BokehJS 2.4.2 successfully loaded.

```
"\noutput_figure = widgets.Output()\n \n# Create the default figure\nfig = []  # Storing the figure in a singular list is a bit of a \n          #
hack. We need it to properly mutate the current\n          # figure in our callbacks.\n#p = create_figure(\n#    iris['feature_names'][0],\n#    ir
is['feature_names'][1],\n#    data)\n#fig.append(p)\nwith output_figure:\n    interact(derive_xnames,y=y)\n    #interact(return_model_vars,x=x_,y=
y,autoremove=autoremove)\n    #show(fig)\n    \napp_layout = widgets.Layout(display='flex',\n                flex_flow='row nowrap',\n
align_items='center',\n                border='none',\n                width='100%',\n                margin='5px 5px 5px 5px')\n \n# The final app
is just a box\napp=widgets.Box([y, output_figure], layout=app_layout)\n \n# Display the app\ndisplay(app)\n"
```

y
- Poverty
- Infant Mort
- White
- Crime
- Doctors

x
- Infant Mort
- White
- Crime
- Doctors
- Traf Deaths

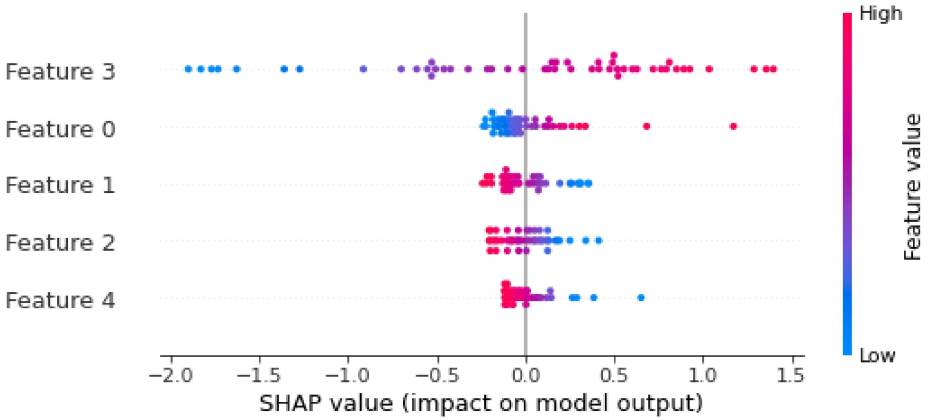
y Poverty

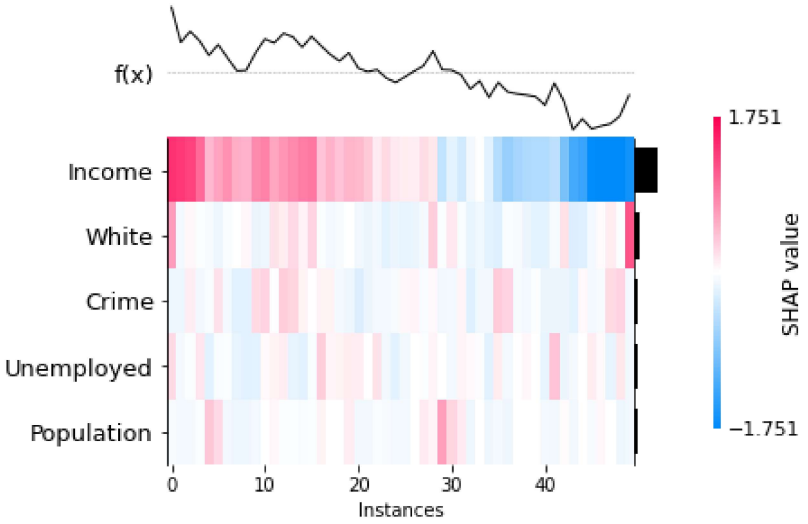
☑ autoremove

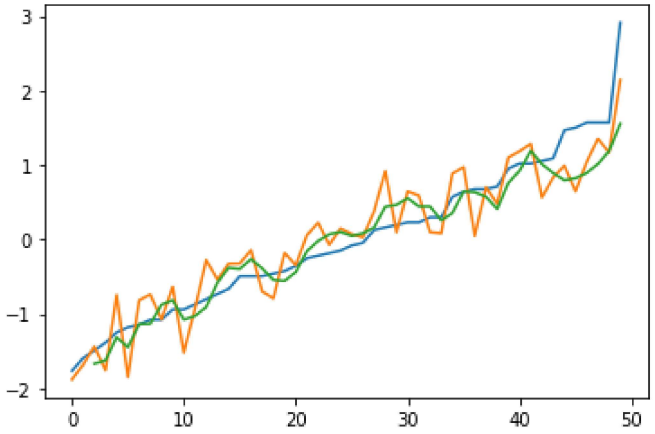
```
['Poverty', 'Infant Mort', 'White', 'Crime', 'Doctors', 'Traf Deaths', 'University', 'Unemployed', 'Income', 'Population', 'const']
```

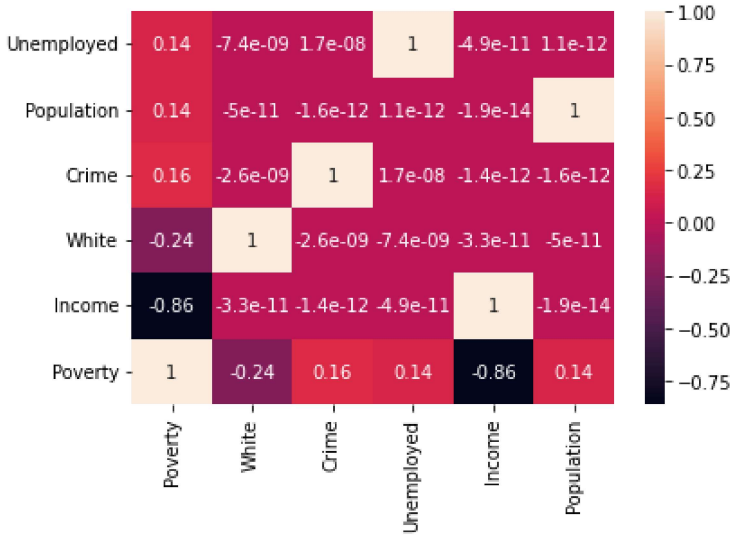
```
Index(['Infant Mort', 'White', 'Crime', 'Doctors', 'Traf Deaths', 'University',
       'Unemployed', 'Income', 'Population', 'const'],
      dtype='object')
Index(['Infant Mort', 'White', 'Crime', 'Doctors', 'Traf Deaths', 'University',
       'Unemployed', 'Income', 'Population'],
      dtype='object')
Index(['White', 'Crime', 'Doctors', 'Traf Deaths', 'University', 'Unemployed',
       'Income', 'Population'],
      dtype='object')
Index(['White', 'Crime', 'Doctors', 'Traf Deaths', 'Unemployed', 'Income',
       'Population'],
      dtype='object')
Index(['White', 'Crime', 'Traf Deaths', 'Unemployed', 'Income', 'Population'], dtype='object')
Index(['White', 'Crime', 'Unemployed', 'Income', 'Population'], dtype='object')
Index(['White', 'Crime', 'Unemployed', 'Income', 'Population'], dtype='object')
```

