Group Project

4/15/2021

Introduction

This project aims to analyze how changes in state minimum wages affect changes in the state unemployment level, and we have built three model to explore this relationship. In the first basic model, we simply regress state's unemployment rate on effective minimum wage in 2020 dollars. In the second model, based on the first basic model, we consider year fixed effect and state fixed effect, and we also introduce three dummy variables for 1980-1990, 1990-2000, and 2000-2010 to check whether or not the results change across the three different periods. In the third model, we build a panel regression model in order to include state fixed effect and time fixed effect. Our analysis indicates that state minimum wages have a positive relationship with state unemployment rate.

Result

Model 1: baseline model

```
# model1:
fm1 <- lm(unemployment_rate ~ Effective.Minimum.Wage.2020.Dollars , data = df)
summary(fm1)
```

```
##
## Call:
## lm(formula = unemployment_rate ~ Effective.Minimum.Wage.2020.Dollars,
##     data = df)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.0242 -1.4064 -0.2301  1.1018 11.4566
##
## Coefficients:
##                                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)                        0.81211    0.39721   2.045    0.041 *
## Effective.Minimum.Wage.2020.Dollars  0.63578    0.04892  12.996   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.015 on 1987 degrees of freedom
## Multiple R-squared:  0.07834,    Adjusted R-squared:  0.07787
## F-statistic: 168.9 on 1 and 1987 DF,  p-value: < 2.2e-16
```

```
coeftest(fm1, df = Inf, vcov = vcovHC(fm1, type = "HC1"))
```

```
##
## z test of coefficients:
```

```
##
##                                    Estimate Std. Error z value Pr(>|z|)
## (Intercept)                        0.812115   0.414142   1.961  0.04988 *
## Effective.Minimum.Wage.2020.Dollars 0.635777   0.053239  11.942  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Interpretation 1

If minimum wage increases by 1 dollar, then unemployment rate would increase by 0.635777% / 63.58 percentage points. (not sure which guys please check it !!!!!!!)

Model2:

base model+year fixed effect

Goal

in order to account of time trend in unemployment rate, we included time dummies in our model

```
#model2: base model+year fixed effect
fm2 <- lm(unemployment_rate ~ Effective.Minimum.Wage.2020.Dollars+
            dummy9000 + dummy0010 + dummy1018, data = df)
summary(fm2)
```

```
##
## Call:
## lm(formula = unemployment_rate ~ Effective.Minimum.Wage.2020.Dollars +
##     dummy9000 + dummy0010 + dummy1018, data = df)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.5149 -1.3392 -0.2112  1.0656 10.5819
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         3.09372    0.44706   6.920 6.07e-12 ***
## Effective.Minimum.Wage.2020.Dollars  0.47407    0.05246   9.037  < 2e-16 ***
## dummy9000                           -1.26096    0.12764  -9.879  < 2e-16 ***
## dummy0010                           -1.55182    0.12508 -12.406  < 2e-16 ***
## dummy1018                           -1.10920    0.12495  -8.877  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.932 on 1984 degrees of freedom
## Multiple R-squared:  0.1537, Adjusted R-squared:  0.152
## F-statistic: 90.11 on 4 and 1984 DF,  p-value: < 2.2e-16
```

```
coeftest(fm2, df = Inf, vcov = vcovHC(fm2, type = "HC1"))
```

```
##
## z test of coefficients:
##
```

```
##                                    Estimate Std. Error  z value  Pr(>|z|)
## (Intercept)                        3.093718   0.451940   6.8454 7.625e-12 ***
## Effective.Minimum.Wage.2020.Dollars  0.474070   0.053323   8.8906 < 2.2e-16 ***
## dummy9000                         -1.260958   0.128280  -9.8297 < 2.2e-16 ***
## dummy0010                         -1.551821   0.128975 -12.0320 < 2.2e-16 ***
## dummy1018                         -1.109199   0.143988  -7.7034 1.325e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

interpretation 2

After accounting for time trend, we had a similar finding: if minimum wage increases by 1 dollar, then unemployment rate would increase by 0.474070% / 47.41 percentage points. (not sure which guys please check it !!!!!!!)

