Mingpei Li

ECON613 Assignment3
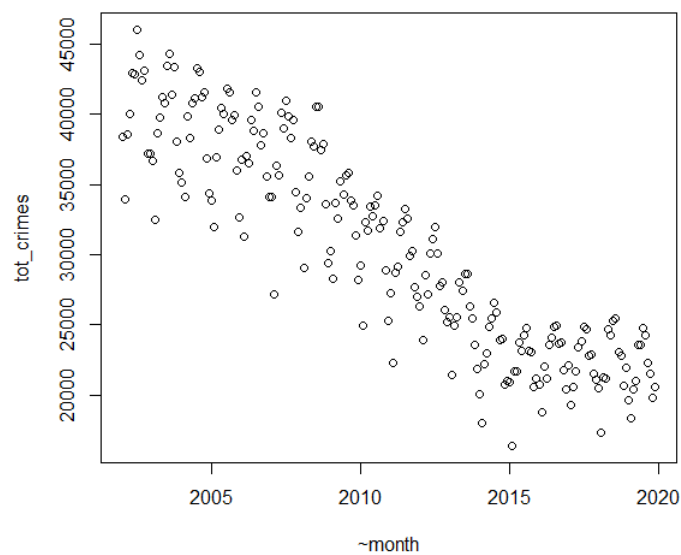
Exercise 2

(1).

total crime per month:

```
   month       tot_crimes
   <chr>          <int>
 1 2002-01-01     38405
 2 2002-02-01     33909
 3 2002-03-01     38583
 4 2002-04-01     40032
 5 2002-05-01     42913
 6 2002-06-01     42834
 7 2002-07-01     46012
 8 2002-08-01     44210
 9 2002-09-01     42389
10 2002-10-01     43144
11 2002-11-01     37151
12 2002-12-01     37171
13 2003-01-01     36715
14 2003-02-01     32509
15 2003-03-01     38651
16 2003-04-01     39789
17 2003-05-01     41194
18 2003-06-01     40813
19 2003-07-01     43413
20 2003-08-01     44267
```

Plot:

(2)

Merge the two datasets by districts-units and period:

```
       month period district tot_pop tot_white tot_black tot_hisp   p50_inc crime_type crimes
2005-01-01      1        1   38472     22608      4953     2543  91084.91       drug    189
2005-01-01      1        1   38472     22608      4953     2543  91084.91      other    364
2005-01-01      1        1   38472     22608      4953     2543  91084.91   property    784
2005-01-01      1        1   38472     22608      4953     2543  91084.91    violent    212
2005-01-01      1        2   37992       630     35966      628  29890.17       drug    209
2005-01-01      1        2   37992       630     35966      628  29890.17      other    268
2005-01-01      1        2   37992       630     35966      628  29890.17   property    509
2005-01-01      1        2   37992       630     35966      628  29890.17    violent    365
2005-01-01      1        3   78629      3217     71792     1371  28047.56       drug    259
2005-01-01      1        3   78629      3217     71792     1371  28047.56      other    309
2005-01-01      1        3   78629      3217     71792     1371  28047.56   property    606
2005-01-01      1        3   78629      3217     71792     1371  28047.56    violent    533
2005-01-01      1        4  124519      9926     77314    35387  39010.22       drug    227
2005-01-01      1        4  124519      9926     77314    35387  39010.22      other    282
2005-01-01      1        4  124519      9926     77314    35387  39010.22   property    714
2005-01-01      1        4  124519      9926     77314    35387  39010.22    violent    616
2005-01-01      1        5   74384       843     70053     2524  33146.90       drug    236
2005-01-01      1        5   74384       843     70053     2524  33146.90      other    273
2005-01-01      1        5   74384       843     70053     2524  33146.90   property    467
2005-01-01      1        5   74384       843     70053     2524  33146.90    violent    435
```

(3)