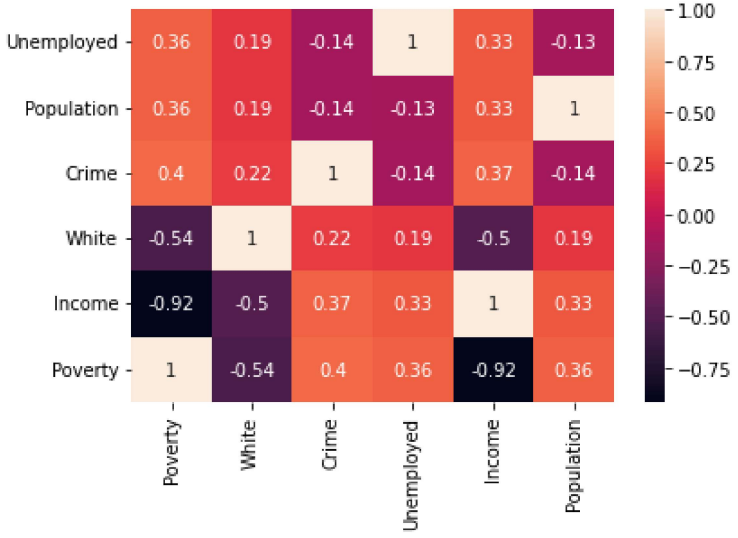
```
divide by zero encountered in true_divide
invalid value encountered in matmul
```

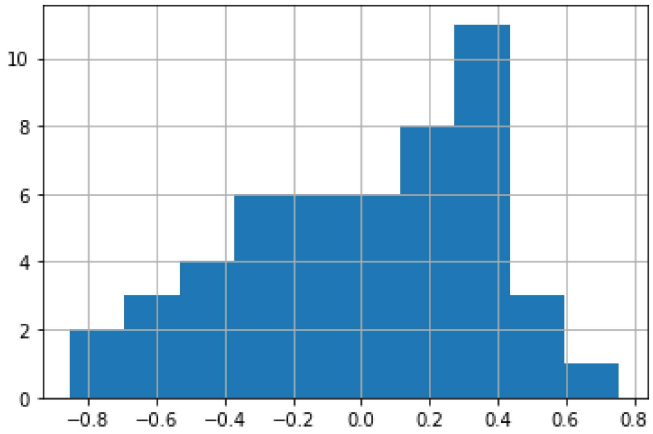

Feature 3
Feature 0
Feature 1
Feature 2
Feature 4
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
SHAP value (impact on model output)
High
Feature value
Low


f(x)
Income
White
Crime
Unemployed
Population
0
10
20
30
40
Instances
1.751
SHAP value
−1.751


3
2
1
0
−1
−2
0
10
20
30
40
50


Unemployed
Population
Crime
White
Income
Poverty
0.14 -7.4e-09 1.7e-08 1 -4.9e-11 1.1e-12
0.14 -5e-11 -1.6e-12 1.1e-12 -1.9e-14 1
0.16 -2.6e-09 1 1.7e-08 -1.4e-12 -1.6e-12
-0.24 1 -2.6e-09 -7.4e-09 -3.3e-11 -5e-11
-0.86 -3.3e-11 -1.4e-12 -4.9e-11 1 -1.9e-14
1 -0.24 0.16 0.14 -0.86 0.14
Poverty
White
Crime
Unemployed
Income
Population
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75

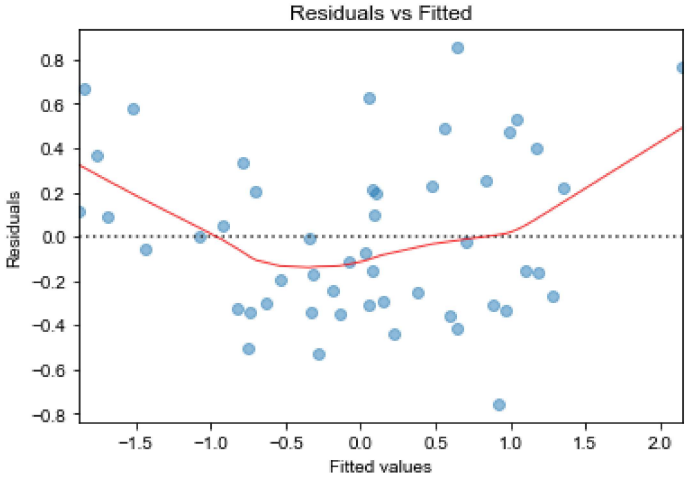

Unemployed
Population
Crime
White
Income
Poverty
0.36 0.19 -0.14 1 0.33 -0.13
0.36 0.19 -0.14 -0.13 0.33 1
0.4 0.22 1 -0.14 0.37 -0.14
-0.54 1 0.22 0.19 -0.5 0.19
-0.92 -0.5 0.37 0.33 1 0.33
1 -0.54 0.4 0.36 -0.92 0.36
Poverty
White
Crime
Unemployed
Income
Population
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75