Model 3:

base model+year fixed effect + state fixed effect ### Goal In this model, we included state dummies because geographic factors might be associated with unemployment rate.

```
#model3: base model+year fixed effect + state fixed effect
fm3 <- lm(unemployment_rate ~ Effective.Minimum.Wage.2020.Dollars+
            factor(stateid) +
            dummy9000 + dummy0010 + dummy1018, data = df)
summary(fm3)
```

```
##
## Call:
## lm(formula = unemployment_rate ~ Effective.Minimum.Wage.2020.Dollars +
##     factor(stateid) + dummy9000 + dummy0010 + dummy1018, data = df)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.3173 -1.0745 -0.1337  0.8605  8.2412
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         4.74962    0.49027   9.688  < 2e-16 ***
## Effective.Minimum.Wage.2020.Dollars  0.43830    0.05123   8.556  < 2e-16 ***
## factor(stateid)1                    0.04196    0.37297   0.112 0.910444
## factor(stateid)2                   -1.10070    0.36724  -2.997 0.002759 **
## factor(stateid)3                   -0.75468    0.36686  -2.057 0.039805 *
## factor(stateid)4                   -0.37650    0.37026  -1.017 0.309353
## factor(stateid)5                   -1.98073    0.36723  -5.394 7.75e-08 ***
## factor(stateid)6                   -2.26807    0.37130  -6.109 1.21e-09 ***
## factor(stateid)7                   -2.22201    0.36764  -6.044 1.80e-09 ***
## factor(stateid)8                   -0.16935    0.37251  -0.455 0.649433
## factor(stateid)9                   -1.23543    0.36706  -3.366 0.000778 ***
## factor(stateid)10                  -1.18462    0.36678  -3.230 0.001260 **
## factor(stateid)11                  -2.89773    0.36879  -7.857 6.45e-15 ***
## factor(stateid)12                  -1.21282    0.36678  -3.307 0.000962 ***
## factor(stateid)13                  -0.41169    0.36781  -1.119 0.263145
## factor(stateid)14                  -0.97179    0.36678  -2.649 0.008127 **
```

```
## factor(stateid)15                  -2.59493    0.36689  -7.073 2.12e-12 ***
## factor(stateid)16                  -2.39487    0.36678  -6.529 8.42e-11 ***
## factor(stateid)17                  -0.26667    0.36678  -0.727 0.467290
## factor(stateid)18                   0.16410    0.36678   0.447 0.654630
## factor(stateid)19                  -1.74852    0.36773  -4.755 2.13e-06 ***
## factor(stateid)20                  -2.02744    0.36697  -5.525 3.74e-08 ***
## factor(stateid)21                  -2.31142    0.37102  -6.230 5.71e-10 ***
## factor(stateid)22                   0.59139    0.36716   1.611 0.107404
## factor(stateid)23                  -2.34169    0.36682  -6.384 2.16e-10 ***
## factor(stateid)24                   0.45641    0.36678   1.244 0.213520
## factor(stateid)25                  -1.24755    0.36686  -3.401 0.000686 ***
## factor(stateid)26                  -1.46072    0.36683  -3.982 7.09e-05 ***
## factor(stateid)27                  -3.67404    0.36688 -10.014  < 2e-16 ***
## factor(stateid)28                  -0.59481    0.36679  -1.622 0.105039
## factor(stateid)29                  -2.93851    0.36681  -8.011 1.95e-15 ***
## factor(stateid)30                  -1.27866    0.36745  -3.480 0.000513 ***
## factor(stateid)31                  -0.52626    0.36683  -1.435 0.151558
## factor(stateid)32                  -1.05002    0.36756  -2.857 0.004326 **
## factor(stateid)33                  -1.33348    0.36679  -3.636 0.000285 ***
## factor(stateid)34                  -3.33333    0.36678  -9.088  < 2e-16 ***
## factor(stateid)35                  -0.51375    0.36693  -1.400 0.161633
## factor(stateid)36                  -1.93846    0.36678  -5.285 1.40e-07 ***
## factor(stateid)37                  -0.71940    0.37369  -1.925 0.054358 .
