Descriptive Statistics

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | n | mean | sd | min | max |
| uninsuredrate | 400 | 12.75 | 4.35 | 2.8 | 23.8 |
| age | 400 | 37.68 | 2.35 | 28.5 | 44.5 |
| gender | 400 | 0.8 | 0.4 | 0 | 1 |
| race | 400 | 10.48 | 9.87 | 0.9 | 47.4 |
| education | 400 | 27.84 | 4.87 | 17 | 41.5 |
| single | 400 | 31.74 | 4.5 | 24.9 | 58 |
| femaleheadedhousehold | 400 | 298326.43 | 331637.08 | 20227 | 1750640 |
| populationdensity | 400 | 7381.03 | 7177.78 | 35.61 | 33932.31 |
| incomegrowth | 400 | 0 | 0.06 | -0.15 | 1.50E-01 |
| population | 400 | 6263410.78 | 6891402.35 | 620477 | 3.90E+07 |
| highwaygvt | 400 | 6.88 | 3.91 | 0.09 | 3.35E+01 |
| caucasian | 400 | 0.77 | 0.15 | 0 | 9.60E-01 |
| unemploymentrate | 400 | 0.07 | 0.04 | 0.03 | 6.60E-01 |
| governmentexpenditure | 400 | 50547267.78 | 174538167.2 | 3698335 | 3.37E+09 |
| predicteduninsuredrate | 400 | 12.75 | 1.94 | 2.73 | 1.75E+01 |
| lagged1growth | 350 | -0.01 | 0.05 | -0.15 | 1.50E-01 |

Uninsuredrate is the uninsured rate which is the percentage of people that do not have health insurance from 2008 to 2015. Age is the median age in different states in United States from 2008 to 2015. Gender is a dummy independent variable in different states in United States. A value of 1 means that more than 50% of the population in a specific state are female. A value of 0 means that more than 50% population in a specific state are male from 2008 to 2015. Race is the percentage of Hispanics in different state from 2008 to 2015. Education is the college attendance rate in different states in United States from 2008 to 2015. Lagged1growth is the 1 order lagged income growth rate. Single is the percentage of single people in the total population in each state from 2008 to 2015. Population is the population in each state from 2008 to 2015. Populationdensity is the population divided by land area. Highwaygvt is the percentage of highway expenditure in the total government expenditure. Femaleheadedhousehold is the number of female headed household in each state. Unemploymentrate is the percentage of unemployment. Government expenditure is the government expenditure from each state from 2008 to 2015. Incomegrowth is the income growth rate in each state from 2008 to 2015. Caucasian is the percentage of Caucasian in all population in each state from 2008 to 2015. Predicteduninsuredrate is the uninsured rate that predicted from the model.

ADF Test

|  |  |  |  |
| --- | --- | --- | --- |
| ADF | Dickey-Fuller | P-value | Stationary |
| uninsuredrate | -6.5155 | <0.01 | Y |
| age | -5.2859 | <0.01 | Y |
| gender | -6.0184 | <0.01 | Y |
| race | -4.1015 | <0.01 | Y |
| education | -5.3085 | <0.01 | Y |
| single | -5.8583 | <0.01 | Y |
| femaleheadedhousehold | -5.7603 | <0.01 | Y |
| populationdensity | -5.4019 | <0.01 | Y |
| incomegrowth | -14.795 | <0.01 | Y |
| population | -5.6971 | <0.01 | Y |
| highwaygvt | -9.1714 | <0.01 | Y |
| caucasian | -6.4075 | <0.01 | Y |
| education | -5.3085 | <0.01 | Y |
| unemploymentrate | -10.229 | <0.01 | Y |
| governmentexpenditure | -10.771 | <0.01 | Y |
| predicteduninsuredrate | -5.3863 | <0.01 | Y |

By the ADF test, I know that I don’t need to transform these data by using first difference method since they are all stationary.

Estimation

Regression for uninsured rate by POLS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Estimate | Std. Error | t-value | Pr(>|t|) |  |
| (Intercept) | 2.05E+01 | 3.91E+00 | 5.2335 | 2.72E-07 | \*\*\* |
| age | 5.94E-02 | 1.15E-01 | 0.5146 | 0.60715 |  |
| gender | -1.24E+00 | 5.48E-01 | -2.2575 | 0.02453 | \* |
| race | 1.83E-02 | 2.34E-02 | 0.781 | 0.43526 |  |
| education | 1.27E-03 | 4.26E-02 | 0.0299 | 0.97616 |  |
| single | -3.41E-01 | 4.88E-02 | -6.9789 | 1.28E-11 | \*\*\* |
| femaleheadedhousehold | 4.09E-06 | 6.73E-07 | 6.074 | 2.95E-09 | \*\*\* |
| populationdensity | 5.62E-05 | 2.94E-05 | 1.9145 | 0.05628 | . |
| Total Sum of Squares: | 7537.2 |  |  |  |  |
| Residual Sum of Squares: | 6032.2 |  |  |  |  |
| R-Squared: | 0.19968 |  |  |  |  |
| Adj. R-Squared: | 0.18539 |  |  |  |  |
| F-statistic: | 13.972 on 7 and 392 DF | p-value: | 3.40E-16 |  |  |

This is the model I use for predicting the uninsured rate by POLS. Then I use the predicted uninsured rate as an explanation variable to explain income growth rate.