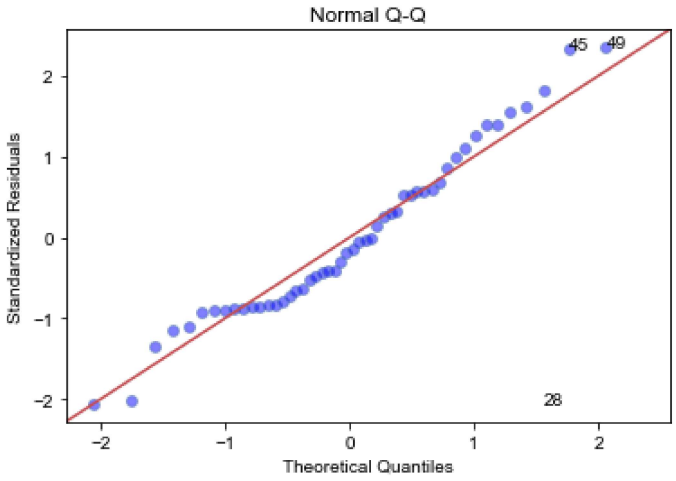


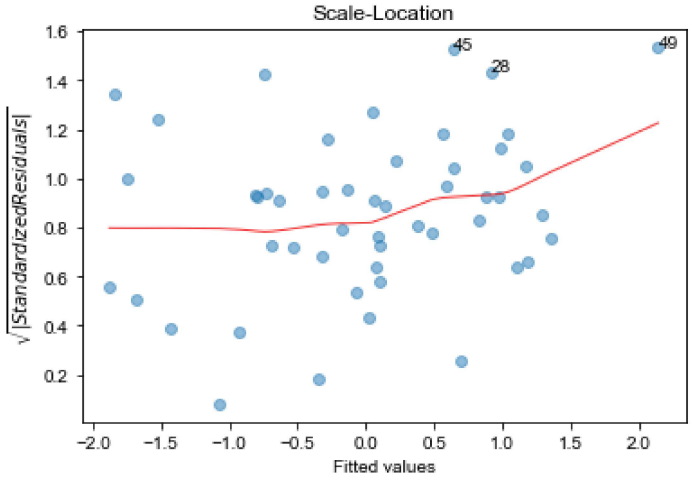

```
mape: 68.26355090031673
```

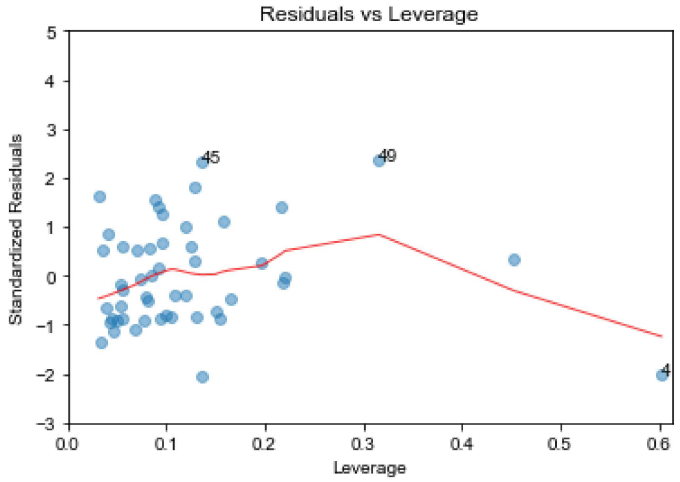
```
Pass the following variables as keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretation.
marker is redundantly defined by the 'marker' keyword argument and the fmt string "bo" (-> marker='o'). The keyword argument will take precedenc
e.
color is redundantly defined by the 'color' keyword argument and the fmt string "bo" (-> color='b'). The keyword argument will take precedence.
Pass the following variables as keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretation.
Pass the following variables as keyword args: x, y. From version 0.12, the only valid positional argument will be `data`, and passing other argum
ents without an explicit keyword will result in an error or misinterpretation.
```

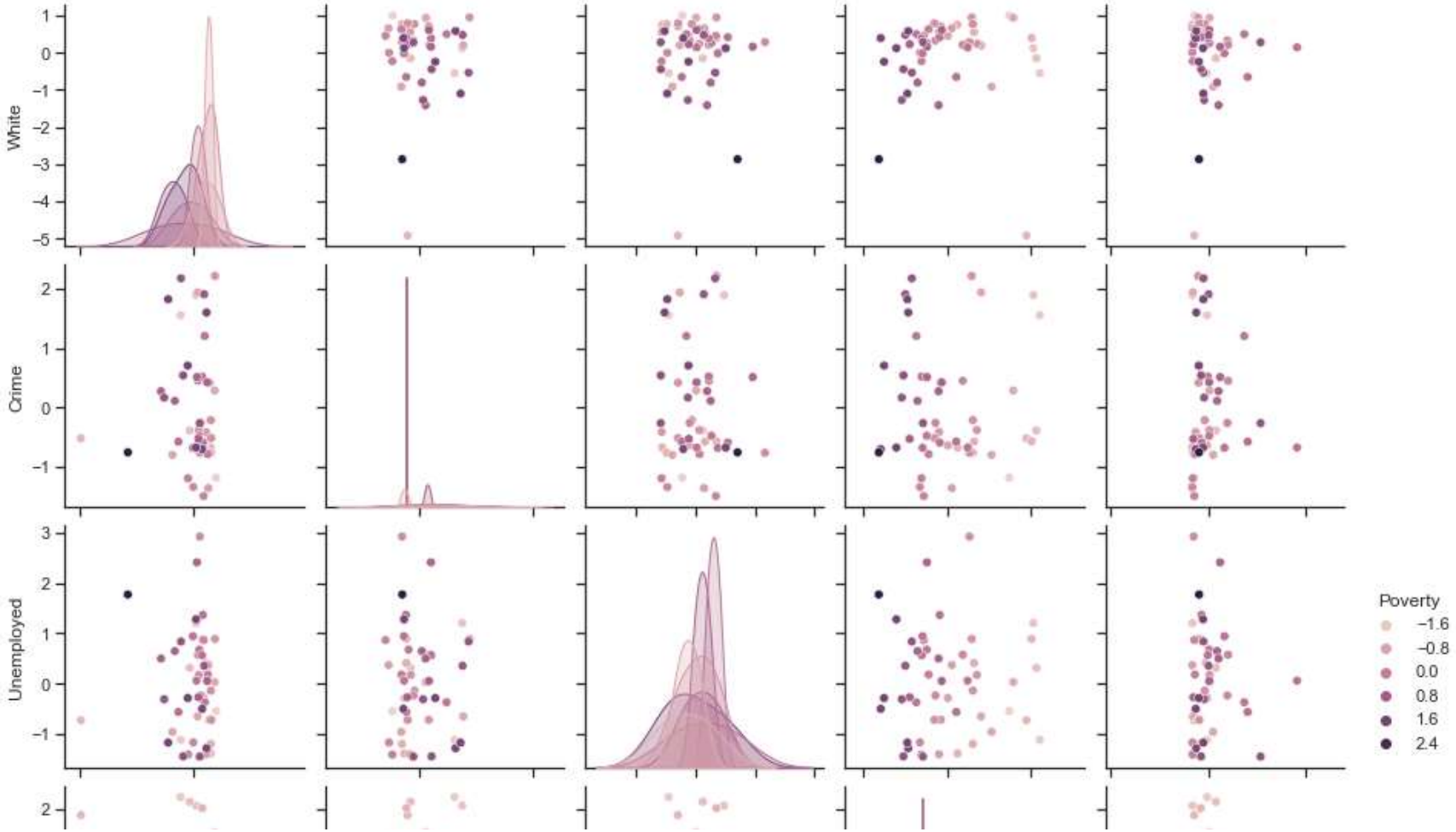
```
Diagnostic Tests of Regression
:{"Non_Linearity_Test": [["F value", NaN], ["p value", NaN]], "Hetroskedasticity_Test": [["Lagrange multiplier statistic", 2.6222863533137075],
["p-value", 0.7579762848669936], ["f-value", 0.4870669800836755], ["f p-value", 0.7840454143773542]], "Residual_Normality_Test": [["Jarque-Bera",
2.3380516101788262], ["Chi^2 two-tail prob.", 0.31066944648567857], ["Skew", 0.4390957134530111], ["Kurtosis", 2.407509839242371]], "MultiCollnea
rity_Test": [["condition no", 1.0000041860250353]], "Residual_AutoCorrelation_Test": [["p value", 1.560083885264049]]}
```

