econ490

Jinghan 39847876

2025-02-24

Import bank-wise data in the test group and the control group from Bloomberg and clean the data

The test set is as follow

```
## # A tibble: 3 x 6
##   date                  roe  t1cr bank  country  test
##   <dttm>              <dbl> <dbl> <chr> <chr>   <dbl>
## 1 2024-12-31 00:00:00  14.1  14.6 rbc   Canada      1
## 2 2024-09-30 00:00:00  14.2  14.5 rbc   Canada      1
## 3 2024-06-30 00:00:00  14.0  14.1 rbc   Canada      1
```

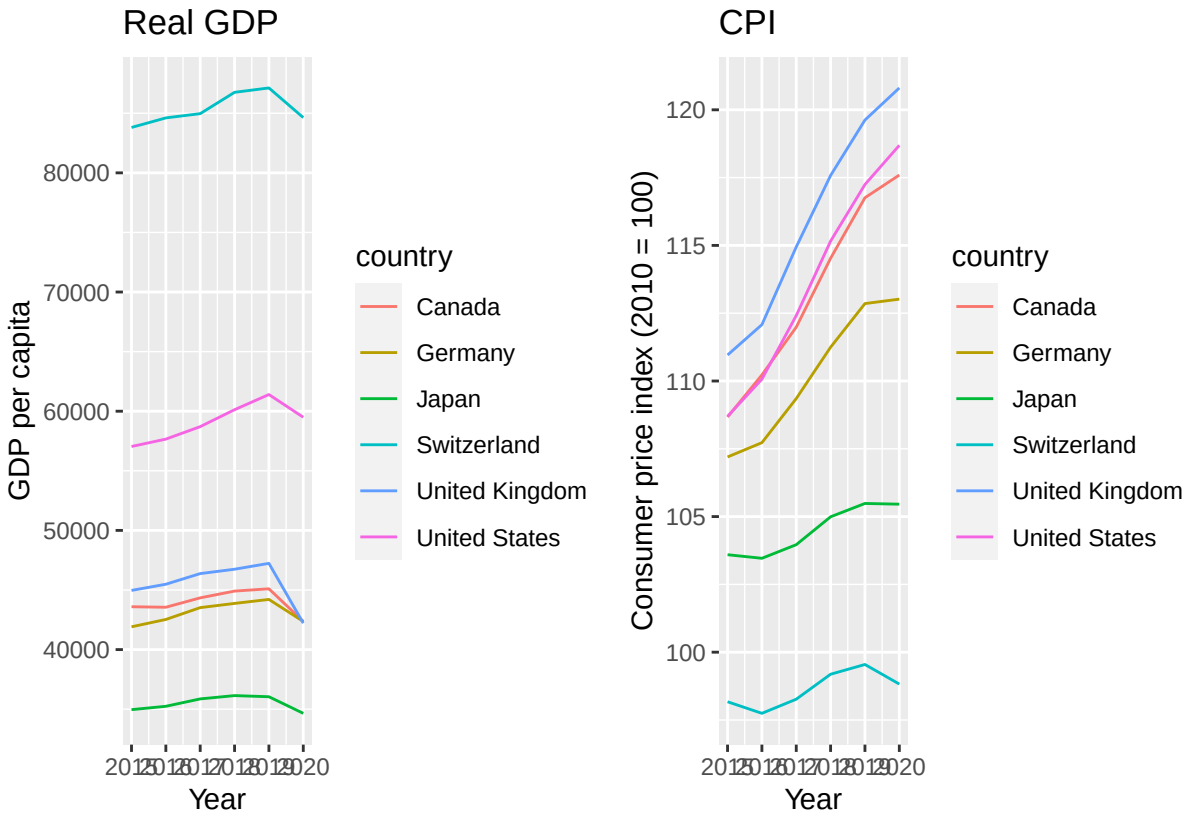
And the control set is as follow

```
## # A tibble: 3 x 6
##   date                  roe  t1cr bank  country        test
##   <dttm>              <dbl> <dbl> <chr> <chr>         <dbl>
## 1 2024-12-31 00:00:00  5.94  17.6 ubs   United States     0
## 2 2024-09-30 00:00:00  4.70  17.5 ubs   United States     0
## 3 2024-06-30 00:00:00  2.22  18   ubs   United States     0
```