## factor(stateid)38                  -0.84626    0.36682  -2.307 0.021158 *
## factor(stateid)39                  -1.13818    0.36949  -3.080 0.002096 **
## factor(stateid)40                  -0.62051    0.36678  -1.692 0.090852 .
## factor(stateid)41                  -3.48169    0.36687  -9.490  < 2e-16 ***
## factor(stateid)42                  -0.73333    0.36678  -1.999 0.045709 *
## factor(stateid)43                  -1.06923    0.36678  -2.915 0.003596 **
## factor(stateid)44                  -2.29487    0.36678  -6.257 4.83e-10 ***
## factor(stateid)45                  -3.13885    0.37056  -8.470  < 2e-16 ***
## factor(stateid)46                  -2.49231    0.36678  -6.795 1.44e-11 ***
## factor(stateid)47                  -0.83789    0.37303  -2.246 0.024805 *
## factor(stateid)48                   0.99592    0.36694   2.714 0.006704 **
## factor(stateid)49                  -1.64075    0.36681  -4.473 8.16e-06 ***
## factor(stateid)50                  -2.06667    0.36678  -5.635 2.01e-08 ***
## dummy9000                          -1.28863    0.10889 -11.834  < 2e-16 ***
## dummy0010                          -1.57340    0.10603 -14.839  < 2e-16 ***
## dummy1018                          -1.10071    0.10491 -10.492  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.62 on 1934 degrees of freedom
## Multiple R-squared:  0.4205, Adjusted R-squared:  0.4043
## F-statistic: 25.99 on 54 and 1934 DF,  p-value: < 2.2e-16
```

```
coeftest(fm3, df = Inf, vcov = vcovHC(fm3, type = "HC1"))
```

```
##
## z test of coefficients:
##
##                                  Estimate Std. Error  z value  Pr(>|z|)
## (Intercept)                      4.749621   0.560728   8.4705 < 2.2e-16 ***
## Effective.Minimum.Wage.2020.Dollars  0.438300   0.057798   7.5834 3.367e-14 ***
## factor(stateid)1                 0.041956   0.372261   0.1127  0.910263
```

```
## factor(stateid)2                -1.100704   0.420029  -2.6205  0.008779 **
## factor(stateid)3                -0.754681   0.393119  -1.9197  0.054893 .
## factor(stateid)4                -0.376496   0.480763  -0.7831  0.433556
## factor(stateid)5                -1.980732   0.414267  -4.7813 1.742e-06 ***
## factor(stateid)6                -2.268065   0.444992  -5.0969 3.453e-07 ***
## factor(stateid)7                -2.222010   0.411108  -5.4049 6.483e-08 ***
## factor(stateid)8                -0.169350   0.435773  -0.3886  0.697558
## factor(stateid)9                -1.235432   0.444371  -2.7802  0.005433 **
## factor(stateid)10               -1.184615   0.422237  -2.8056  0.005023 **
## factor(stateid)11               -2.897731   0.413050  -7.0155 2.292e-12 ***
## factor(stateid)12               -1.212821   0.396827  -3.0563  0.002241 **
## factor(stateid)13               -0.411695   0.425600  -0.9673  0.333380
## factor(stateid)14               -0.971795   0.459882  -2.1131  0.034589 *
## factor(stateid)15               -2.594932   0.374269  -6.9333 4.110e-12 ***
## factor(stateid)16               -2.394872   0.374736  -6.3908 1.650e-10 ***
## factor(stateid)17               -0.266667   0.412499  -0.6465  0.517977
## factor(stateid)18                0.164103   0.423860   0.3872  0.698636
## factor(stateid)19               -1.748521   0.419799  -4.1651 3.112e-05 ***
## factor(stateid)20               -2.027441   0.388528  -5.2183 1.806e-07 ***
## factor(stateid)21               -2.311418   0.456794  -5.0601 4.191e-07 ***
## factor(stateid)22                0.591391   0.544318   1.0865  0.277266
## factor(stateid)23               -2.341695   0.383969  -6.0987 1.070e-09 ***
## factor(stateid)24                0.456410   0.415669   1.0980  0.272199
## factor(stateid)25               -1.247551   0.403800  -3.0895  0.002005 **
## factor(stateid)26               -1.460717   0.371465  -3.9323 8.413e-05 ***
## factor(stateid)27               -3.674041   0.355222 -10.3429 < 2.2e-16 ***
## factor(stateid)28               -0.594813   0.497975  -1.1945  0.232297
## factor(stateid)29               -2.938506   0.412152  -7.1297 1.006e-12 ***
## factor(stateid)30               -1.278662   0.435161  -2.9384  0.003299 **
## factor(stateid)31               -0.526260   0.360812  -1.4585  0.144691
## factor(stateid)32               -1.050020   0.413483  -2.5394  0.011103 *
## factor(stateid)33               -1.333479   0.461949  -2.8866  0.003894 **
## factor(stateid)34               -3.333333   0.347510  -9.5921 < 2.2e-16 ***
## factor(stateid)35               -0.513751   0.436003  -1.1783  0.238670
## factor(stateid)36               -1.938462   0.381339  -5.0833 3.709e-07 ***
## factor(stateid)37               -0.719402   0.448824  -1.6029  0.108965
## factor(stateid)38               -0.846261   0.401878  -2.1058  0.035225 *
## factor(stateid)39               -1.138181   0.514562  -2.2119  0.026971 *
## factor(stateid)40               -0.620513   0.457486  -1.3564  0.174987
## factor(stateid)41               -3.481692   0.347946 -10.0064 < 2.2e-16 ***
## factor(stateid)42               -0.733333   0.429864  -1.7060  0.088014 .
## factor(stateid)43               -1.069231   0.387644  -2.7583  0.005811 **
## factor(stateid)44               -2.294872   0.381870  -6.0096 1.860e-09 ***
## factor(stateid)45               -3.138854   0.396822  -7.9100 2.574e-15 ***
## factor(stateid)46               -2.492308   0.378075  -6.5921 4.337e-11 ***
## factor(stateid)47               -0.837889   0.432489  -1.9374  0.052701 .
## factor(stateid)48                0.995923   0.534524   1.8632  0.062435 .
## factor(stateid)49               -1.640754   0.413909  -3.9641 7.369e-05 ***
## factor(stateid)50               -2.066667   0.374645  -5.5163 3.461e-08 ***
## dummy9000                       -1.288626   0.105734 -12.1875 < 2.2e-16 ***
## dummy0010                       -1.573402   0.108817 -14.4591 < 2.2e-16 ***
## dummy1018                       -1.100710   0.119991  -9.1732 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

interpretation 3

After accounting for time and state dummies, we had a similar finding: if minimum wage increases by 1 dollar, then unemployment rate would increase by 0.43830% / 43.83 percentage points. (not sure which guys please check it !!!!!!!)

Model 4

base model+year fixed effect + year · effective + state fixed effect + state ·effective

Goal

In this model, we aim to explore the association between minimum wage and unemployment rate across year periods