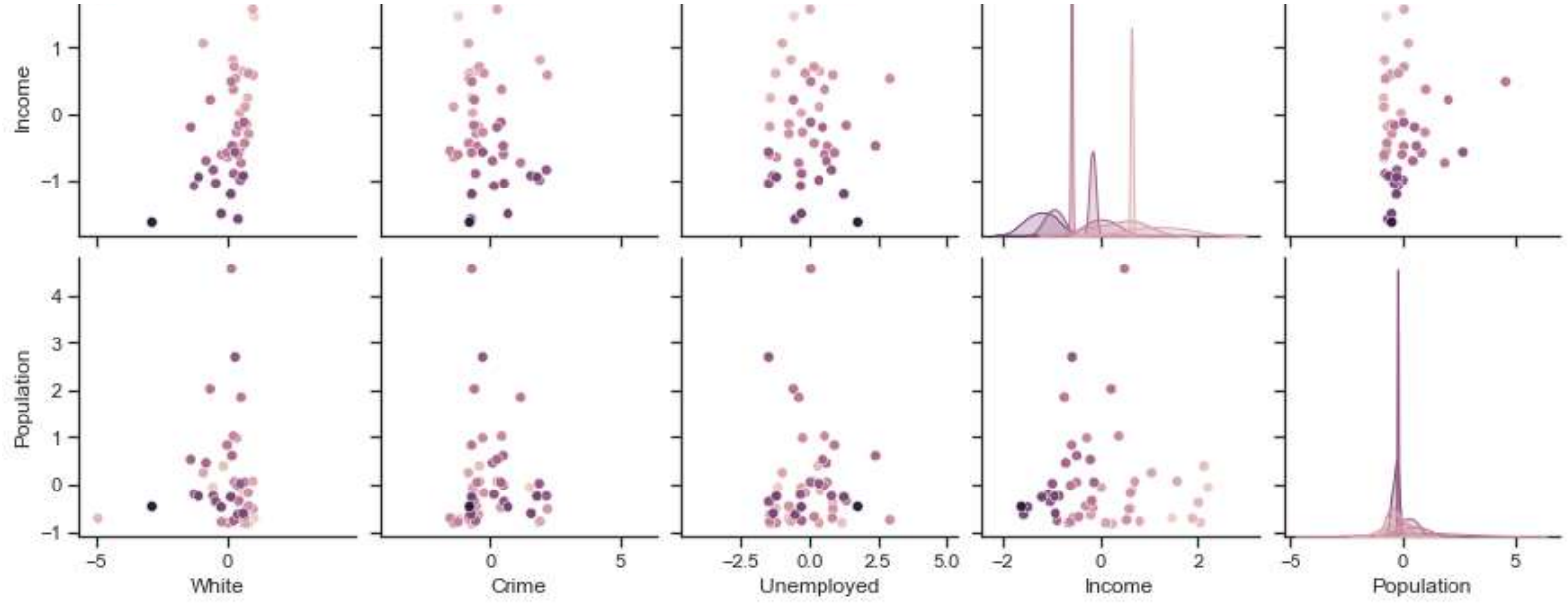



Normal Q-Q
Standardized Residuals
Theoretical Quantiles
45
49
28
2
1
0
−1
−2
−2
−1
0
1
2


Scale-Location
√|StandardizedResiduals|
Fitted values
45
28
49
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0


Residuals vs Leverage
Standardized Residuals
Leverage
45
49
4


White
Crime
Unemployed
Poverty
−1.6
−0.8
0.0
0.8
1.6
2.4



[<class 'statsmodels.iolib.summary.Summary'>
"""

OLS Regression Results

Dep. Variable:	Poverty	R-squared (uncentered):	0.862
Model:	OLS	Adj. R-squared (uncentered):	0.847
Method:	Least Squares	F-statistic:	56.39
Date:	Sun, 23 Jan 2022	Prob (F-statistic):	2.94e-18
Time:	07:55:45	Log-Likelihood:	-21.368
No. Observations:	50	AIC:	52.74
Df Residuals:	45	BIC:	62.30
Df Model:	5		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
White	-0.2383	0.055	-4.308	0.000	-0.350	-0.127
Crime	0.1614	0.055	2.919	0.005	0.050	0.273
Unemployed	0.1416	0.055	2.560	0.014	0.030	0.253
Income	-0.8597	0.055	-15.545	0.000	-0.971	-0.748
Population	0.1427	0.055	2.581	0.013	0.031	0.254