Import Marco Data from World Bank, including GDP and CPI

```
##            country       year           gdp             cpi       
##  Canada        :6   Min.   :2015   Min.   :34651   Min.   : 97.75  
##  Germany       :6   1st Qu.:2016   1st Qu.:42365   1st Qu.:104.74  
##  Japan         :6   Median :2018   Median :44936   Median :110.15  
##  Switzerland   :6   Mean   :2018   Mean   :52069   Mean   :109.39  
##  United Kingdom:6   3rd Qu.:2019   3rd Qu.:58901   3rd Qu.:114.63  
##  United States :6   Max.   :2020   Max.   :87124   Max.   :120.81
```

Let's visualize the macro data



Import the indcies in the main stock exchanges in the countries we have

```
##   exchange    stock_idx          country              year
##  DAX  :41   Min.   :-19.269   Length:246         Min.   :2015
##  NKY  :41   1st Qu.:  6.186   Class :character   1st Qu.:2017
##  SMI  :41   Median : 28.349   Mode  :character   Median :2020
##  SPTSX:41   Mean   : 41.882                      Mean   :2020
##  SPX  :41   3rd Qu.: 63.936                      3rd Qu.:2022
##  UKX  :41   Max.   :245.307                      Max.   :2025
##      month
##  Min.   : 2.000
##  1st Qu.: 3.000
##  Median : 6.000
##  Mean   : 7.366
##  3rd Qu.: 9.000
##  Max.   :12.000
```

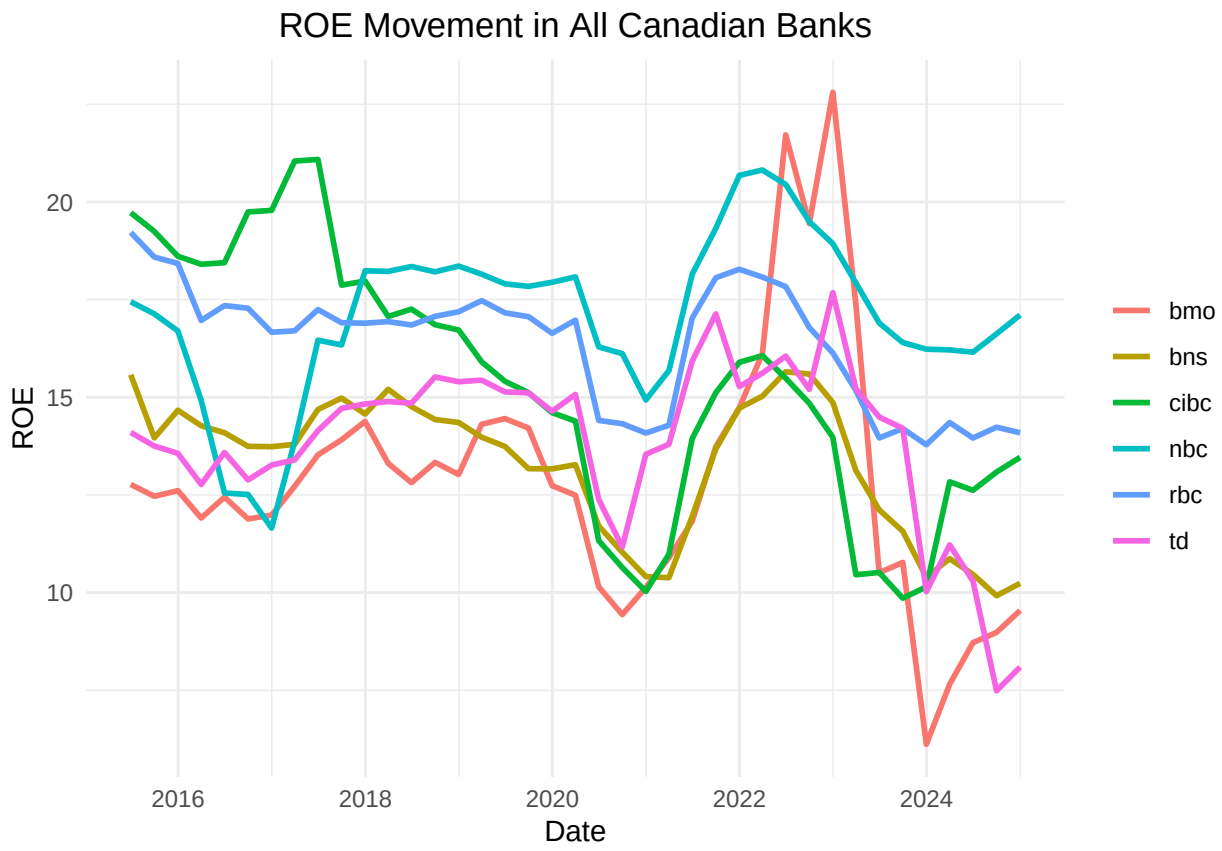
Integrate bank-wise, macro data & stock index

```
##       date                          roe              t1cr
##  Min.   :2015-03-31 00:00:00   Min.   :-13.303   Min.   :11.20
##  1st Qu.:2016-06-30 00:00:00   1st Qu.:  4.818   1st Qu.:12.57
```

