18
##	6.434606e-01	6.372529e-01	6.401890e-01
##	factor(unit)19	factor(unit)20	factor(unit)21
##	6.451079e-01	6.207241e-01	5.994560e-01
##	factor(unit)22	factor(unit)23	factor(unit)24
##	6.355380e-01	6.252008e-01	6.207761e-01
##	factor(unit)25	factor(month)2007-02-01	factor(month)2007-03-01
##	6.581988e-01	2.746517e-03	5.425086e-03
##	factor(month)2007-04-01	factor(month)2007-05-01	factor(month)2007-06-01
##	-4.433449e-03	9.642377e-03	-1.518439e-02
##	factor(month)2007-07-01	factor(month)2007-08-01	factor(month)2007-09-01
##	-2.476077e-03	-9.283480e-03	2.831905e-03
##	factor(month)2007-10-01	factor(month)2007-11-01	factor(month)2007-12-01
##	5.531776e-03	3.270094e-03	-8.522393e-03
##	factor(month)2008-01-01	factor(month)2008-02-01	factor(month)2008-03-01
##	-1.580319e-02	-7.935551e-03	-7.042028e-03
##	factor(month)2008-04-01	factor(month)2008-05-01	factor(month)2008-06-01
##	7.880029e-03	1.889847e-02	1.042877e-03
##	factor(month)2008-07-01	factor(month)2008-08-01	factor(month)2008-09-01
##	-1.992463e-05	1.040177e-03	9.368277e-03
##	factor(month)2008-10-01	factor(month)2008-11-01	factor(month)2008-12-01
##	-3.356443e-03	-1.541507e-03	1.093272e-02
##	factor(month)2009-01-01	factor(month)2009-02-01	factor(month)2009-03-01
##	-6.007364e-03	-5.783149e-03	-8.894307e-03
##	factor(month)2009-04-01	factor(month)2009-05-01	factor(month)2009-06-01
##	-4.911125e-03	-1.544614e-03	4.205706e-03
##	factor(month)2009-07-01	factor(month)2009-08-01	factor(month)2009-09-01
##	5.471119e-03	-4.666546e-03	-4.795034e-03
##	factor(month)2009-10-01	factor(month)2009-11-01	factor(month)2009-12-01
##	-1.586495e-03	-5.210196e-03	-9.885677e-03
##	factor(month)2010-01-01	factor(month)2010-02-01	factor(month)2010-03-01
##	1.814697e-03	3.619692e-03	-8.878372e-03
##	factor(month)2010-04-01	factor(month)2010-05-01	factor(month)2010-06-01
##	7.082318e-03	-3.414388e-03	-5.868300e-03
##	factor(month)2010-07-01	factor(month)2010-08-01	factor(month)2010-09-01
##	-1.353438e-02	9.875346e-03	2.215222e-03
##	factor(month)2010-10-01	factor(month)2010-11-01	factor(month)2010-12-01
##	-2.548071e-03	-9.174658e-03	-4.759482e-03
##	factor(month)2011-01-01	factor(month)2011-02-01	factor(month)2011-03-01
##	-8.207417e-03	-5.389484e-03	-4.548749e-03
##	factor(month)2011-04-01	factor(month)2011-05-01	factor(month)2011-06-01
##	-1.189441e-03	-5.307481e-04	1.206606e-04
##	factor(month)2011-07-01	factor(month)2011-08-01	factor(month)2011-09-01
##	4.004173e-03	-1.042689e-04	-1.134552e-02
##	factor(month)2011-10-01	factor(month)2011-11-01	factor(month)2011-12-01
##	1.049381e-02	-6.974074e-03	2.879175e-04
##	factor(month)2012-01-01	factor(month)2012-02-01	factor(month)2012-03-01
##	-1.044974e-02	2.973167e-03	1.819509e-03
##	factor(month)2012-04-01	factor(month)2012-05-01	factor(month)2012-06-01

```