Omnibus:	2.584	Durbin-Watson:	1.560
Prob(Omnibus):	0.275	Jarque-Bera (JB):	2.338
Skew:	0.439	Prob(JB):	0.311
Kurtosis:	2.408	Cond. No.	1.00

Notes:

```
    [1] R² is computed without centering (uncentered) since the model does not contain a constant.
    [2] Standard Errors assume that the covariance matrix of the errors is correctly specified.
    """]
```

```
<function __main__.return_model_subset(x, y, autoremove)>
```

```
[1] "C:/Users/User/Documents/R/R-4.1.2/library"
```

y
- Poverty
- Infant Mort
- White
- Crime
- Doctors

x
- const
- Infant Mort
- White
- Crime
- Doctors

y: Poverty

AboveMedian
- Traf Deaths
- University
- Unemployed
- Income
- Population

BelowMedian
- Traf Deaths
- University
- Unemployed
- Income
- Population

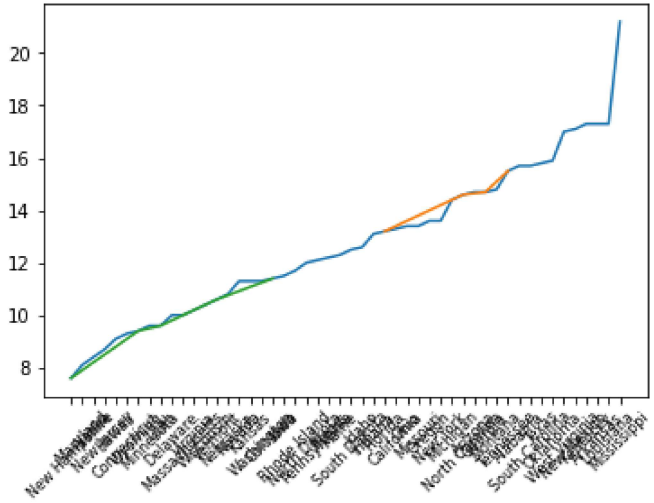
☑ Center: [Checked: Mean, Unchecked: Median]

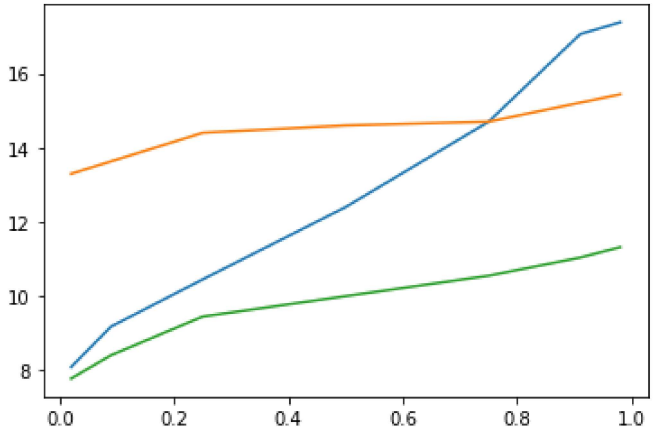
```
all group
         Poverty  const  Infant Mort     White       Crime     Doctors  \
count  50.000000   50.0    50.000000  50.00000   50.000000   50.000000
mean   12.732000    1.0     6.830000  81.96200  407.480000  260.276000
std     2.939002    0.0     1.338786  11.97458  183.633868   64.363415
min     7.600000    1.0     4.700000  29.70000  118.000000  168.800000
25%    10.450000    1.0     5.725000  76.15000  278.250000  218.425000
50%    12.400000    1.0     6.850000  84.55000  345.500000  249.050000
75%    14.700000    1.0     7.750000  89.85000  520.000000  274.800000
max    21.200000    1.0    10.600000  96.40000  788.000000  469.000000

       Traf Deaths  University  Unemployed        Income    Population
count     50.00000   50.000000   50.000000     50.000000  5.000000e+01
mean       1.40440   26.940000    5.270000  51985.100000  6.016154e+06
std        0.38654    4.761152    1.253933   8592.657934  6.663772e+06
min        0.76000   17.100000    3.000000  37790.000000  5.232260e+05
25%        1.14000   24.025000    4.400000  46161.250000  1.779632e+06
50%        1.37500   26.200000    5.300000  50173.000000  4.313980e+06
```

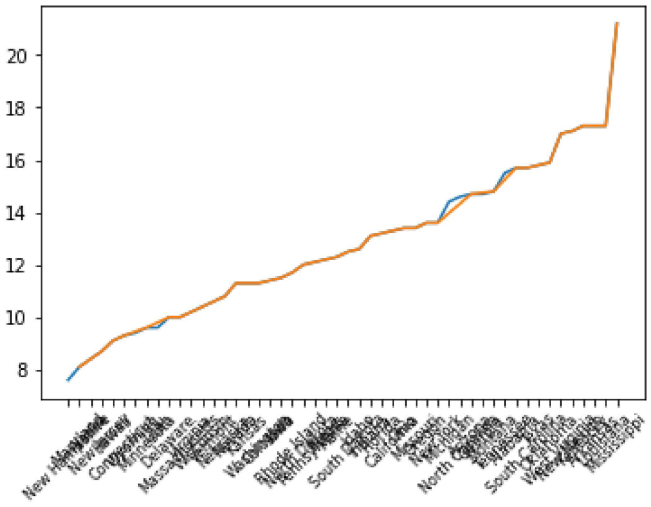
```
75%         1.62000   29.825000    6.275000  56903.000000  6.490796e+06
max         2.45000   38.100000    8.400000  70545.000000  3.618591e+07
```