Construct a panel data:

	month	district	total_crimes_per_resident	violent_crimes_per_resident	property_crimes_per_resident	median_income	black	hispanic	white
	<chr>	<int>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
1	2005-01-01	1	0.0403	0.00551	0.0204	91085.	0.129	0.0661	0.588
2	2005-01-01	2	0.0356	0.00961	0.0134	29890.	0.947	0.0165	0.0166
3	2005-01-01	3	0.0217	0.00678	0.00771	28048.	0.913	0.0174	0.0409
4	2005-01-01	4	0.0148	0.00495	0.00573	39010.	0.621	0.284	0.0797
5	2005-01-01	5	0.0190	0.00585	0.00628	33147.	0.942	0.0339	0.0113
6	2005-01-01	6	0.0194	0.00660	0.00819	34672.	0.975	0.0101	0.00345
7	2005-01-01	7	0.0275	0.00994	0.00891	23961.	0.968	0.0164	0.00370
8	2005-01-01	8	0.00963	0.00255	0.00474	49069.	0.211	0.565	0.208
9	2005-01-01	9	0.00993	0.00294	0.00437	36324.	0.122	0.611	0.152
10	2005-01-01	10	0.0119	0.00376	0.00392	29147.	0.337	0.619	0.0359
11	2005-01-01	11	0.0319	0.00865	0.00771	26338.	0.843	0.117	0.0248
12	2005-01-01	12	0.0188	0.00491	0.00864	52561.	0.174	0.412	0.311
13	2005-01-01	13	0.00746	0.00193	0.00406	61950.	0.184	0.248	0.516
14	2005-01-01	14	0.0103	0.00250	0.00558	61849.	0.0722	0.461	0.417
15	2005-01-01	15	0.0269	0.00806	0.00649	27940.	0.933	0.0370	0.0163
16	2005-01-01	16	0.00560	0.00107	0.00317	64130.	0.0101	0.232	0.688
17	2005-01-01	17	0.00683	0.00138	0.00367	55060.	0.0333	0.433	0.386
18	2005-01-01	18	0.0115	0.00215	0.00578	87939.	0.0928	0.0498	0.753
19	2005-01-01	19	0.0114	0.00207	0.00682	93098.	0.0251	0.107	0.798
20	2005-01-01	20	0.00664	0.00158	0.00343	52333.	0.107	0.183	0.540

Exercise 3

```
Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)     5.067e-01  1.278e-02  39.644   <2e-16 ***
tenure         -4.161e-06  8.354e-06  -0.498    0.618
crimes          2.229e-07  1.805e-06   0.124    0.902
p50_inc         1.618e-08  9.186e-08   0.176    0.860
black_share    -8.102e-03  1.340e-02  -0.604    0.546
hispanic_share -5.363e-03  1.391e-02  -0.385    0.700
white_share    -1.207e-02  1.632e-02  -0.740    0.460
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Exercise 4