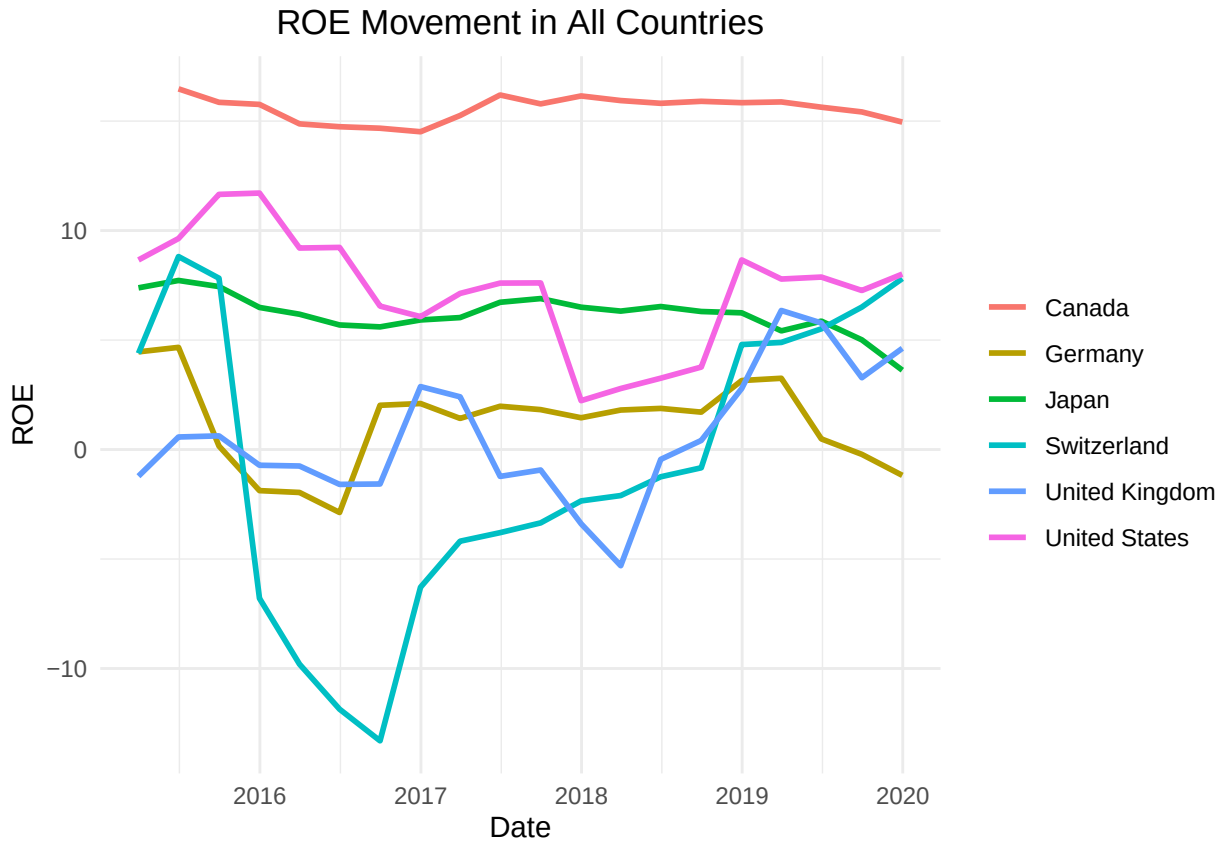
```
##  Median :2017-09-30 00:00:00   Median :  9.434   Median :13.50
##  Mean   :2017-09-06 07:23:04   Mean   :  8.932   Mean   :14.35
##  3rd Qu.:2018-12-31 00:00:00   3rd Qu.: 14.963   3rd Qu.:15.78
##  Max.   :2019-12-31 00:00:00   Max.   : 21.086   Max.   :22.70
##      bank             country              test        policy_change
##  Length:234         Length:234         Min.   :0.0000   Min.   :0.0000
##  Class :character   Class :character   1st Qu.:0.0000   1st Qu.:1.0000
##  Mode  :character   Mode  :character   Median :0.0000   Median :1.0000
##                                        Mean   :0.4872   Mean   :0.8205
##                                        3rd Qu.:1.0000   3rd Qu.:1.0000
##                                        Max.   :1.0000   Max.   :1.0000
##       did              gdp             cpi          exchange
##  Min.   :0.0000   Min.   :34961   Min.   : 97.75   DAX  : 40
##  1st Qu.:0.0000   1st Qu.:43551   1st Qu.:108.67   NKY  : 20
##  Median :0.0000   Median :44339   Median :110.96   SMI  : 20
##  Mean   :0.4103   Mean   :48323   Mean   :110.43   SPTSX:114
##  3rd Qu.:1.0000   3rd Qu.:45100   3rd Qu.:114.52   SPX  : 20
##  Max.   :1.0000   Max.   :87124   Max.   :119.62   UKX  : 20
##    stock_idx
##  Min.   :-19.269
##  1st Qu.: -1.635
##  Median :  8.206
##  Mean   :  9.435
##  3rd Qu.: 19.648
##  Max.   : 72.131
```