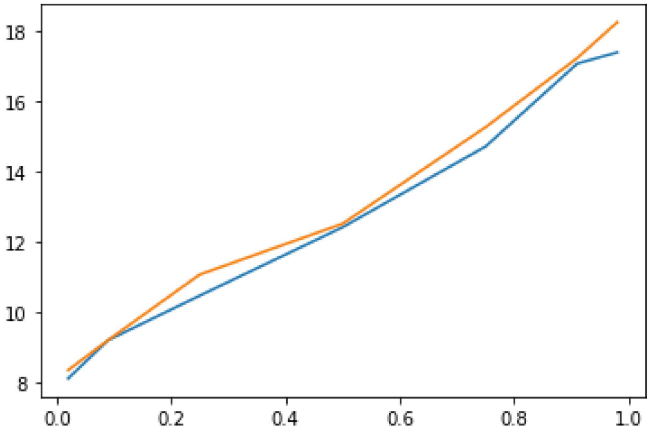
all mapped with in and out group





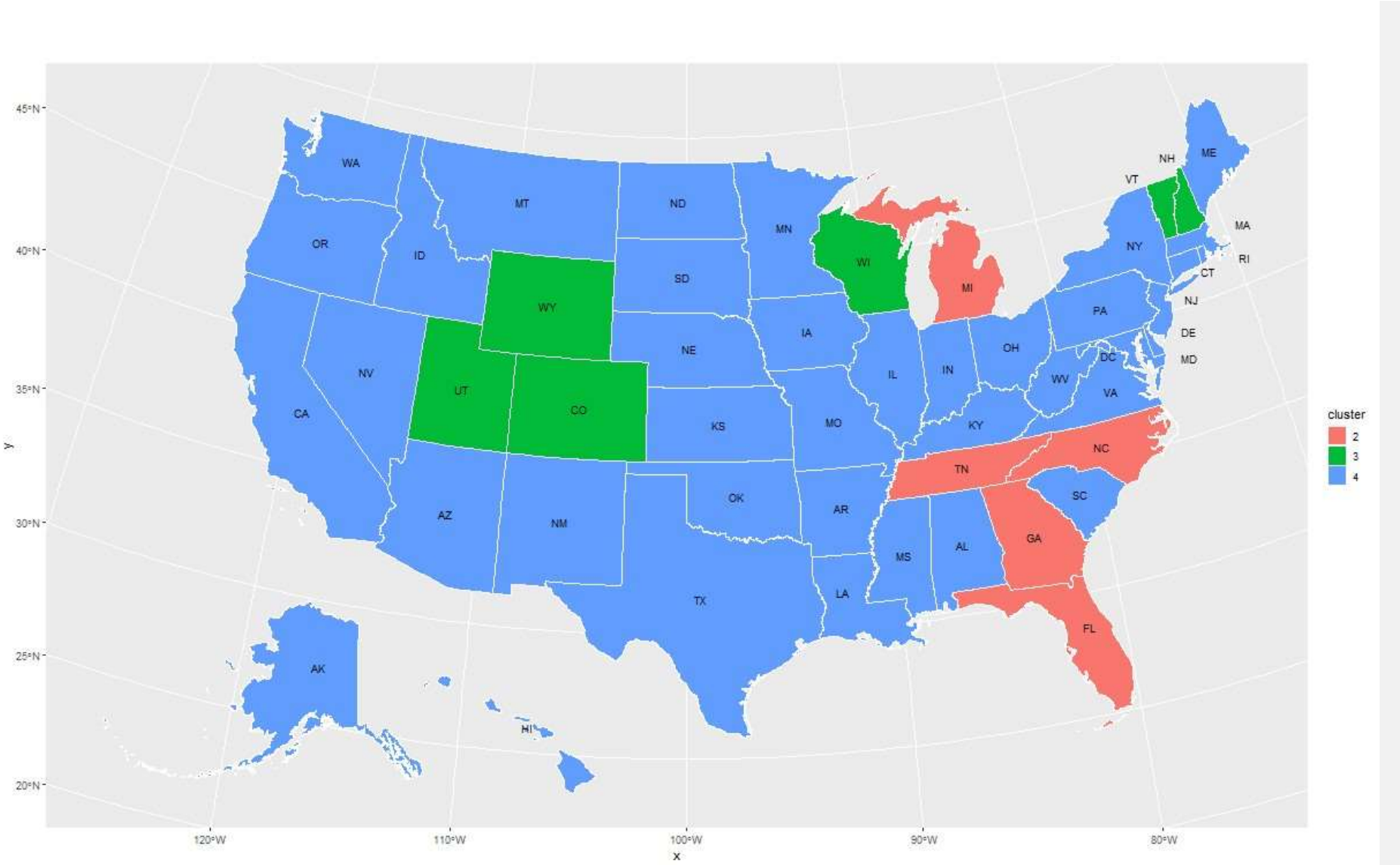
all mapped against neither group

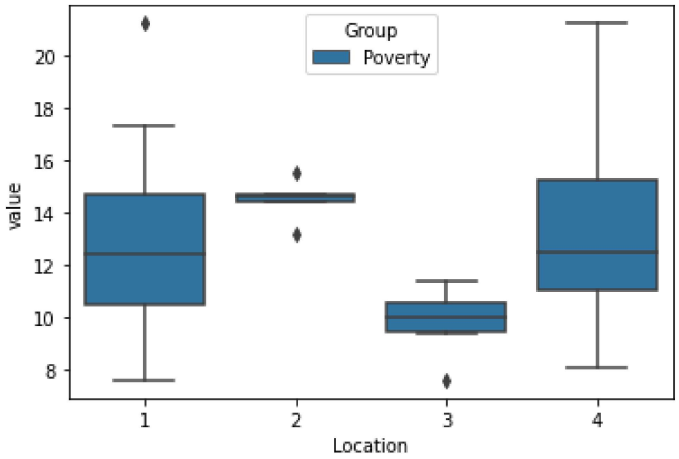




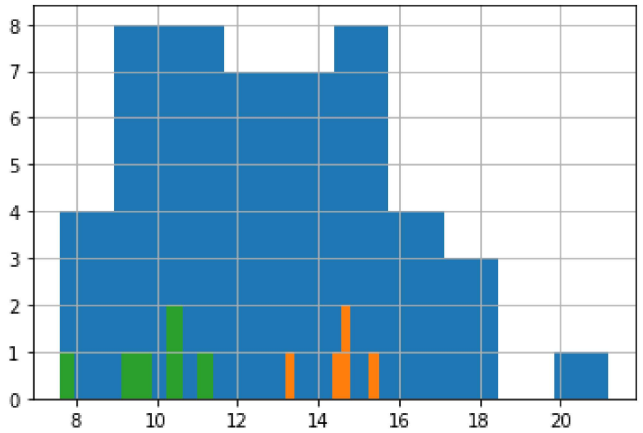

```
R[write to console]: old-style crs object detected; please recreate object with a recent sf::st_crs()

[1] "C:\\Users\\User\\Documents\\wiki\\wiki\\dev\\R\\clusterMap.png"
R[write to console]: old-style crs object detected; please recreate object with a recent sf::st_crs()
```