Regression for income growth rate by POLS with predicted uninsured rate (state MA as base)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Estimate | Std. Error | t-value | Pr(>|t|) |  |
| (Intercept) | -2.78E-01 | 3.18E-01 | -0.8734 | 0.38318 |  |
| population | -1.97E-08 | 1.85E-08 | -1.0628 | 0.28874 |  |
| highwaygvt | 8.40E-04 | 8.18E-04 | 1.0264 | 0.30554 |  |
| caucasian | -1.40E-02 | 5.27E-02 | -0.2658 | 0.79061 |  |
| education | 2.05E-04 | 2.69E-03 | 0.0762 | 0.93928 |  |
| unemploymentrate | -1.66E+00 | 2.84E-01 | -5.8437 | 1.37E-08 | \*\*\* |
| governmentexpenditure | -5.52E-12 | 1.67E-11 | -0.3297 | 0.74189 |  |
| populationdensity | 2.72E-05 | 1.31E-05 | 2.0666 | 0.03966 | \* |
| femaleheadedhousehold | -5.74E-09 | 2.74E-07 | -0.0209 | 0.98332 |  |
| predicteduninsuredrate | 1.37E-02 | 1.82E-02 | 0.7521 | 0.45257 |  |
| lagged1growth | -4.16E-01 | 5.46E-02 | -7.6248 | 3.51E-13 | \*\*\* |
| stateAK | 2.43E-01 | 1.91E-01 | 1.2736 | 0.20383 |  |
| stateAL | 2.19E-01 | 1.23E-01 | 1.785 | 0.07531 | . |
| stateAR | 2.09E-01 | 1.56E-01 | 1.3385 | 0.18177 |  |
| stateAZ | -8.38E-02 | 6.05E-02 | -1.3857 | 0.16691 |  |
| stateCA | 5.93E-01 | 6.16E-01 | 0.9612 | 0.33725 |  |
| stateCO | -9.06E-03 | 6.79E-02 | -0.1334 | 0.89393 |  |
| stateCT | -2.55E-01 | 1.31E-01 | -1.9443 | 0.05283 | . |
| stateDE | 4.53E-02 | 1.25E-01 | 0.3627 | 0.71711 |  |
| stateFL | 6.42E-01 | 3.66E-01 | 1.7512 | 0.08097 | . |
| stateGA | 2.18E-01 | 2.14E-01 | 1.0218 | 0.3077 |  |
| stateHI | -7.19E-01 | 3.19E-01 | -2.2496 | 0.02522 | \* |
| stateIA | 6.09E-02 | 1.10E-01 | 0.5542 | 0.57985 |  |
| stateID | 1.95E-01 | 1.73E-01 | 1.1244 | 0.26178 |  |
| stateIL | 8.60E-02 | 1.49E-01 | 0.5771 | 0.56429 |  |
| stateIN | -1.39E-01 | 1.13E-01 | -1.2363 | 0.21735 |  |
| stateKS | 1.13E-01 | 1.24E-01 | 0.9161 | 0.36038 |  |
| stateKY | 1.89E-01 | 1.31E-01 | 1.4407 | 0.15075 |  |
| stateLA | 2.90E-01 | 1.70E-01 | 1.7058 | 0.08912 | . |
| stateMD | 1.29E-01 | 1.04E-01 | 1.2393 | 0.21622 |  |
| stateME | 2.37E-01 | 1.80E-01 | 1.3131 | 0.1902 |  |
| stateMI | 3.47E-01 | 1.52E-01 | 2.285 | 0.02303 | \* |
| stateMN | 3.04E-01 | 1.76E-01 | 1.7267 | 0.0853 | . |
| stateMO | 2.23E-01 | 1.07E-01 | 2.079 | 0.0385 | \* |
| stateMS | 2.22E-01 | 1.38E-01 | 1.6039 | 0.10982 |  |
| stateMT | 2.06E-01 | 1.86E-01 | 1.1045 | 0.27028 |  |
| stateNC | 3.78E-01 | 2.69E-01 | 1.4034 | 0.16158 |  |
| stateND | 1.97E-01 | 2.08E-01 | 0.9485 | 0.34364 |  |
| stateNE | 1.19E-01 | 1.59E-01 | 0.7526 | 0.45229 |  |
| stateNH | 1.18E-01 | 1.46E-01 | 0.8105 | 0.4183 |  |
| stateNJ | -1.31E-01 | 1.24E-01 | -1.063 | 0.28868 |  |
| stateNM | 6.53E-02 | 1.28E-01 | 0.5102 | 0.61033 |  |
| stateNV | 1.89E-01 | 1.50E-01 | 1.2637 | 0.20734 |  |
| stateNY | 3.53E-01 | 2.76E-01 | 1.2795 | 0.20173 |  |
| stateOH | -1.97E-01 | 1.85E-01 | -1.0668 | 0.28695 |  |
| stateOK | 1.74E-01 | 1.78E-01 | 0.9778 | 0.32897 |  |
| stateOR | 2.36E-01 | 1.35E-01 | 1.7428 | 0.08242 | . |
| statePA | -1.37E-01 | 1.61E-01 | -0.8519 | 0.39495 |  |
| stateRI | 1.11E-01 | 1.69E-01 | 0.6557 | 0.51253 |  |
| stateSC | 2.58E-01 | 1.39E-01 | 1.8523 | 0.06499 | . |
| stateSD | 1.64E-01 | 1.87E-01 | 0.8759 | 0.38178 |  |
| stateTN | 1.97E-01 | 1.20E-01 | 1.6369 | 0.10273 |  |
| stateTX | 6.06E-01 | 4.05E-01 | 1.4941 | 0.13623 |  |
| stateUT | 1.76E-01 | 3.46E-01 | 0.5099 | 0.61049 |  |
| stateVA | 1.77E-01 | 1.37E-01 | 1.2959 | 0.19606 |  |
| stateVT | 2.00E-01 | 1.74E-01 | 1.1505 | 0.2509 |  |
| stateWA | 2.67E-01 | 1.35E-01 | 1.9835 | 0.04826 | \* |
| stateWI | 2.51E-01 | 1.55E-01 | 1.6178 | 0.10679 |  |
| stateWV | 2.08E-03 | 1.11E-01 | 0.0187 | 0.98507 |  |
| stateWY | 1.54E-01 | 1.60E-01 | 0.962 | 0.33685 |  |
| Total Sum of Squares: | 1.0508 |  |  |  |  |
| Residual Sum of Squares: | 0.74375 |  |  |  |  |
| R-Squared: | 0.29218 |  |  |  |  |
| Adj. R-Squared: | 0.14818 |  |  |  |  |
| F-statistic: | 2.02901 on 59 and 290 DF | p-value: | 6.97E-05 |  |  |
|  |  |  |  |  |  |
| Breusch-Pagan test | |  |  |  |  |
| BP = 93.92 | df = 59 | p-value = 0.002589 | |  |  |
| Alt. Hypothesis | Heteroskedasticity | |  |  |  |
| So the model is heteroskedasticity | | | |  |  |
|  |  |  |  |  |  |
| Pesaran CD test for cross-sectional dependence in panels | | | | | |
| z = -1.071 | p-value = 0.2842 | |  |  |  |
| Alt. Hypothesis | cross-sectional dependence | | |  |  |
| So the model is cross-sectional independence | | | | |  |