```
Coefficients:
                         Estimate Std. Error t value Pr(>|t|)
(Intercept)             6.362e-01  1.061e-01   5.996 2.03e-09 *
tenure                 -3.810e-06  8.525e-06  -0.447   0.6549
crimes                 -6.320e-06  5.305e-06  -1.191   0.2335
p50_inc                -4.910e-07  6.505e-07  -0.755   0.4504
black_share            -9.201e-02  1.043e-01  -0.882   0.3775
hispanic_share         -1.398e-01  2.028e-01  -0.690   0.4904
white_share            -1.013e-01  1.818e-01  -0.557   0.5773
dist_strdistrict10      7.682e-03  6.920e-02   0.111   0.9116
dist_strdistrict11     -1.134e-02  2.276e-02  -0.498   0.6185
dist_strdistrict12      4.412e-04  4.463e-02   0.010   0.9921
dist_strdistrict13     -3.064e-03  4.251e-02  -0.072   0.9425
dist_strdistrict14      2.441e-02  5.880e-02   0.415   0.6781
dist_strdistrict15     -2.027e-02  2.122e-02  -0.956   0.3393
dist_strdistrict16      7.288e-03  5.178e-02   0.141   0.8881
dist_strdistrict17      1.080e-03  4.859e-02   0.022   0.9823
dist_strdistrict18      4.017e-03  2.594e-02   0.155   0.8770
dist_strdistrict19      8.935e-03  3.625e-02   0.247   0.8053
dist_strdistrict2      -2.438e-02  1.901e-02  -1.282   0.1998
dist_strdistrict20     -1.545e-02  3.378e-02  -0.457   0.6475
dist_strdistrict21     -3.672e-02  2.291e-02  -1.603   0.1090
dist_strdistrict22     -6.345e-04  1.390e-02  -0.046   0.9636
dist_strdistrict23     -1.097e-02  4.180e-02  -0.262   0.7929
dist_strdistrict24     -1.540e-02  3.085e-02  -0.499   0.6177
dist_strdistrict25      2.203e-02  7.539e-02   0.292   0.7702
dist_strdistrict3      -2.001e-02  2.128e-02  -0.940   0.3471
dist_strdistrict4      -3.633e-05  3.221e-02  -0.001   0.9991
dist_strdistrict5      -1.580e-02  2.106e-02  -0.750   0.4531
dist_strdistrict6      -1.386e-02  2.275e-02  -0.609   0.5424
dist_strdistrict7      -2.109e-02  2.271e-02  -0.928   0.3532
dist_strdistrict8       2.343e-02  6.598e-02   0.355   0.7226
dist_strdistrict9       3.110e-03  6.192e-02   0.050   0.9599
month2007-02-01         2.747e-03  1.112e-02   0.247   0.8049
month2007-03-01         5.425e-03  1.098e-02   0.494   0.6213
month2007-04-01        -4.433e-03  1.100e-02  -0.403   0.6868
month2007-05-01         9.642e-03  1.105e-02   0.872   0.3830
month2007-06-01        -1.518e-02  1.100e-02  -1.380   0.1675
month2007-07-01        -2.476e-03  1.107e-02  -0.224   0.8230
month2007-08-01        -9.283e-03  1.101e-02  -0.843   0.3992
month2007-09-01         2.832e-03  1.096e-02   0.258   0.7962
month2007-10-01         5.532e-03  1.098e-02   0.504   0.6145
month2007-11-01         3.270e-03  1.088e-02   0.300   0.7638
month2007-12-01        -8.522e-03  1.089e-02  -0.783   0.4339
month2008-01-01        -1.580e-02  1.090e-02  -1.450   0.1470
month2008-02-01        -7.936e-03  1.096e-02  -0.724   0.4691
month2008-03-01        -7.042e-03  1.090e-02  -0.646   0.5182
month2008-04-01         7.880e-03  1.089e-02   0.723   0.4695
month2008-05-01         1.890e-02  1.091e-02   1.732   0.0833 .
month2008-06-01         1.043e-03  1.088e-02   0.096   0.9237
month2008-07-01        -1.992e-05  1.092e-02  -0.002   0.9985
month2008-08-01         1.040e-03  1.093e-02   0.095   0.9242
month2008-09-01         9.368e-03  1.086e-02   0.863   0.3882
month2008-10-01        -3.356e-03  1.085e-02  -0.309   0.7571
month2008-11-01        -1.542e-03  1.083e-02  -0.142   0.8868
month2008-12-01         1.093e-02  1.088e-02   1.005   0.3149
```