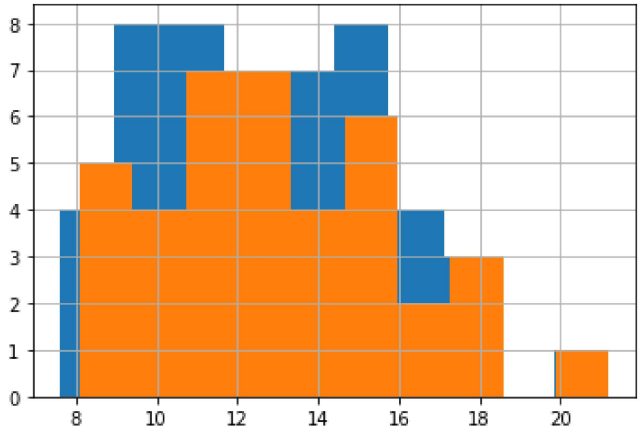

45°N
40°N
35°N
30°N
25°N
20°N
y
120°W
110°W
100°W
90°W
80°W
x
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
KY
TN
AL
OH
WV
GA
FL
SC
NC
VA
PA
NY
DC
MD
DE
NJ
CT
RI
MA
VT
NH
ME
AK
HI
cluster
2
3
4



all mapped with in and out group



all mapped against neither group



in group

```
0.0028310170602545677
f/variance test: (0.0795347795433797, 1.9764922436279146)
```

	Poverty	const	Infant Mort	White	Crime	Doctors	Traf Deaths	University	Unemployed	Income	Population
count	5.000000	5.0	5.000000	5.000000	5.00000	5.000000	5.000000	5.000000	5.000000	5.000000	5.000000e+00
mean	14.480000	1.0	7.920000	76.140000	594.20000	246.660000	1.476000	25.400000	6.700000	47478.600000	1.061211e+07
std	0.828855	0.0	0.576194	6.661681	134.04365	17.421481	0.258998	1.717556	0.953939	2672.404966	4.532375e+06
min	13.200000	1.0	7.300000	65.400000	466.00000	217.400000	1.040000	22.900000	6.200000	43614.000000	6.172788e+06
25%	14.400000	1.0	7.400000	73.900000	493.00000	247.900000	1.460000	24.700000	6.200000	46549.000000	9.047856e+06
50%	14.600000	1.0	8.100000	79.800000	536.00000	250.200000	1.560000	25.800000	6.300000	47778.000000	9.526642e+06
75%	14.700000	1.0	8.100000	80.400000	723.00000	254.200000	1.620000	26.100000	6.400000	48591.000000	1.005114e+07
max	15.500000	1.0	8.700000	81.200000	753.00000	263.600000	1.700000	27.500000	8.400000	50861.000000	1.826210e+07

States	Poverty	const	Infant Mort	White	Crime	Doctors	Traf Deaths	University	Unemployed	Income	Population
Florida	13.2	1.0	7.3	79.8	723	247.9	1.56	25.8	6.2	47778	18262096
Michigan	14.4	1.0	7.4	81.2	536	250.2	1.04	24.7	8.4	48591	10051145
North Carolina	14.6	1.0	8.1	73.9	466	254.2	1.62	26.1	6.3	46549	9047856
Georgia	14.7	1.0	8.1	65.4	493	217.4	1.46	27.5	6.2	50861	9526642
Tennessee	15.5	1.0	8.7	80.4	753	263.6	1.70	22.9	6.4	43614	6172788

```
out group
0.0005001231398252702
f/variance test: (0.19897201519925553, 1.9227516416903894)
```

	Poverty	const	Infant Mort	White	Crime	Doctors	Traf Deaths	University	Unemployed	Income	Population
count	6.000000	6.0	6.000000	6.000000	6.000000	6.000000	6.000000	6.000000	6.000000	6.000000	6.000000e+00
mean	9.833333	1.0	5.966667	93.016667	229.000000	259.983333	1.156667	29.900000	4.116667	55793.666667	2.593634e+06
std	1.310979	0.0	0.680196	2.842827	86.752522	65.665163	0.260205	4.622986	0.783369	4452.777994	2.186184e+06
min	7.600000	1.0	5.100000	89.700000	124.000000	184.400000	0.860000	23.600000	3.100000	52094.000000	5.232260e+05
25%	9.450000	1.0	5.550000	90.500000	161.500000	220.850000	0.997500	26.550000	3.500000	52379.750000	7.944525e+05
50%	10.000000	1.0	5.900000	93.400000	237.000000	259.400000	1.125000	30.600000	4.250000	54920.000000	1.989702e+06
75%	10.550000	1.0	6.325000	95.100000	278.000000	271.100000	1.237500	33.000000	4.775000	56903.000000	4.293649e+06
max	11.400000	1.0	7.000000	96.400000	348.000000	373.700000	1.600000	35.600000	4.900000	63731.000000	5.601508e+06

States	Poverty	const	Infant Mort	White	Crime	Doctors	Traf Deaths	University	Unemployed	Income	Population
New Hampshire	7.6	1.0	6.1	95.5	137	274.9	0.96	33.3	3.8	63731	1316496
Wyoming	9.4	1.0	7.0	93.9	239	184.4	1.60	23.6	3.1	53207	523226
Utah	9.6	1.0	5.1	92.9	235	208.1	1.11	29.1	3.4	56633	2662908
Wisconsin	10.4	1.0	6.4	89.7	291	259.1	1.27	25.7	4.7	52094	5601508
Vermont	10.6	1.0	5.5	96.4	124	373.7	0.86	32.1	4.8	52104	620438
Colorado	11.4	1.0	5.7	89.7	348	259.7	1.14	35.6	4.9	56993	4837229

```
neither group
0.36416062410252825
f/variance test: (1.0489381703205023, 0.866213715817532)
```