Here is the model for income growth rate by POLS with predicted uninsured rate.

By the Pesaran CD test, it shows that the model is cross-sectional independence which is I want since the model needs cross-sectional independence for POLS.

By the test of Breusch-Pagan test, I find that the model is heteroskedasticity. Therefore, I need to do robust in order to make the standard error correct.

Here is the model with robust.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Coef | Estimate | SE | p-val (naive-t) | Sig. |
| (Intercept) | -2.78E-01 | 2.21E-01 | 0.21543 |  |
| population | -1.97E-08 | 1.23E-08 | 0.11638 |  |
| highwaygvt | 8.40E-04 | 6.20E-04 | 0.18158 |  |
| caucasian | -1.40E-02 | 1.02E-02 | 0.17392 |  |
| education | 2.05E-04 | 1.70E-03 | 0.90446 |  |
| unemploymentrate | -1.66E+00 | 2.22E-01 | <0.001 | \*\*\* |
| governmentexpenditure | -5.52E-12 | 3.39E-12 | 0.11007 |  |
| populationdensity | 2.72E-05 | 5.71E-06 | <0.001 | \*\*\* |
| femaleheadedhousehold | -5.74E-09 | 1.66E-07 | 0.97251 |  |
| predicteduninsuredrate | 1.37E-02 | 1.60E-02 | 0.39699 |  |
| lagged1growth | -4.16E-01 | 4.85E-02 | <0.001 | \*\*\* |
| stateAK | 2.43E-01 | 9.00E-02 | 0.00941 | \*\* |
| stateAL | 2.19E-01 | 5.09E-02 | <0.001 | \*\*\* |
| stateAR | 2.09E-01 | 7.19E-02 | 0.00543 | \*\* |
| stateAZ | -8.38E-02 | 3.60E-02 | 0.02402 | \* |
| stateCA | 5.93E-01 | 3.75E-01 | 0.12053 |  |
| stateCO | -9.06E-03 | 4.73E-02 | 0.84868 |  |
| stateCT | -2.55E-01 | 6.36E-02 | <0.001 | \*\*\* |
| stateDE | 4.53E-02 | 6.78E-02 | 0.50711 |  |
| stateFL | 6.42E-01 | 2.23E-01 | 0.0059 | \*\* |
| stateGA | 2.18E-01 | 1.03E-01 | 0.03948 | \* |
| stateHI | -7.19E-01 | 1.74E-01 | <0.001 | \*\*\* |
| stateIA | 6.09E-02 | 5.18E-02 | 0.24603 |  |
| stateID | 1.95E-01 | 8.27E-02 | 0.02269 | \* |
| stateIL | 8.60E-02 | 9.86E-02 | 0.38741 |  |
| stateIN | -1.39E-01 | 6.87E-02 | 0.04791 | \* |
| stateKS | 1.13E-01 | 6.03E-02 | 0.0661 | . |
| stateKY | 1.89E-01 | 6.37E-02 | 0.00466 | \*\* |
| stateLA | 2.90E-01 | 7.45E-02 | <0.001 | \*\*\* |
| stateMD | 1.29E-01 | 6.35E-02 | 0.04683 | \* |
| stateME | 2.37E-01 | 7.69E-02 | 0.00342 | \*\* |
| stateMI | 3.47E-01 | 7.75E-02 | <0.001 | \*\*\* |
| stateMN | 3.04E-01 | 6.70E-02 | <0.001 | \*\*\* |
| stateMO | 2.23E-01 | 4.99E-02 | <0.001 | \*\*\* |
| stateMS | 2.22E-01 | 6.16E-02 | <0.001 | \*\*\* |
| stateMT | 2.06E-01 | 8.04E-02 | 0.01371 | \* |
| stateNC | 3.78E-01 | 1.22E-01 | 0.0032 | \*\* |
| stateND | 1.97E-01 | 9.45E-02 | 0.0422 | \* |
| stateNE | 1.19E-01 | 8.12E-02 | 0.14779 |  |
| stateNH | 1.18E-01 | 6.89E-02 | 0.0922 | . |
| stateNJ | -1.31E-01 | 5.81E-02 | 0.02834 | \* |
| stateNM | 6.53E-02 | 6.17E-02 | 0.29474 |  |
| stateNV | 1.89E-01 | 7.76E-02 | 0.01839 | \* |
