```python
import pandas as pd
import math
from IPython import display
import statsmodels.api as sm

df = sm.add_constant(pd.read_stata('game2_data.dta'))
df = df.dropna()

display.display(df.head())
```

```
/usr/local/lib/python3.6/dist-packages/numpy/core/fromnumeric.py:2389: FutureWarning: Method .ptp is
deprecated and will be removed in a future version. Use numpy.ptp instead.
  return ptp(axis=axis, out=out, **kwargs)
```

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

|   | const | y | x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 | x9 | x |
|---|-------|---|----|----|----|----|----|----|----|----|----|---|
| 0 | 1.0 | 2.438777 | -9.163060 | -1.588530 | -0.802902 | -3.990557 | -0.802902 | 1.584558 | -3.111471 | -0.451257 | 2.154801 | -5 |
| 1 | 1.0 | 0.629828 | -1.438437 | 1.177610 | -0.196004 | 0.446565 | -0.196004 | -1.218185 | 0.690861 | -2.143279 | 0.121307 | -0 |
| 2 | 1.0 | -3.428959 | 11.462125 | 2.887286 | 1.358113 | 3.876879 | 1.358113 | -0.815247 | 2.638416 | 0.158565 | -1.563668 | 4 |
| 3 | 1.0 | -1.320286 | 5.854400 | -0.552525 | 1.233984 | 1.719736 | 1.233984 | 2.150350 | 0.896650 | -0.827780 | 4.008009 | 1 |
| 4 | 1.0 | 1.773177 | -7.031788 | -1.952549 | -0.887858 | -2.296057 | -0.887858 | -0.705950 | 0.054110 | -0.355626 | -2.779588 | -1 |

# IV-2SLS 预测

- IV2SLS
- IVGMM
- IVGMMCUE
- IVLIML

```python
import linearmodels.iv as iv
import statsmodels.api as sm

dependent = df['y']
exdog = df[['const', 'x9', 'x10', 'x11']]
endog = df[['x1']]
instruments = df[['x2', 'x3', 'x4', 'x6', 'x7', 'x8']]

model = iv.IV2SLS(dependent, exdog, endog, instruments)
result = model.fit()
print(result)

print("~" * 100)

model = iv.IVGMM(dependent, exdog, endog, instruments)
result = model.fit()
print(result)

print("~" * 100)

model = iv.IVGMMCUE(dependent, exdog, endog, instruments)
result = model.fit()
print(result)

print("~" * 100)

model = iv.IVLIML(dependent, exdog, endog, instruments)
result = model.fit()
print(result)
```

```
                    IV-2SLS Estimation Summary
==============================================================================
Dep. Variable:                    y   R-squared:                    0.9982
Estimator:                   IV-2SLS   Adj. R-squared:               0.9982
No. Observations:              10000   F-statistic:               5.474e+06
Date:                Wed, Jul 31 2019  P-value (F-stat)              0.0000
Time:                       01:42:49   Distribution:                chi2(4)
Cov. Estimator:               robust

                            Parameter Estimates
==============================================================================
            Parameter  Std. Err.    T-stat   P-value   Lower CI   Upper CI
------------------------------------------------------------------------------
const          0.0003     0.0011    0.3107    0.7560    -0.0018     0.0025
x9             0.0864     0.0005    159.81    0.0000     0.0853     0.0875
x10            0.1193     0.0010    124.86    0.0000     0.1175     0.1212
x11            0.0988     0.0011    90.767    0.0000     0.0967     0.1010
x1            -0.3329     0.0003   -1253.2    0.0000    -0.3334    -0.3324
==============================================================================

Endogenous: x1
Instruments: x2, x3, x4, x6, x7, x8
Robust Covariance (Heteroskedastic)
Debiased: False
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
                     IV-GMM Estimation Summary
==============================================================================
Dep. Variable:                    y   R-squared:                    0.9982
Estimator:                    IV-GMM   Adj. R-squared:               0.9982
No. Observations:              10000   F-statistic:               5.489e+06
Date:                Wed, Jul 31 2019  P-value (F-stat)              0.0000
Time:                       01:42:49   Distribution:                chi2(4)
Cov. Estimator:               robust

                            Parameter Estimates
==============================================================================
            Parameter  Std. Err.    T-stat   P-value   Lower CI   Upper CI
------------------------------------------------------------------------------
const         -0.0018     0.0011   -1.6647    0.0960    -0.0039     0.0003
x9             0.0866     0.0005    160.18    0.0000     0.0855     0.0876
x10            0.1209     0.0010    126.63    0.0000     0.1190     0.1228
x11            0.0999     0.0011    91.689    0.0000     0.0978     0.1020
x1            -0.3334     0.0003   -1257.3    0.0000    -0.3339    -0.3329
==============================================================================

Endogenous: x1
Instruments: x2, x3, x4, x6, x7, x8
GMM Covariance
Debiased: False
Robust (Heteroskedastic)
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
                     IV-GMM Estimation Summary
==============================================================================
Dep. Variable:                    y   R-squared:                    0.9977
Estimator:                    IV-GMM   Adj. R-squared:               0.9977
No. Observations:              10000   F-statistic:               4.434e+06
Date:                Wed, Jul 31 2019  P-value (F-stat)              0.0000
Time:                       01:42:50   Distribution:                chi2(4)
Cov. Estimator:               robust

                            Parameter Estimates
==============================================================================
            Parameter  Std. Err.    T-stat   P-value   Lower CI   Upper CI
------------------------------------------------------------------------------
const         -0.0271     0.0012   -23.275    0.0000    -0.0294    -0.0249
x9             0.0858     0.0006    141.11    0.0000     0.0846     0.0870
x10            0.1400     0.0011    129.66    0.0000     0.1378     0.1421
x11            0.1338     0.0013    104.80    0.0000     0.1313     0.1363
x1            -0.3398     0.0003   -1124.9    0.0000    -0.3404    -0.3392
==============================================================================

Endogenous: x1
Instruments: x2, x3, x4, x6, x7, x8
GMM Covariance
Debiased: False
Robust (Heteroskedastic)
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
                     IV-LIML Estimation Summary
==============================================================================
Dep. Variable:                    y   R-squared:                    0.9981
```

```
Estimator:                    IV-LIML   Adj. R-squared:              0.9981
No. Observations:               10000   F-statistic:              5.119e+06
Date:              Wed, Jul 31 2019   P-value (F-stat)             0.0000
Time:                        01:42:50   Distribution:              chi2(4)
Cov. Estimator:                robust

                          Parameter Estimates
==============================================================================
          Parameter  Std. Err.    T-stat    P-value   Lower CI   Upper CI
------------------------------------------------------------------------------
const        0.0001     0.0011     0.0924     0.9264    -0.0021     0.0023
x9           0.0824     0.0006     148.64     0.0000     0.0814     0.0835
x10          0.1090     0.0010     111.46     0.0000     0.1071     0.1109
x11          0.0988     0.0011     89.019     0.0000     0.0966     0.1010
x1          -0.3288     0.0003    -1194.5     0.0000    -0.3294    -0.3283
==============================================================================

Endogenous: x1
Instruments: x2, x3, x4, x6, x7, x8
Robust Covariance (Heteroskedastic)
Debiased: False
Kappa: 2722423926149.400
```