##          4.576250e-03          4.361146e-03          -2.065034e-03
## factor(month)2012-07-01 factor(month)2012-08-01 factor(month)2012-09-01
##          6.780647e-04          -5.126210e-03          2.322100e-03
## factor(month)2012-10-01 factor(month)2012-11-01 factor(month)2012-12-01
##          -1.457656e-02          3.462557e-03          -1.687488e-02
## factor(month)2013-01-01 factor(month)2013-02-01 factor(month)2013-03-01
##          3.795055e-03          -8.077931e-03          -1.585271e-02
## factor(month)2013-04-01 factor(month)2013-05-01 factor(month)2013-06-01
##          3.512273e-03          1.410776e-02          7.059393e-03
## factor(month)2013-07-01 factor(month)2013-08-01 factor(month)2013-09-01
##          1.753106e-02          -2.731977e-03          3.036804e-03
## factor(month)2013-10-01 factor(month)2013-11-01 factor(month)2013-12-01
##          -8.699381e-03          -5.810358e-03          3.319051e-03
## factor(month)2014-01-01 factor(month)2014-02-01 factor(month)2014-03-01
##          -1.496478e-02          2.499075e-03          -4.441004e-03
## factor(month)2014-04-01 factor(month)2014-05-01 factor(month)2014-06-01
##          -1.862457e-02          -5.901253e-03          -1.760679e-03
## factor(month)2014-07-01 factor(month)2014-08-01 factor(month)2014-09-01
##          5.574852e-03          -1.112962e-03          1.054709e-03
## factor(month)2014-10-01 factor(month)2014-11-01 factor(month)2014-12-01
##          -1.729819e-03          -8.539207e-03          -7.021181e-03
## factor(month)2015-01-01 factor(month)2015-02-01 factor(month)2015-03-01
##          -4.922362e-03          -9.307792e-03          4.154443e-03
## factor(month)2015-04-01 factor(month)2015-05-01 factor(month)2015-06-01
##          -3.524368e-03          -6.722439e-03          -7.111330e-03
## factor(month)2015-07-01 factor(month)2015-08-01 factor(month)2015-09-01
##          -8.631208e-03          -5.340895e-03          -1.012199e-03
## factor(month)2015-10-01 factor(month)2015-11-01 factor(month)2015-12-01
##          -8.334859e-03          2.320336e-03          -7.372761e-03
## factor(month)2016-01-01 factor(month)2016-02-01 factor(month)2016-03-01
##          -5.343684e-03          -7.098580e-03          -1.453481e-02
## factor(month)2016-04-01 factor(month)2016-05-01 factor(month)2016-06-01
##          9.817929e-03          9.858467e-03          -5.146654e-03
## factor(month)2016-07-01 factor(month)2016-08-01 factor(month)2016-09-01
##          -1.082352e-02          -1.921383e-02          -1.541889e-03
## factor(month)2016-10-01 factor(month)2016-11-01 factor(month)2016-12-01
##          3.117914e-03          -1.397966e-02          -1.289825e-02
## factor(month)2017-01-01 factor(month)2017-02-01 factor(month)2017-03-01
##          8.783617e-05          -5.838321e-03          6.054365e-03
## factor(month)2017-04-01 factor(month)2017-05-01 factor(month)2017-06-01
##          -5.737714e-03          8.409860e-03          -1.219203e-02
## factor(month)2017-07-01 factor(month)2017-08-01 factor(month)2017-09-01
##          -6.123435e-03          -2.664221e-03          -8.493195e-03
## factor(month)2017-10-01 factor(month)2017-11-01 factor(month)2017-12-01
##          -9.683101e-03          -1.684569e-02          -8.924383e-03
```

Exercise 5

```
#### within
fe2_within <- plm(formula = arrest ~ tenure + total_crimes + median_income + share_black + share_hisp +
#### between
fe2_between <- plm(formula = arrest ~ tenure + total_crimes + median_income + share_black + share_hisp +
#### first difference
fe4 <- plm(formula = arrest ~ tenure + total_crimes + median_income + share_black + share_hisp + share_v
```