```
#model4: base model+year fixed effect + year*effective + state fixed effect + state*effective
fm4 <- lm(unemployment_rate ~ Effective.Minimum.Wage.2020.Dollars+
            Effective.Minimum.Wage.2020.Dollars*dummy9000+
            Effective.Minimum.Wage.2020.Dollars*dummy0010+
            Effective.Minimum.Wage.2020.Dollars*dummy1018+
            factor(stateid) +
            dummy9000 + dummy0010 + dummy1018, data = df)
summary(fm4)
```

```
##
## Call:
## lm(formula = unemployment_rate ~ Effective.Minimum.Wage.2020.Dollars +
##     Effective.Minimum.Wage.2020.Dollars * dummy9000 + Effective.Minimum.Wage.2020.Dollars *
##     dummy0010 + Effective.Minimum.Wage.2020.Dollars * dummy1018 +
##     factor(stateid) + dummy9000 + dummy0010 + dummy1018, data = df)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.9360 -1.0802 -0.1665  0.8350  8.1006
##
## Coefficients:
##                                             Estimate Std. Error t value
## (Intercept)                                  0.92084    0.73142   1.259
## Effective.Minimum.Wage.2020.Dollars          0.88765    0.08178  10.854
## dummy9000                                    6.84603    1.24012   5.520
## dummy0010                                    2.10827    0.94717   2.226
## dummy1018                                    6.32142    1.02850   6.146
## factor(stateid)1                             0.15767    0.36710   0.429
## factor(stateid)2                            -0.99386    0.36146  -2.750
## factor(stateid)3                            -0.71486    0.36067  -1.982
## factor(stateid)4                            -0.18389    0.36641  -0.502
## factor(stateid)5                            -1.87932    0.36142  -5.200
## factor(stateid)6                            -2.08732    0.36733  -5.682
## factor(stateid)7                            -2.15718    0.36207  -5.958
## factor(stateid)8                             0.20005    0.36943   0.542
## factor(stateid)9                            -1.17686    0.36103  -3.260
## factor(stateid)10                           -1.18462    0.36053  -3.286
## factor(stateid)11                           -2.74243    0.36340  -7.547
```

```
## factor(stateid)12                                -1.21282    0.36053  -3.364
## factor(stateid)13                                -0.30616    0.36233  -0.845
## factor(stateid)14                                -0.97179    0.36053  -2.695
## factor(stateid)15                                -2.53157    0.36091  -7.014
## factor(stateid)16                                -2.39487    0.36053  -6.643
## factor(stateid)17                                -0.26667    0.36053  -0.740
## factor(stateid)18                                 0.16410    0.36053   0.455
## factor(stateid)19                                -1.68374    0.36197  -4.652
## factor(stateid)20                                -1.94901    0.36096  -5.399
## factor(stateid)21                                -2.10949    0.36698  -5.748
## factor(stateid)22                                 0.67534    0.36123   1.870
## factor(stateid)23                                -2.31856    0.36058  -6.430
## factor(stateid)24                                 0.45641    0.36053   1.266
## factor(stateid)25                                -1.22272    0.36066  -3.390
## factor(stateid)26                                -1.41169    0.36068  -3.914
## factor(stateid)27                                -3.60459    0.36083  -9.990
## factor(stateid)28                                -0.59528    0.36055  -1.651
## factor(stateid)29                                -2.94159    0.36056  -8.158
## factor(stateid)30                                -1.14525    0.36160  -3.167
## factor(stateid)31                                -0.49978    0.36061  -1.386
## factor(stateid)32                                -0.94088    0.36192  -2.600
## factor(stateid)33                                -1.33389    0.36055  -3.700
## factor(stateid)34                                -3.33333    0.36053  -9.246
## factor(stateid)35                                -0.47742    0.36079  -1.323
## factor(stateid)36                                -1.93846    0.36053  -5.377
## factor(stateid)37                                -0.36404    0.37100  -0.981
## factor(stateid)38                                -0.84719    0.36062  -2.349
## factor(stateid)39                                -0.97241    0.36444  -2.668
## factor(stateid)40                                -0.62051    0.36053  -1.721
## factor(stateid)41                                -3.41726    0.36079  -9.472
## factor(stateid)42                                -0.73333    0.36053  -2.034
## factor(stateid)43                                -1.06923    0.36053  -2.966
## factor(stateid)44                                -2.29487    0.36053  -6.365
## factor(stateid)45                                -2.93464    0.36644  -8.009
## factor(stateid)46                                -2.49231    0.36053  -6.913
## factor(stateid)47                                -0.56437    0.37079  -1.522
## factor(stateid)48                                 1.05599    0.36084   2.926
## factor(stateid)49                                -1.64156    0.36060  -4.552
## factor(stateid)50                                -2.06667    0.36053  -5.732
## Effective.Minimum.Wage.2020.Dollars:dummy9000 -1.02579    0.15849  -6.472
## Effective.Minimum.Wage.2020.Dollars:dummy0010 -0.43942    0.11692  -3.758
## Effective.Minimum.Wage.2020.Dollars:dummy1018 -0.87522    0.12046  -7.266
##                                                 Pr(>|t|)
## (Intercept)                                     0.208190
## Effective.Minimum.Wage.2020.Dollars              < 2e-16 ***
## dummy9000                                       3.84e-08 ***
## dummy0010                                       0.026138 *
## dummy1018                                       9.61e-10 ***
## factor(stateid)1                                0.667613
## factor(stateid)2                                0.006024 **
## factor(stateid)3                                0.047619 *
## factor(stateid)4                                0.615814
## factor(stateid)5                                2.21e-07 ***
## factor(stateid)6                                1.53e-08 ***
```

