What is the process and output of probit regression analysis, as demonstrated by the annotated output from Mplus?

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Probit regression analysis is a statistical method used to model the relationship between a binary dependent variable and one or more independent variables. This method is commonly used in social sciences, economics, and other fields to analyze data where the dependent variable is dichotomous (e.g. yes/no, success/failure).

The process of probit regression analysis involves estimating the probability of an event occurring, given a set of independent variables. This is done by fitting a probit model to the data, which calculates the predicted probability of the dependent variable based on the independent variables. The model also produces a coefficient for each independent variable, indicating the direction and strength of its relationship with the dependent variable.

The output of probit regression analysis, as demonstrated by the annotated output from Mplus, includes various statistics such as the model fit indices, regression coefficients, standard errors, and p-values. The model fit indices help assess how well the model fits the data, while the regression coefficients provide information on the direction and significance of the relationships between the variables. Additionally, the output may also include the predicted probabilities for each level of the dependent variable, allowing for further interpretation and analysis.

In summary, probit regression analysis is a useful tool for understanding the relationship between a binary dependent variable and one or more independent variables. The annotated output from Mplus provides valuable information and statistics to aid in the interpretation and understanding of the probit model.

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Probit Regression | Mplus Annotated Output

This page shows an example of probit 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 drawn from the Mplus User's Guide (example 3.4) 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 probit regression example using Stata with two continuous predictors
x1 and x2 used to predict a binary outcome variable, u1.

```
infile u1 x1 x3 using ex3.4.dat, clear

tabulate u1

u1 | Freq. Percent Cum.
------------+-----------------------------------
```

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0 | 321 64.20A 64.20

1 | 179 35.80A 100.00

----------+----------

Total | 500 100.00

probit u1 x1 x3

Iteration 0: log likelihood = -326.12939

Iteration 1: log likelihood = -161.14424

Iteration 2: log likelihood = -122.87381

Iteration 3: log likelihood = -111.40561

Iteration 4: log likelihood = -109.52052

Iteration 5: log likelihood = -109.45715

Iteration 6: log likelihood = -109.45707

Probit regression Number of obs = 500

LR chi2(2) = 433.34

Prob > chi2 = 0.0000

Log likelihood = -109.45707 Pseudo R2 = 0.6644

---

u1 | Coef. Std. Err. z P>|z|

----------+----------

x1 | 1.022478B .1262691 8.10 0.000 .7749951 1.269961

x3 | 2.474276B .2276468 10.87 0.000 2.028096 2.920455

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_cons | -.9838567 .1250848 -7.87 0.000 -1.229018 -.738695

--

note: 15 failures and 1 success completely determined.

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 x2, are significantly related to the outcome variable, u1.

Mplus Example

Here is the same example illustrated in Mplus based on the https://stats.idre.ucla.edu/wp-content/uploads/2016/02/ex3.4.dat data file. Note that by using estimator=wls; (weighted least squares) the results are shown in a probit metric.
Had we specified something like estimator=ml; (maximum likelihood) then the results would be shown in a logit scale.

TITLE:

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this is an example of a probit regression
for a binary or categorical observed
dependent variable with two covariates
DATA:
FILE IS ex3.4.dat;
analysis:
estimator=wls;
VARIABLE:
NAMES ARE u1 x1 x3;
CATEGORICAL = u1;
MODEL:
u1 ON x1 x3;

SUMMARY OF ANALYSIS

Number of observations 500
Estimator WLS
<some output was omitted to save space>

SUMMARY OF CATEGORICAL DATA PROPORTIONS

U1
Category 1 0.642A
Category 2 0.358A

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THE MODEL ESTIMATION TERMINATED NORMALLY

<some output omitted to save space>

MODEL RESULTS

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

U1 ON

X1 1.022B 0.121 8.457

X3 2.474B 0.224 11.028

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