```
month2009-01-01    -6.007e-03  1.086e-02   -0.553   0.5801
month2009-02-01    -5.783e-03  1.092e-02   -0.530   0.5964
month2009-03-01    -8.894e-03  1.085e-02   -0.820   0.4124
month2009-04-01    -4.911e-03  1.087e-02   -0.452   0.6515
month2009-05-01    -1.545e-03  1.086e-02   -0.142   0.8869
month2009-06-01     4.206e-03  1.086e-02    0.387   0.6986
month2009-07-01     5.471e-03  1.087e-02    0.503   0.6147
month2009-08-01    -4.667e-03  1.087e-02   -0.429   0.6678
month2009-09-01    -4.795e-03  1.087e-02   -0.441   0.6592
month2009-10-01    -1.586e-03  1.087e-02   -0.146   0.8840
month2009-11-01    -5.210e-03  1.088e-02   -0.479   0.6322
month2009-12-01    -9.886e-03  1.095e-02   -0.902   0.3668
month2010-01-01     1.815e-03  1.094e-02    0.166   0.8682
month2010-02-01     3.620e-03  1.116e-02    0.324   0.7457
month2010-03-01    -8.878e-03  1.099e-02   -0.808   0.4192
month2010-04-01     7.082e-03  1.100e-02    0.644   0.5198
month2010-05-01    -3.414e-03  1.101e-02   -0.310   0.7565
month2010-06-01    -5.868e-03  1.102e-02   -0.532   0.5944
month2010-07-01    -1.353e-02  1.102e-02   -1.228   0.2196
month2010-08-01     9.875e-03  1.103e-02    0.895   0.3708
month2010-09-01     2.215e-03  1.103e-02    0.201   0.8408
month2010-10-01    -2.548e-03  1.103e-02   -0.231   0.8172
month2010-11-01    -9.175e-03  1.110e-02   -0.827   0.4084
month2010-12-01    -4.759e-03  1.122e-02   -0.424   0.6715
month2011-01-01    -8.207e-03  1.119e-02   -0.733   0.4633
month2011-02-01    -5.389e-03  1.145e-02   -0.471   0.6378
month2011-03-01    -4.549e-03  1.121e-02   -0.406   0.6849
month2011-04-01    -1.189e-03  1.120e-02   -0.106   0.9154
month2011-05-01    -5.307e-04  1.117e-02   -0.048   0.9621
month2011-06-01     1.207e-04  1.115e-02    0.011   0.9914
month2011-07-01     4.004e-03  1.113e-02    0.360   0.7191
month2011-08-01    -1.043e-04  1.114e-02   -0.009   0.9925
month2011-09-01    -1.135e-02  1.101e-02   -1.031   0.3027
month2011-10-01     1.049e-02  1.100e-02    0.954   0.3399
month2011-11-01    -6.974e-03  1.106e-02   -0.631   0.5283
month2011-12-01     2.879e-04  1.109e-02    0.026   0.9793
month2012-01-01    -1.045e-02  1.113e-02   -0.939   0.3477
month2012-02-01     2.973e-03  1.121e-02    0.265   0.7909
month2012-03-01     1.820e-03  1.105e-02    0.165   0.8692
month2012-04-01     4.576e-03  1.114e-02    0.411   0.6812
month2012-05-01     4.361e-03  1.107e-02    0.394   0.6936
month2012-06-01    -2.065e-03  1.107e-02   -0.187   0.8520
month2012-07-01     6.781e-04  1.107e-02    0.061   0.9512
month2012-08-01    -5.126e-03  1.111e-02   -0.461   0.6445
month2012-09-01     2.322e-03  1.117e-02    0.208   0.8353
month2012-10-01    -1.458e-02  1.117e-02   -1.305   0.1919
month2012-11-01     3.463e-03  1.125e-02    0.308   0.7582
month2012-12-01    -1.687e-02  1.130e-02   -1.494   0.1352
month2013-01-01     3.795e-03  1.131e-02    0.335   0.7373
month2013-02-01    -8.078e-03  1.156e-02   -0.699   0.4847
month2013-03-01    -1.585e-02  1.137e-02   -1.395   0.1631
month2013-04-01     3.512e-03  1.133e-02    0.310   0.7565
month2013-05-01     1.411e-02  1.123e-02    1.257   0.2088
month2013-06-01     7.059e-03  1.125e-02    0.628   0.5303
month2013-07-01     1.753e-02  1.122e-02    1.563   0.1180
month2013-08-01    -2.732e-03  1.122e-02   -0.244   0.8076
```