```
## factor(stateid)7                                3.03e-09 ***
## factor(stateid)8                                0.588213
## factor(stateid)9                                0.001134 **
## factor(stateid)10                               0.001035 **
## factor(stateid)11                               6.84e-14 ***
## factor(stateid)12                               0.000783 ***
## factor(stateid)13                               0.398224
## factor(stateid)14                               0.007091 **
## factor(stateid)15                               3.18e-12 ***
## factor(stateid)16                               4.00e-11 ***
## factor(stateid)17                               0.459605
## factor(stateid)18                               0.649041
## factor(stateid)19                               3.52e-06 ***
## factor(stateid)20                               7.51e-08 ***
## factor(stateid)21                               1.05e-08 ***
## factor(stateid)22                               0.061699 .
## factor(stateid)23                               1.60e-10 ***
## factor(stateid)24                               0.205690
## factor(stateid)25                               0.000713 ***
## factor(stateid)26                               9.39e-05 ***
## factor(stateid)27                                < 2e-16 ***
## factor(stateid)28                               0.098901 .
## factor(stateid)29                               6.05e-16 ***
## factor(stateid)30                               0.001563 **
## factor(stateid)31                               0.165936
## factor(stateid)32                               0.009402 **
## factor(stateid)33                               0.000222 ***
## factor(stateid)34                                < 2e-16 ***
## factor(stateid)35                               0.185903
## factor(stateid)36                               8.51e-08 ***
## factor(stateid)37                               0.326605
## factor(stateid)38                               0.018911 *
## factor(stateid)39                               0.007690 **
## factor(stateid)40                               0.085393 .
## factor(stateid)41                                < 2e-16 ***
## factor(stateid)42                               0.042085 *
## factor(stateid)43                               0.003057 **
## factor(stateid)44                               2.43e-10 ***
## factor(stateid)45                               1.99e-15 ***
## factor(stateid)46                               6.43e-12 ***
## factor(stateid)47                               0.128160
## factor(stateid)48                               0.003468 **
## factor(stateid)49                               5.64e-06 ***
## factor(stateid)50                               1.15e-08 ***
## Effective.Minimum.Wage.2020.Dollars:dummy9000 1.22e-10 ***
## Effective.Minimum.Wage.2020.Dollars:dummy0010 0.000176 ***
## Effective.Minimum.Wage.2020.Dollars:dummy1018 5.37e-13 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.592 on 1931 degrees of freedom
## Multiple R-squared:  0.4409, Adjusted R-squared:  0.4244
## F-statistic: 26.72 on 57 and 1931 DF,  p-value: < 2.2e-16
```