| stateNY | 3.53E-01 | 1.92E-01 | 0.07217 | . |
| stateOH | -1.97E-01 | 9.51E-02 | 0.04352 | \* |
| stateOK | 1.74E-01 | 7.30E-02 | 0.02104 | \* |
| stateOR | 2.36E-01 | 6.25E-02 | <0.001 | \*\*\* |
| statePA | -1.37E-01 | 9.75E-02 | 0.1647 |  |
| stateRI | 1.11E-01 | 8.44E-02 | 0.19624 |  |
| stateSC | 2.58E-01 | 6.91E-02 | <0.001 | \*\*\* |
| stateSD | 1.64E-01 | 8.08E-02 | 0.04773 | \* |
| stateTN | 1.97E-01 | 6.74E-02 | 0.00532 | \*\* |
| stateTX | 6.06E-01 | 2.71E-01 | 0.03026 | \* |
| stateUT | 1.76E-01 | 1.64E-01 | 0.28679 |  |
| stateVA | 1.77E-01 | 8.56E-02 | 0.0436 | \* |
| stateVT | 2.00E-01 | 8.17E-02 | 0.01805 | \* |
| stateWA | 2.67E-01 | 5.59E-02 | <0.001 | \*\*\* |
| stateWI | 2.51E-01 | 8.12E-02 | 0.00329 | \*\* |
| stateWV | 2.08E-03 | 6.07E-02 | 0.97278 |  |
| stateWY | 1.54E-01 | 7.11E-02 | 0.03484 | \* |

This is the result with robust which the standard errors are corrected. By the result, unemployment rate, population density, and the 1 order lagged income growth rate are significant for explaining the income growth rate. I also use state dummies to help the model to explain income growth rate more precise.

Regression for income growth rate by FE Model with predicted uninsured rate

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Estimate | Std. Error | t-value | Pr(>|t|) |  |
| population | -1.97E-08 | 1.85E-08 | -1.0628 | 0.28874 |  |
| highwaygvt | 8.40E-04 | 8.18E-04 | 1.0264 | 0.30554 |  |
| caucasian | -1.40E-02 | 5.27E-02 | -0.2658 | 0.79061 |  |
| education | 2.05E-04 | 2.69E-03 | 0.0762 | 0.93928 |  |
| unemploymentrate | -1.66E+00 | 2.84E-01 | -5.8437 | 1.37E-08 | \*\*\* |
| governmentexpenditure | -5.52E-12 | 1.67E-11 | -0.3297 | 0.74189 |  |
| populationdensity | 2.72E-05 | 1.31E-05 | 2.0666 | 0.03966 | \* |
| femaleheadedhousehold | -5.74E-09 | 2.74E-07 | -0.0209 | 0.98332 |  |
| predicteduninsuredrate | 1.37E-02 | 1.82E-02 | 0.7521 | 0.45257 |  |
| lagged1growth | -4.16E-01 | 5.46E-02 | -7.6248 | 3.51E-13 | \*\*\* |
| Total Sum of Squares: | 1.0247 |  |  |  |  |
| Residual Sum of Squares: | 0.74375 |  |  |  |  |
| R-Squared: | 0.27419 |  |  |  |  |
| Adj. R-Squared: | 0.12653 |  |  |  |  |
| F-statistic: | 10.9555 on 10 and 290 DF | p-value: | 7.91E-16 |  |  |
|  |  |  |  |  |  |
| Breusch-Pagan test | |  |  |  |  |
| BP = 93.92 | df = 59 | p-value = 0.002589 | |  |  |
| Alt. Hypothesis | Heteroskedasticity | |  |  |  |
| So the model is heteroskedasticity | | | |  |  |
|  |  |  |  |  |  |
| Pesaran CD test for cross-sectional dependece in panels | | | | | |
| z = -1.071 | p-value = 0.2842 | |  |  |  |
| Alt. Hypothesis | cross-sectional dependence | | |  |  |
| So the model is cross-sectional independece | | | | |  |