Check the ROE movement in Canada

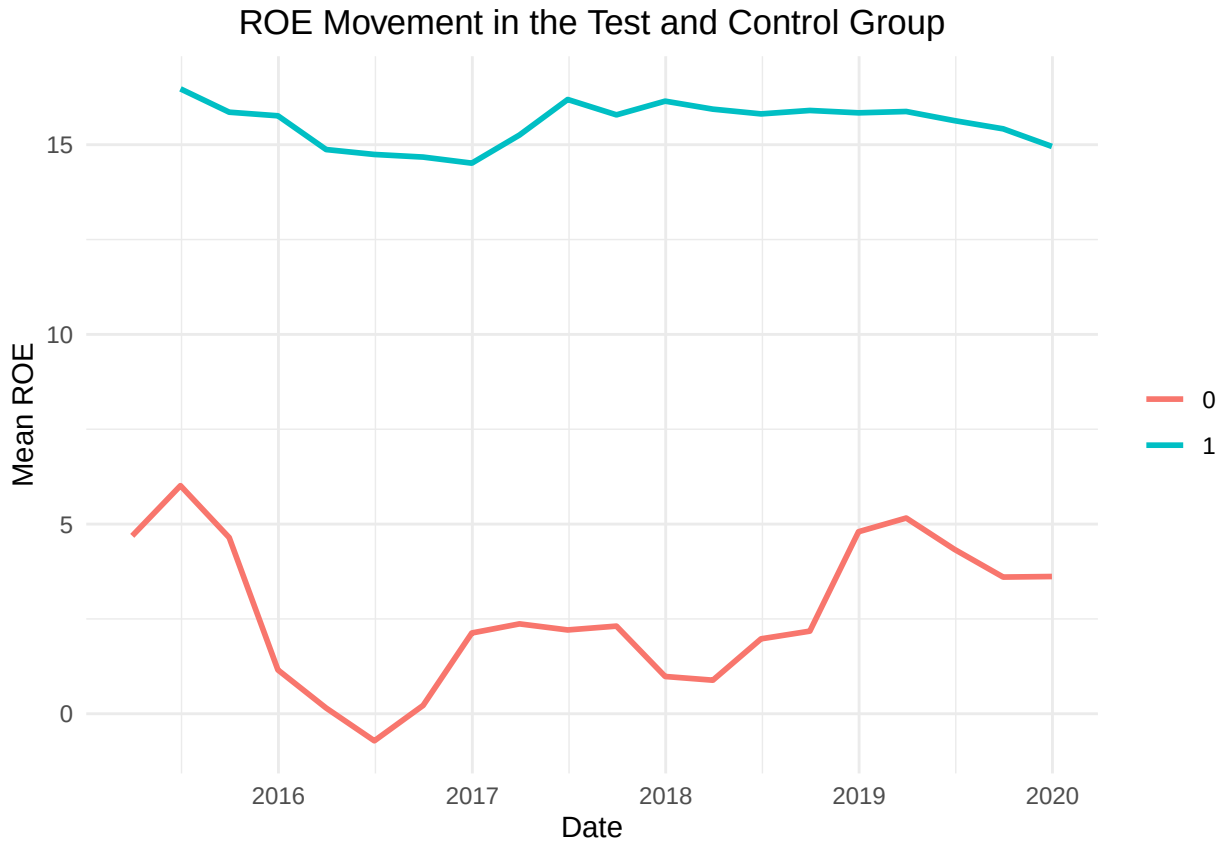
```
## Warning: Using ‘size‘ aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use ‘linewidth‘ instead.
## This warning is displayed once every 8 hours.
## Call ‘lifecycle::last_lifecycle_warnings()‘ to see where this warning was
## generated.
```


ROE Movement in All Canadian Banks
ROE
20
15
10
2016
2018
2020
2022
2024
Date
bmo
bns
cibc
nbc
rbc
td

Check the ROE movement in each couuntry



Check ROE movement in the test and control groups



Estimating the DID estimator

```
##
## Call:
## lm(formula = roe ~ test + policy_change + did, data = df_both)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -15.5660  -2.3315   0.6389   3.1429   7.5870
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)     4.1254     0.8746   4.717 4.16e-06 ***
## test           11.9052     1.3360   8.911  < 2e-16 ***
## policy_change  -1.8623     0.9779  -1.904   0.0581 .
## did             1.3042     1.4722   0.886   0.3766
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.285 on 230 degrees of freedom
## Multiple R-squared:  0.6997, Adjusted R-squared:  0.6958
## F-statistic: 178.6 on 3 and 230 DF,  p-value: < 2.2e-16
```

The coefficient for 'did' is the differences-in-differences estimator. The effect is **not significant** at 10% with the treatment having no positive effect.