```r
coeftest(fm4, df = Inf, vcov = vcovHC(fm4, type = "HC1"))
```

```
##
## z test of coefficients:
##
##                                          Estimate Std. Error  z value
## (Intercept)                              0.920837   0.711423   1.2944
## Effective.Minimum.Wage.2020.Dollars      0.887652   0.079669  11.1418
## dummy9000                                6.846031   0.966889   7.0805
## dummy0010                                2.108273   0.846503   2.4906
## dummy1018                                6.321420   1.077115   5.8688
## factor(stateid)1                         0.157665   0.367728   0.4288
## factor(stateid)2                        -0.993860   0.413144  -2.4056
## factor(stateid)3                        -0.714861   0.390972  -1.8284
## factor(stateid)4                        -0.183893   0.470584  -0.3908
## factor(stateid)5                        -1.879318   0.409576  -4.5884
## factor(stateid)6                        -2.087320   0.446938  -4.6703
## factor(stateid)7                        -2.157179   0.397721  -5.4238
## factor(stateid)8                         0.200051   0.421300   0.4748
## factor(stateid)9                        -1.176862   0.440441  -2.6720
## factor(stateid)10                       -1.184615   0.422007  -2.8071
## factor(stateid)11                       -2.742429   0.415575  -6.5991
## factor(stateid)12                       -1.212821   0.401464  -3.0210
## factor(stateid)13                       -0.306163   0.426341  -0.7181
## factor(stateid)14                       -0.971795   0.454735  -2.1371
## factor(stateid)15                       -2.531574   0.374283  -6.7638
## factor(stateid)16                       -2.394872   0.378127  -6.3335
## factor(stateid)17                       -0.266667   0.415724  -0.6415
## factor(stateid)18                        0.164103   0.436652   0.3758
## factor(stateid)19                       -1.683740   0.409072  -4.1160
## factor(stateid)20                       -1.949010   0.375920  -5.1846
## factor(stateid)21                       -2.109487   0.443136  -4.7604
## factor(stateid)22                        0.675336   0.529903   1.2745
## factor(stateid)23                       -2.318562   0.383713  -6.0424
## factor(stateid)24                        0.456410   0.422206   1.0810
## factor(stateid)25                       -1.222717   0.400807  -3.0506
## factor(stateid)26                       -1.411687   0.372256  -3.7922
## factor(stateid)27                       -3.604591   0.354722 -10.1617
## factor(stateid)28                       -0.595276   0.494848  -1.2029
## factor(stateid)29                       -2.941585   0.409657  -7.1806
## factor(stateid)30                       -1.145251   0.426490  -2.6853
## factor(stateid)31                       -0.499777   0.363579  -1.3746
## factor(stateid)32                       -0.940883   0.397273  -2.3684
## factor(stateid)33                       -1.333888   0.457156  -2.9178
## factor(stateid)34                       -3.333333   0.354285  -9.4086
## factor(stateid)35                       -0.477418   0.432641  -1.1035
## factor(stateid)36                       -1.938462   0.391215  -4.9550
## factor(stateid)37                       -0.364036   0.433574  -0.8396
## factor(stateid)38                       -0.847193   0.396907  -2.1345
## factor(stateid)39                       -0.972406   0.504031  -1.9293
## factor(stateid)40                       -0.620513   0.455360  -1.3627
## factor(stateid)41                       -3.417265   0.345271  -9.8973
## factor(stateid)42                       -0.733333   0.428672  -1.7107
## factor(stateid)43                       -1.069231   0.398608  -2.6824
```