Here is the model for income growth rate by FE model with predicted uninsured rate.

By the Pesaran CD test, it shows that the model is cross-sectional independence which is I want since the model needs cross-sectional independence for FE model.

By the test of Breusch-Pagan test, I find that the model is heteroskedasticity. Therefore, I need to do robust in order to make the standard error correct.

Here is the model with robust.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Coef | Estimate | SE | p-val(naive-t) | Sig. |
| population | -1.97E-08 | 1.23E-08 | 0.116 |  |
| highwaygvt | 8.40E-04 | 6.20E-04 | 0.182 |  |
| caucasian | -1.40E-02 | 1.02E-02 | 0.174 |  |
| education | 2.05E-04 | 1.70E-03 | 0.904 |  |
| unemploymentrate | -1.66E+00 | 2.22E-01 | <0.001 | \*\*\* |
| governmentexpenditure | -5.52E-12 | 3.39E-12 | 0.11 |  |
| populationdensity | 2.72E-05 | 5.71E-06 | <0.001 | \*\*\* |
| femaleheadedhousehold | -5.74E-09 | 1.66E-07 | 0.973 |  |
| predicteduninsuredrate | 1.37E-02 | 1.60E-02 | 0.397 |  |
| lagged1growth | -4.16E-01 | 4.85E-02 | <0.001 | \*\*\* |

This is the result with robust which the standard errors are corrected. By the result, unemployment rate, population density, and the 1 order lagged income growth rate are significant for explaining the income growth rate, which shows the same result as POLS did. However, FE model is much easier than POLS since we do not need to create any dummies for state and the result is the same as POLS. FE model is more efficient and fast. However, the disadvantage of FE model is it is impossible to get the coefficients from the variables without any time variation, but POLS could get the coefficients from the variables.

