

What is the difference between Zero Inflated Poisson Regression and regular Poisson Regression?

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Zero Inflated Poisson Regression and regular Poisson Regression are both statistical models used for count data analysis. However, there are fundamental differences between the two.

Regular Poisson Regression assumes that the count data follows a Poisson distribution, where the mean and variance are equal. This means that the probability of observing a particular count is solely dependent on the mean value. On the other hand, Zero Inflated Poisson Regression takes into account the presence of excess zeros in the count data, which cannot be explained by the Poisson distribution.

In Zero Inflated Poisson Regression, two separate models are used to analyze the data - one for the excess zeros and the other for the non-zero counts. This allows for a more accurate estimation of the mean and variance, as well as the probability of observing a zero count.

Moreover, while regular Poisson Regression assumes that all observations are independent, Zero Inflated Poisson Regression allows for the presence of correlation among the observations. This is especially useful when analyzing data with repeated measures or clustered data.

Overall, the key difference between the two models lies in their approach to handling excess zeros in the count data. Regular Poisson Regression assumes that the data follows a Poisson distribution, while Zero Inflated Poisson Regression takes into account the presence of excess zeros and allows for more flexibility in the modeling process.

Zero Inflated Poisson Regression | Mplus Annotated Output

This page shows an example of zero inflated Poisson regression with footnotes explaining the output. First an example is shown using Stata, and then an example is shown using Mplus, to help you relate the output you are likely to be familiar with (Stata) to output that may be new to you (Mplus). We suggest that

you view this page using two web browsers so you can show the page side by side showing the Stata output in one browser and the corresponding Mplus output in the other browser.

This example is from the Mplus User's Guide (example 3.8) and we suggest that you see the Mplus User's Guide for more details about this example. We thank the kind people at Muthén & Muthén for permission to use examples from their manual.

Example Using Stata

Here is a logit regression example using Stata with two continuous predictors x1 and x3 used to predict a binary outcome variable, u1. These same predictors are used to predict the zero inflation in u1 as well.

```
infile      u1      x1      x3      using
https://stats.idre.ucla.edu/wp-content/uploads/2016/02/ex3.8.dat, clear
```

```
zip u1 x1 x3, inflate(x1 x3)
```

<some output omitted>

Zero-inflated Poisson regression Number of obs = 500

Nonzero obs = 282

Zero obs = 218

Inflation model = logit LR chi2(2) = 209.64

Log likelihood = -758.855 Prob > chi2 = 0.0000

```
-----
| Coef. Std. Err. z P>|z|
```

```
-----+-----
u1 |
x1 | .5478153C .0398304 13.75 0.000 .4697492 .6258814
x3 | .3087748C .0416855 7.41 0.000 .2270728 .3904768
_cons | 1.06087D .0380128 27.91 0.000 .9863659
1.135373
```

```
-----+-----
inflate |
```

```
x1 | 1.629311E .2163157 7.53 0.000 1.20534 2.053282
x3 | 1.054722E .1717856 6.14 0.000 .718028 1.391415
_cons | -.9500156F .1674828 -5.67 0.000 -1.278276 -
.6217554
```

estat ic

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
-------	-----	----------	-----------	----	-----	-----

-----+-----						
.	500	-863.6735	-758.855A	6	1529.71B	1554.998B

The output is labeled with superscripts to help you relate the later Mplus output to this Stata output. To summarize the output, both predictors in this model, x1 and x3, are significantly related to the outcome variable, u1, and both predictors are related to the zero inflation in u1. The estat ic command produces fit indices for the model including the log likelihood for the empty (null) model, the log likelihood for the model, as well as the AIC and BIC fit indices.

Mplus Example #1

Here is the same example illustrated in Mplus based on the

<https://stats.idre.ucla.edu/wp-content/uploads/2016/02/ex3.8.dat> data file. The output has been edited and condensed to save space.

TITLE:

this is an example of a zero-inflated
Poisson regression for a count dependent
variable with two covariates

DATA:

FILE

IS

<https://stats.idre.ucla.edu/wp-content/uploads/2016/02/ex3.8.dat>;

VARIABLE:

NAMES ARE u1 x1 x3;

COUNT IS u1 (i);

MODEL:

u1 ON x1 x3;

u1#1 ON x1 x3;

SUMMARY OF ANALYSIS

Number of observations 500

TESTS OF MODEL FIT

Loglikelihood

H0 Value -758.8551

Information Criteria

Number of Free Parameters 6

Akaike (AIC) 1529.7102

Bayesian (BIC) 1554.9982

Sample-Size Adjusted BIC 1535.953

($n^* = (n + 2) / 24$)

MODEL RESULTS

Estimates S.E. Est./S.E.

U1 ON

X1 0.5483 0.041 13.308

X3 0.3093 0.041 7.619

U1#1 ON

X1 1.6295 0.237 6.871

X3 1.0555 0.181 5.827

Intercepts

U1#1 -0.9506 0.170 -5.596

U1 1.0614 0.041 26.115

1. This is the log likelihood value associated with the model (see the $ll(model)$) from the `estat ic` command in Stata.
2. These are the AIC and BIC values, see the AIC and BIC values from the `estat ic` command in Stata.
3. These are the coefficients for the Poisson model expressing the relationship between x_1 x_3 and u_1 , the same as those from the Stata `zip` command.
4. This is the intercept for the Poisson model, the same as that from the Stata `poisson` command.
5. These are the coefficients for the zero inflation part of the model model expressing the relationship between x_1 x_3 and the zero inflation in u_1 , the same as those from the `inflate` part of the model from the Stata `zip` command.
6. This is the intercept for the zero inflation part of the

**model, the same as
the intercept from the inflate part of the model from the
Stata
zip command.**

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