	Poverty	const	Infant Mort	White	Crime	Doctors	Traf Deaths	University	Unemployed	Income	Population
count	39.000000	39.0	39.000000	39.000000	39.000000	39.000000	39.000000	39.000000	39.000000	39.000000	3.900000e+01
mean	12.953846	1.0	6.823077	81.007692	411.000000	262.066667	1.433333	26.682051	5.264103	51976.923077	5.953471e+06
std	3.010057	0.0	1.393304	12.428731	175.986842	68.664644	0.406780	4.933978	1.171254	9321.135007	7.059468e+06
min	8.100000	1.0	4.700000	29.700000	118.000000	168.800000	0.760000	17.100000	3.000000	37790.000000	6.375340e+05
25%	11.050000	1.0	5.700000	75.150000	288.000000	218.650000	1.185000	23.850000	4.400000	45155.000000	1.790520e+06
50%	12.500000	1.0	6.800000	84.300000	343.000000	245.400000	1.380000	26.300000	5.300000	50043.000000	3.730833e+06
75%	15.250000	1.0	7.700000	88.850000	517.000000	279.300000	1.655000	29.750000	6.250000	57638.500000	6.412202e+06
max	21.200000	1.0	10.600000	96.400000	788.000000	469.000000	2.450000	38.100000	7.800000	70545.000000	3.618591e+07

States	Poverty	const	Infant Mort	White	Crime	Doctors	Traf Deaths	University	Unemployed	Income	Population
Maryland	8.1	1.0	8.0	63.4	642	421.4	1.09	35.2	4.4	70545	5627211
Alaska	8.4	1.0	6.9	70.6	661	228.5	1.63	27.3	6.7	68460	679893
New Jersey	8.7	1.0	5.5	76.0	329	316.3	0.95	34.4	5.5	70378	8630810
Hawaii	9.1	1.0	5.6	29.7	273	317.0	1.33	29.1	3.9	67214	1269796
Connecticut	9.3	1.0	6.2	84.3	256	376.4	0.86	35.6	5.7	68595	3488084
Minnesota	9.6	1.0	5.2	89.0	289	293.2	0.88	31.5	5.4	57288	5191267
Delaware	10.0	1.0	8.3	74.3	689	250.9	1.23	27.5	4.8	57989	865314

States	Poverty	const	Infant Mort	White	Crime	Doctors	Traf Deaths	University	Unemployed	Income	Population
Massachusetts	10.0	1.0	4.8	86.2	432	469.0	0.76	38.1	5.3	65401	6499672
Virginia	10.2	1.0	7.1	73.0	270	274.5	1.25	33.7	4.0	61233	7705466
Nebraska	10.8	1.0	5.6	91.4	302	245.4	1.32	27.1	3.3	49693	1768745
Nevada	11.3	1.0	6.4	80.9	751	187.8	1.68	21.9	6.7	56361	2564816
Kansas	11.3	1.0	7.1	88.7	453	222.5	1.38	29.6	4.4	50177	2773740
Washington	11.3	1.0	4.7	84.3	333	270.0	1.00	30.7	5.3	58078	6464167
Iowa	11.5	1.0	5.1	94.2	295	189.3	1.42	24.3	4.1	48980	2979867
Rhode Island	11.7	1.0	6.1	88.5	227	375.5	0.80	30.0	7.8	55701	1059706
North Dakota	12.0	1.0	5.8	91.4	142	244.4	1.42	26.9	3.2	45685	637534
Pennsylvania	12.1	1.0	7.6	85.4	417	305.3	1.37	26.3	5.4	50713	12517701
Illinois	12.2	1.0	7.3	79.1	533	280.2	1.16	29.9	6.5	56235	12775864
Maine	12.3	1.0	6.3	96.4	118	278.4	1.22	25.4	5.4	46581	1315749
South Dakota	12.5	1.0	6.9	88.2	169	219.1	1.62	25.1	3.0	46032	795521
Idaho	12.6	1.0	6.8	94.6	239	168.8	1.60	24.0	4.9	47576	1498390
Indiana	13.1	1.0	8.0	88.0	334	216.9	1.26	22.9	5.9	47966	6344771
California	13.3	1.0	5.0	76.6	523	268.7	1.21	29.6	7.2	61021	36185908
Ohio	13.4	1.0	7.8	84.8	343	266.7	1.14	24.1	6.5	47988	11518989
Missouri	13.4	1.0	7.4	85.0	505	246.0	1.43	25.0	6.1	46867	5905750
Oregon	13.6	1.0	5.5	90.1	288	274.5	1.31	28.1	6.4	50169	3730833
New York	13.6	1.0	5.6	73.4	414	395.9	0.97	31.9	5.4	56033	19419540
Arizona	14.7	1.0	6.4	86.5	483	209.7	1.69	25.1	5.5	50958	6360238
Montana	14.8	1.0	5.8	90.5	288	220.6	2.45	27.1	4.5	43654	957123
Alabama	15.7	1.0	9.0	71.0	448	218.2	1.81	22.0	5.0	42666	4634063
South Carolina	15.7	1.0	8.4	68.7	788	229.8	2.09	23.7	6.9	44625	4417059
Texas	15.8	1.0	6.2	82.4	511	214.2	1.38	25.3	4.9	50043	23824518
Oklahoma	15.9	1.0	8.0	78.1	500	173.5	1.58	22.2	3.8	42822	3608759
West Virginia	17.0	1.0	7.4	94.5	275	232.1	2.10	17.1	4.3	37989	1812295

States	Poverty	const	Infant Mort	White	Crime	Doctors	Traf Deaths	University	Unemployed	Income	Population
New Mexico	17.1	1.0	5.8	84.0	664	243.6	1.54	24.7	4.2	43508	1966357
Kentucky	17.3	1.0	7.5	89.9	295	232.3	1.80	19.7	6.4	41538	4254513
Arkansas	17.3	1.0	8.5	80.8	529	203.4	1.96	18.8	5.1	38815	2841595
Louisiana	17.3	1.0	9.9	64.8	730	262.7	2.17	20.3	4.6	43733	4373448
Mississippi	21.2	1.0	10.6	60.6	291	177.9	2.04	19.4	6.9	37790	2920312

```
<function __main__.derive_xnames(y)>
```