Regression for income growth rate by POLS with real uninsured rate

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Estimate | Std. Error | t-value | Pr(>|t|) |  |
| (Intercept) | 4.01E-02 | 2.34E-01 | 0.1716 | 0.863899 |  |
| population | -2.05E-08 | 1.83E-08 | -1.1215 | 0.2630107 | |
| highwaygvt | 1.17E-03 | 8.13E-04 | 1.4347 | 0.1524545 | |
| caucasian | -1.32E-02 | 5.21E-02 | -0.2533 | 0.8001782 | |
| education | -2.40E-03 | 2.65E-03 | -0.9069 | 0.3652021 | |
| unemploymentrate | -1.18E+00 | 3.09E-01 | -3.8122 | 0.0001682 | \*\*\* |
| governmentexpenditure | -6.50E-12 | 1.64E-11 | -0.3955 | 0.6927701 | |
| populationdensity | 2.33E-05 | 1.31E-05 | 1.7828 | 0.0756572 | . |
| femaleheadedhousehold | 4.04E-08 | 2.71E-07 | 0.1489 | 0.881773 |  |
| lagged1growth | -4.23E-01 | 5.38E-02 | -7.8651 | 7.33E-14 | \*\*\* |
| uninsuredrate | -5.31E-03 | 2.05E-03 | -2.587 | 0.0101678 | \* |
| stateAK | 2.03E-01 | 1.89E-01 | 1.0759 | 0.2828519 | |
| stateAL | 1.64E-01 | 1.22E-01 | 1.345 | 0.1796693 | |
| stateAR | 1.73E-01 | 1.55E-01 | 1.119 | 0.2640795 | |
| stateAZ | -3.90E-02 | 5.63E-02 | -0.6925 | 0.4891753 | |
| stateCA | 6.29E-01 | 6.09E-01 | 1.0315 | 0.303181 |  |
| stateCO | 4.64E-02 | 4.84E-02 | 0.9574 | 0.3391609 | |
| stateCT | -2.02E-01 | 1.28E-01 | -1.5799 | 0.1152307 | |
| stateDE | -9.25E-03 | 1.25E-01 | -0.0738 | 0.9412513 | |
| stateFL | 4.53E-01 | 3.16E-01 | 1.4311 | 0.153477 |  |
| stateGA | 2.31E-01 | 2.08E-01 | 1.1122 | 0.2669765 | |
| stateHI | -5.74E-01 | 3.06E-01 | -1.8753 | 0.0617565 | . |
| stateIA | 5.08E-02 | 1.06E-01 | 0.4803 | 0.6314023 | |
| stateID | 1.23E-01 | 1.73E-01 | 0.7128 | 0.4765433 | |
| stateIL | 1.17E-01 | 1.48E-01 | 0.7892 | 0.430625 |  |
| stateIN | -1.37E-01 | 1.08E-01 | -1.2767 | 0.2027443 | |
| stateKS | 7.60E-02 | 1.22E-01 | 0.6214 | 0.5348496 | |
| stateKY | 1.37E-01 | 1.31E-01 | 1.0446 | 0.297087 |  |
| stateLA | 2.33E-01 | 1.70E-01 | 1.3711 | 0.1713938 | |
| stateMD | 1.31E-01 | 1.00E-01 | 1.3087 | 0.1916613 | |
| stateME | 1.94E-01 | 1.79E-01 | 1.0847 | 0.2789468 | |
| stateMI | 2.31E-01 | 1.51E-01 | 1.5265 | 0.127979 |  |
| stateMN | 2.54E-01 | 1.75E-01 | 1.448 | 0.1487109 | |
| stateMO | 2.02E-01 | 1.06E-01 | 1.9023 | 0.0581193 | . |
| stateMS | 1.16E-01 | 1.41E-01 | 0.8181 | 0.4139627 | |
| stateMT | 1.78E-01 | 1.81E-01 | 0.9834 | 0.3262211 | |
| stateNC | 2.96E-01 | 2.68E-01 | 1.105 | 0.2700582 | |
| stateND | 1.44E-01 | 2.06E-01 | 0.6975 | 0.486047 |  |
| stateNE | 1.34E-01 | 1.53E-01 | 0.8733 | 0.3832245 | |
| stateNH | 1.39E-01 | 1.43E-01 | 0.968 | 0.3338474 | |
| stateNJ | -1.06E-01 | 1.22E-01 | -0.8636 | 0.3884992 | |
| stateNM | 3.35E-02 | 1.25E-01 | 0.2675 | 0.7893091 | |
| stateNV | 1.41E-01 | 1.46E-01 | 0.9687 | 0.3335022 | |
| stateNY | 4.00E-01 | 2.73E-01 | 1.461 | 0.1450894 | |
| stateOH | -1.69E-01 | 1.83E-01 | -0.9252 | 0.3556536 | |
| stateOK | 1.15E-01 | 1.77E-01 | 0.6486 | 0.5170805 | |
| stateOR | 2.34E-01 | 1.31E-01 | 1.7824 | 0.0757334 | . |
| statePA | -7.46E-02 | 1.59E-01 | -0.4706 | 0.6382731 | |
| stateRI | 5.45E-02 | 1.67E-01 | 0.3258 | 0.744844 |  |
| stateSC | 1.67E-01 | 1.35E-01 | 1.2368 | 0.2171439 | |
| stateSD | 1.40E-01 | 1.85E-01 | 0.7611 | 0.4472218 | |
| stateTN | 1.53E-01 | 1.20E-01 | 1.2714 | 0.2046212 | |
| stateTX | 6.05E-01 | 4.01E-01 | 1.5084 | 0.1325528 | |
| stateUT | 2.01E-01 | 3.33E-01 | 0.6034 | 0.5467372 | |
| stateVA | 1.52E-01 | 1.36E-01 | 1.118 | 0.26449 |  |
| stateVT | 1.78E-01 | 1.72E-01 | 1.0367 | 0.3007581 | |
| stateWA | 2.31E-01 | 1.34E-01 | 1.7233 | 0.085894 | . |
| stateWI | 2.22E-01 | 1.53E-01 | 1.4486 | 0.1485251 | |
| stateWV | -4.09E-02 | 1.11E-01 | -0.3691 | 0.7123217 | |
| stateWY | 9.88E-02 | 1.59E-01 | 0.6206 | 0.5353719 | |
| Total Sum of Squares: | 1.0508 |  |  |  |  |
| Residual Sum of Squares: | 0.72839 |  |  |  |  |
| R-Squared: | 0.3068 |  |  |  |  |
| Adj. R-Squared: | 0.16577 |  |  |  |  |
| F-statistic: | 2.17544 on 59 and 290 DF | p-value: | 1.29E-05 |  |  |
|  |  |  |  |  |  |
| Breusch-Pagan test | |  |  |  |  |
| BP = 91.61 | df = 59 | p-value = 0.004173 | |  |  |
| Alt. Hypothesis | Heteroskedasticity | |  |  |  |
| So the model is heteroskedasticity | | | |  |  |
|  |  |  |  |  |  |
| Pesaran CD test for cross-sectional dependece in panels | | | | | |
| z = -1.1901 | p-value = 0.234 | |  |  |  |
| Alt. Hypothesis | cross-sectional dependence | | |  |  |
| So the model is cross-sectional independece | | | | |  |

Here is the model for income growth rate by POLS with real uninsured rate.

By the Pesaran CD test, it shows that the model is cross-sectional independence which is I want since the model needs cross-sectional independence for POLS.

By the test of Breusch-Pagan test, I find that the model is heteroskedasticity. Therefore, I need to do robust in order to make the standard error correct.