```
## factor(stateid)44                                -2.294872   0.384891  -5.9624
## factor(stateid)45                                -2.934640   0.383014  -7.6620
## factor(stateid)46                                -2.492308   0.374968  -6.6467
## factor(stateid)47                                -0.564368   0.419628  -1.3449
## factor(stateid)48                                 1.055985   0.530993   1.9887
## factor(stateid)49                                -1.641561   0.412107  -3.9833
## factor(stateid)50                                -2.066667   0.385785  -5.3570
## Effective.Minimum.Wage.2020.Dollars:dummy9000 -1.025792   0.125011  -8.2056
## Effective.Minimum.Wage.2020.Dollars:dummy0010 -0.439424   0.108488  -4.0504
## Effective.Minimum.Wage.2020.Dollars:dummy1018 -0.875224   0.127473  -6.8659
##                                                Pr(>|z|)
## (Intercept)                                   0.1955415
## Effective.Minimum.Wage.2020.Dollars           < 2.2e-16 ***
## dummy9000                                     1.437e-12 ***
## dummy0010                                     0.0127539 *
## dummy1018                                     4.388e-09 ***
## factor(stateid)1                              0.6681009
## factor(stateid)2                              0.0161459 *
## factor(stateid)3                              0.0674870 .
## factor(stateid)4                              0.6959630
## factor(stateid)5                              4.465e-06 ***
## factor(stateid)6                              3.008e-06 ***
## factor(stateid)7                              5.833e-08 ***
## factor(stateid)8                              0.6348989
## factor(stateid)9                              0.0075399 **
## factor(stateid)10                             0.0049990 **
## factor(stateid)11                             4.136e-11 ***
## factor(stateid)12                             0.0025194 **
## factor(stateid)13                             0.4726846
## factor(stateid)14                             0.0325932 *
## factor(stateid)15                             1.344e-11 ***
## factor(stateid)16                             2.396e-10 ***
## factor(stateid)17                             0.5212300
## factor(stateid)18                             0.7070509
## factor(stateid)19                             3.855e-05 ***
## factor(stateid)20                             2.164e-07 ***
## factor(stateid)21                             1.933e-06 ***
## factor(stateid)22                             0.2025030
## factor(stateid)23                             1.518e-09 ***
## factor(stateid)24                             0.2796913
## factor(stateid)25                             0.0022836 **
## factor(stateid)26                             0.0001493 ***
## factor(stateid)27                             < 2.2e-16 ***
## factor(stateid)28                             0.2289969
## factor(stateid)29                             6.940e-13 ***
## factor(stateid)30                             0.0072466 **
## factor(stateid)31                             0.1692544
## factor(stateid)32                             0.0178674 *
## factor(stateid)33                             0.0035251 **
## factor(stateid)34                             < 2.2e-16 ***
## factor(stateid)35                             0.2698109
## factor(stateid)36                             7.234e-07 ***
## factor(stateid)37                             0.4011229
## factor(stateid)38                             0.0328028 *
```

```
## factor(stateid)39                                0.0536987 .
## factor(stateid)40                                0.1729810
## factor(stateid)41                                < 2.2e-16 ***
## factor(stateid)42                                0.0871351 .
## factor(stateid)43                                0.0073093 **
## factor(stateid)44                                2.486e-09 ***
## factor(stateid)45                                1.831e-14 ***
## factor(stateid)46                                2.997e-11 ***
## factor(stateid)47                                0.1786497
## factor(stateid)48                                0.0467343 *
## factor(stateid)49                                6.796e-05 ***
## factor(stateid)50                                8.460e-08 ***
## Effective.Minimum.Wage.2020.Dollars:dummy9000 2.294e-16 ***
## Effective.Minimum.Wage.2020.Dollars:dummy0010 5.112e-05 ***
## Effective.Minimum.Wage.2020.Dollars:dummy1018 6.606e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Interpretation 4

we found that minimum wage was asscoiated with increased unemployment rate, and we found that compared to baseline time periord (1980-1990) if minimum wage increases by 1 dollar, then unemployment rate would decrease by -102.5792 percentage points (1990-2000), -43.9424 percentage points (2000-2010), -87. 5224 percentage points for (2010-2018). (not sure which % or percentage points guys please check it !!!!!!!)