```
month2013-09-01      3.037e-03   1.130e-02    0.269   0.7882
month2013-10-01     -8.699e-03   1.134e-02   -0.767   0.4430
month2013-11-01     -5.810e-03   1.144e-02   -0.508   0.6117
month2013-12-01      3.319e-03   1.155e-02    0.287   0.7738
month2014-01-01     -1.496e-02   1.171e-02   -1.278   0.2011
month2014-02-01      2.499e-03   1.186e-02    0.211   0.8331
month2014-03-01     -4.441e-03   1.155e-02   -0.385   0.7005
month2014-04-01     -1.862e-02   1.148e-02   -1.622   0.1049
month2014-05-01     -5.901e-03   1.137e-02   -0.519   0.6038
month2014-06-01     -1.761e-03   1.130e-02   -0.156   0.8762
month2014-07-01      5.575e-03   1.126e-02    0.495   0.6206
month2014-08-01     -1.113e-03   1.130e-02   -0.098   0.9215
month2014-09-01      1.055e-03   1.134e-02    0.093   0.9259
month2014-10-01     -1.730e-03   1.133e-02   -0.153   0.8787
month2014-11-01     -8.539e-03   1.154e-02   -0.740   0.4591
month2014-12-01     -7.021e-03   1.153e-02   -0.609   0.5427
month2015-01-01     -4.922e-03   1.157e-02   -0.425   0.6705
month2015-02-01     -9.308e-03   1.196e-02   -0.778   0.4363
month2015-03-01      4.154e-03   1.153e-02    0.360   0.7187
month2015-04-01     -3.524e-03   1.156e-02   -0.305   0.7604
month2015-05-01     -6.722e-03   1.142e-02   -0.589   0.5561
month2015-06-01     -7.111e-03   1.143e-02   -0.622   0.5340
month2015-07-01     -8.631e-03   1.138e-02   -0.758   0.4483
month2015-08-01     -5.341e-03   1.136e-02   -0.470   0.6383
month2015-09-01     -1.012e-03   1.147e-02   -0.088   0.9297
month2015-10-01     -8.335e-03   1.147e-02   -0.727   0.4673
month2015-11-01      2.320e-03   1.162e-02    0.200   0.8418
month2015-12-01     -7.373e-03   1.161e-02   -0.635   0.5253
month2016-01-01     -5.344e-03   1.166e-02   -0.458   0.6467
month2016-02-01     -7.099e-03   1.180e-02   -0.601   0.5476
month2016-03-01     -1.453e-02   1.155e-02   -1.258   0.2084
month2016-04-01      9.818e-03   1.160e-02    0.846   0.3973
month2016-05-01      9.858e-03   1.145e-02    0.861   0.3891
month2016-06-01     -5.147e-03   1.141e-02   -0.451   0.6520
month2016-07-01     -1.082e-02   1.138e-02   -0.951   0.3417
month2016-08-01     -1.921e-02   1.134e-02   -1.694   0.0903  .
month2016-09-01     -1.542e-03   1.141e-02   -0.135   0.8925
month2016-10-01      3.118e-03   1.141e-02    0.273   0.7847
month2016-11-01     -1.398e-02   1.155e-02   -1.210   0.2261
month2016-12-01     -1.290e-02   1.163e-02   -1.109   0.2673
month2017-01-01      8.784e-05   1.159e-02    0.008   0.9940
month2017-02-01     -5.838e-03   1.179e-02   -0.495   0.6205
month2017-03-01      6.054e-03   1.171e-02    0.517   0.6050
month2017-04-01     -5.738e-03   1.164e-02   -0.493   0.6222
month2017-05-01      8.410e-03   1.154e-02    0.729   0.4660
month2017-06-01     -1.219e-02   1.151e-02   -1.059   0.2894
month2017-07-01     -6.123e-03   1.146e-02   -0.534   0.5930
month2017-08-01     -2.664e-03   1.148e-02   -0.232   0.8165
month2017-09-01     -8.493e-03   1.157e-02   -0.734   0.4628
month2017-10-01     -9.683e-03   1.155e-02   -0.839   0.4017
month2017-11-01     -1.685e-02   1.166e-02   -1.444   0.1486
month2017-12-01     -8.924e-03   1.166e-02   -0.765   0.4442
```

Exercise 5

(1) Between estimator:

```
Coefficients:
                  Estimate Std. Error t value Pr(>|t|)
(Intercept)      4.676e-01  2.687e-02  17.399   <2e-16 ***
mtenure          1.211e-05  1.440e-05   0.841   0.4003
mcrimes         -7.854e-06  4.428e-06  -1.774   0.0761 .
mp50_inc         1.421e-07  1.902e-07   0.747   0.4550
mblack_share     3.979e-02  2.839e-02   1.402   0.1611
mhispanic_share  4.836e-02  2.942e-02   1.644   0.1003
mwhite_share     2.151e-02  3.350e-02   0.642   0.5209
---
```

β is the coefficient of mtenure.

(2) Within estimator:

```
Coefficients:
                  Estimate Std. Error t value Pr(>|t|)
(Intercept)     -1.131e-15  6.768e-04   0.000    1.000
dtenure          2.554e-05  2.395e-05   1.067    0.286
dcrimes          3.522e-06  2.875e-06   1.225    0.220
dp50_inc        -2.858e-07  2.428e-07  -1.177    0.239
dblack_share    -4.796e-02  3.182e-02  -1.507    0.132
dhispanic_share -5.417e-02  3.391e-02  -1.597    0.110
dwhite_share    -3.408e-02  4.203e-02  -0.811    0.417
```

β is the coefficient of dtenure.

(3) First difference estimator:

```
                  Estimate Std. Error t value Pr(>|t|)
(Intercept)     -5.409e-04  1.191e-03  -0.454    0.650
fd_tenure        4.839e-04  6.714e-04   0.721    0.471
fd_crimes       -2.730e-06  6.923e-06  -0.394    0.693
fd_p50_inc       1.129e-07  1.163e-06   0.097    0.923
fd_black_share  -9.099e-02  1.590e-01  -0.572    0.567
fd_hispanic_share -1.095e-01 1.688e-01  -0.649    0.517
fd_white_share  -1.115e-01  2.155e-01  -0.517    0.605
```

β is the coefficient of fd_tenure.

They are not the same.

(4) Results are showed in the code.