Here is the model with robust.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Coef | Estimate | SE | p-val (naive-t) | Sig. |
| (Intercept) | 4.01E-02 | 1.13E-01 | 0.72518 |  |
| population | -2.05E-08 | 1.05E-08 | 0.05769 | . |
| highwaygvt | 1.17E-03 | 6.11E-04 | 0.06196 | . |
| caucasian | -1.32E-02 | 9.79E-03 | 0.18338 |  |
| education | -2.40E-03 | 1.07E-03 | 0.02895 | \* |
| unemploymentrate | -1.18E+00 | 2.33E-01 | <0.001 | \*\*\* |
| governmentexpenditure | -6.50E-12 | 3.26E-12 | 0.05161 | . |
| populationdensity | 2.33E-05 | 5.27E-06 | <0.001 | \*\*\* |
| femaleheadedhousehold | 4.04E-08 | 1.47E-07 | 0.78489 |  |
| lagged1growth | -4.23E-01 | 4.79E-02 | <0.001 | \*\*\* |
| uninsuredrate | -5.31E-03 | 1.78E-03 | 0.00446 | \*\* |
| stateAK | 2.03E-01 | 8.52E-02 | 0.02111 | \* |
| stateAL | 1.64E-01 | 4.55E-02 | <0.001 | \*\*\* |
| stateAR | 1.73E-01 | 6.32E-02 | 0.00852 | \*\* |
| stateAZ | -3.90E-02 | 2.41E-02 | 0.11184 |  |
| stateCA | 6.29E-01 | 3.14E-01 | 0.05072 | . |
| stateCO | 4.64E-02 | 1.78E-02 | 0.01206 | \* |
| stateCT | -2.02E-01 | 5.34E-02 | <0.001 | \*\*\* |
| stateDE | -9.25E-03 | 6.54E-02 | 0.88815 |  |
| stateFL | 4.52E-01 | 1.81E-01 | 0.01597 | \* |
| stateGA | 2.31E-01 | 8.98E-02 | 0.01321 | \* |
| stateHI | -5.74E-01 | 1.58E-01 | <0.001 | \*\*\* |
| stateIA | 5.08E-02 | 4.31E-02 | 0.24349 |  |
| stateID | 1.23E-01 | 8.34E-02 | 0.14557 |  |
| stateIL | 1.17E-01 | 8.32E-02 | 0.16695 |  |
| stateIN | -1.37E-01 | 5.89E-02 | 0.02384 | \* |
| stateKS | 7.60E-02 | 5.82E-02 | 0.19783 |  |
| stateKY | 1.37E-01 | 5.91E-02 | 0.02453 | \* |
| stateLA | 2.33E-01 | 6.76E-02 | 0.00119 | \*\* |
| stateMD | 1.31E-01 | 5.19E-02 | 0.01472 | \* |
| stateME | 1.94E-01 | 6.99E-02 | 0.00765 | \*\* |
| stateMI | 2.31E-01 | 7.30E-02 | 0.00268 | \*\* |
| stateMN | 2.54E-01 | 6.14E-02 | <0.001 | \*\*\* |
| stateMO | 2.02E-01 | 4.21E-02 | <0.001 | \*\*\* |
| stateMS | 1.16E-01 | 6.39E-02 | 0.07679 | . |
| stateMT | 1.78E-01 | 7.34E-02 | 0.01909 | \* |
| stateNC | 2.96E-01 | 1.07E-01 | 0.00808 | \*\* |
| stateND | 1.44E-01 | 8.19E-02 | 0.08486 | . |
| stateNE | 1.34E-01 | 6.73E-02 | 0.05219 | . |
| stateNH | 1.39E-01 | 5.91E-02 | 0.02309 | \* |
| stateNJ | -1.06E-01 | 4.91E-02 | 0.03604 | \* |
| stateNM | 3.35E-02 | 5.68E-02 | 0.55791 |  |
| stateNV | 1.41E-01 | 6.97E-02 | 0.04821 | \* |
| stateNY | 3.99E-01 | 1.59E-01 | 0.01536 | \* |
| stateOH | -1.69E-01 | 7.51E-02 | 0.02889 | \* |
| stateOK | 1.15E-01 | 6.71E-02 | 0.09335 | . |
| stateOR | 2.34E-01 | 5.19E-02 | <0.001 | \*\*\* |
| statePA | -7.46E-02 | 7.25E-02 | 0.30864 |  |
| stateRI | 5.45E-02 | 8.03E-02 | 0.50048 |  |
| stateSC | 1.67E-01 | 6.64E-02 | 0.01492 | \* |
| stateSD | 1.40E-01 | 7.30E-02 | 0.06031 | . |
| stateTN | 1.53E-01 | 6.20E-02 | 0.01741 | \* |
| stateTX | 6.05E-01 | 2.23E-01 | 0.00909 | \*\* |
| stateUT | 2.01E-01 | 1.54E-01 | 0.19773 |  |
| stateVA | 1.52E-01 | 7.55E-02 | 0.05032 | . |
| stateVT | 1.78E-01 | 7.51E-02 | 0.02153 | \* |
| stateWA | 2.31E-01 | 4.93E-02 | <0.001 | \*\*\* |
| stateWI | 2.22E-01 | 7.07E-02 | 0.00285 | \*\* |
| stateWV | -4.09E-02 | 5.32E-02 | 0.44591 |  |
| stateWY | 9.88E-02 | 6.84E-02 | 0.15493 |  |

This is the result with robust which the standard errors are corrected. By the result, education, unemployment rate, population density, the 1 order lagged income growth rate, and real uninsured rate are significant for explaining the income growth rate. I also use state dummies to help the model to explain income growth rate more precise.

Regression for income growth rate by FE model with real uninsured rate

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Estimate | Std. Error | t-value | Pr(>|t|) |  |
| population | -2.05E-08 | 1.83E-08 | -1.1215 | 0.2630107 | |
| highwaygvt | 1.17E-03 | 8.13E-04 | 1.4347 | 0.1524545 | |
| caucasian | -1.32E-02 | 5.21E-02 | -0.2533 | 0.8001782 | |
| education | -2.40E-03 | 2.65E-03 | -0.9069 | 0.3652021 | |
| unemploymentrate | -1.18E+00 | 3.09E-01 | -3.8122 | 0.0001682 | \*\*\* |
| governmentexpenditure | -6.50E-12 | 1.64E-11 | -0.3955 | 0.6927701 | |
| populationdensity | 2.33E-05 | 1.31E-05 | 1.7828 | 0.0756572 | . |
| femaleheadedhousehold | 4.04E-08 | 2.71E-07 | 0.1489 | 0.881773 |  |
| lagged1growth | -4.23E-01 | 5.38E-02 | -7.8651 | 7.33E-14 | \*\*\* |
| uninsuredrate | -5.31E-03 | 2.05E-03 | -2.587 | 0.0101678 | \* |
| Total Sum of Squares: | 1.0247 |  |  |  |  |
| Residual Sum of Squares: | 0.72839 |  |  |  |  |
| R-Squared: | 0.28918 |  |  |  |  |
| Adj. R-Squared: | 0.14457 |  |  |  |  |
| F-statistic: | 11.798 on 10 and 290 DF | p-value: | <2.22e-16 |  |  |
|  |  |  |  |  |  |
| Breusch-Pagan test | |  |  |  |  |
| BP = 91.61 | df = 59 | p-value = 0.004173 | |  |  |
| Alt. Hypothesis | Heteroskedasticity | |  |  |  |
| So the model is heteroskedasticity | | | |  |  |
|  |  |  |  |  |  |
| Pesaran CD test for cross-sectional dependece in panels | | | | | |
| z = -1.1901 | p-value = 0.234 | |  |  |  |
| Alt. Hypothesis | cross-sectional dependence | | |  |  |
| So the model is cross-sectional independece | | | | |  |

Here is the model for income growth rate by FE model with real uninsured rate.

By the Pesaran CD test, it shows that the model is cross-sectional independence which is I want since the model needs cross-sectional independence for FE model.

By the test of Breusch-Pagan test, I find that the model is heteroskedasticity. Therefore, I need to do robust in order to make the standard error correct.

Here is the model with robust.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Coef | Estimate | SE | p-val(naive-t) | Sig. |
| population | -2.05E-08 | 1.05E-08 | 0.05769 | . |
| highwaygvt | 1.17E-03 | 6.11E-04 | 0.06196 | . |
| caucasian | -1.32E-02 | 9.79E-03 | 0.18338 |  |
| education | -2.40E-03 | 1.07E-03 | 0.02895 | \* |
| unemploymentrate | -1.18E+00 | 2.33E-01 | <0.001 | \*\*\* |
| governmentexpenditure | -6.50E-12 | 3.26E-12 | 0.05161 | . |
| populationdensity | 2.33E-05 | 5.27E-06 | <0.001 | \*\*\* |
| femaleheadedhousehold | 4.04E-08 | 1.47E-07 | 0.78489 |  |
| lagged1growth | -4.23E-01 | 4.79E-02 | <0.001 | \*\*\* |
| uninsuredrate | -5.31E-03 | 1.78E-03 | 0.00446 | \*\* |

This is the result with robust which the standard errors are corrected. By the result, education, unemployment rate, population density, the 1 order lagged income growth rate, and real uninsured rate are significant for explaining the income growth rate, which shows the same result as POLS did. However, FE model is much easier than POLS since we do not need to create any dummies for state and the result is the same as POLS. FE model is more efficient and fast. However, the disadvantage of FE model is it is impossible to get the coefficients from the variables without any time variation, but POLS could get the coefficients from the variables.

Compare all the models, I find out that the real uninsured rate has a greater power to explain income growth rate than the predicted uninsured rate since the R-squared and Adj. R-squared with real uninsured rate are higher than the ones with predicted uninsured rate, therefore, I prefer to use real uninsured rate as an explanation variable to do the regression for income growth rate. Since FE model could help me to ignore the unobserved variables which have no time variation and make the regression more efficient to find out the coefficients that we need, I prefer to use FE model.