

Predicted Probabilities and Marginal Effects After (Ordered) Logit/Probit models using margins in Stata

(v. 1.0)

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Predicted probabilities after logit/probit: estimating the probability that the outcome variable = 1

```
use http://dss.princeton.edu/training/Panel101.dta  
quietly logit y_bin x1 x2 x3 i.opinion  
margins, atmeans post
```

```
. margins, atmeans  
  
Adjusted predictions          Number of obs   =          70  
Model VCE      : OIM  
  
Expression   : Pr(y_bin), predict()  
at           : x1          =   .6480006 (mean)  
              x2          =   .1338694 (mean)  
              x3          =   .761851  (mean)  
              1.opinion   =   .2857143 (mean)  
              2.opinion   =   .2142857 (mean)  
              3.opinion   =   .2714286 (mean)  
              4.opinion   =   .2285714 (mean)
```

Variables at mean values

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_cons	.8575618	.0512873	16.72	0.000	.7570405 .9580832



The probability of $y_bin = 1$ is 85% given that all predictors are set to their mean values.

Type `help margins` for more details. Available since Stata 11+

Predicted probabilities after logit/probit: estimating the probability that the outcome variable = 1, setting a predictor to specific value

```
use http://dss.princeton.edu/training/Panel101.dta  
quietly logit y_bin x1 x2 x3 i.opinion  
margins, at(x2=3) atmeans post
```

```
. margins, at(x2=3) atmeans  
  
Adjusted predictions          Number of obs   =          70  
Model VCE      : OIM  
  
Expression   : Pr(y_bin), predict()  
at           : x1           =   .6480006 (mean)  
              x2           =           3  
              x3           =   .761851 (mean)  
              1.opinion    =   .2857143 (mean)  
              2.opinion    =   .2142857 (mean)  
              3.opinion    =   .2714286 (mean)  
              4.opinion    =   .2285714 (mean)
```

Variables at mean values

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_cons	.9346922	.0732788	12.76	0.000	.7910683 1.078316



The probability of $y_bin = 1$ is 93% given that $x2 = 3$ and the rest of predictors are set to their mean values.

Type `help margins` for more details. Available since Stata 11+

Predicted probabilities after logit/probit: estimating the probability that the outcome variable = 1, setting predictors to specific value

```
use http://dss.princeton.edu/training/Panel101.dta
quietly logit y_bin x1 x2 x3 i.opinion
margins, at(x2=3 x3=5) atmeans post
```

```
. margins, at(x2=3 x3=5) atmeans

Adjusted predictions          Number of obs   =          70
Model VCE      : OIM

Expression   : Pr(y_bin), predict()
at           : x1          =   .6480006 (mean)
              x2          =           3
              x3          =           5
              1.opinion   =   .2857143 (mean)
              2.opinion   =   .2142857 (mean)
              3.opinion   =   .2714286 (mean)
              4.opinion   =   .2285714 (mean)
```

Variables at mean values

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
._cons	.9872112	.0357288	27.63	0.000	.917184 1.057238



The probability of $y_bin = 1$ is 99% given that $x2 = 3$, $x3 = 5$ and the rest of predictors are set to their mean values.

Predicted probabilities after logit/probit: estimating the probability that the outcome variable = 1, setting predictors to specific value

use `http://dss.princeton.edu/training/Panel101.dta`

`quietly logit y_bin x1 x2 x3 i.opinion`

`margins, at(x2=3 x3=5 opinion=(1 2)) atmeans post`

```
. margins, at(x2=3 x3=5 opinion=1 opinion=2) atmeans
```

```
Adjusted predictions          Number of obs   =          70
Model VCE      : OIM
```

```
Expression      : Pr(y_bin), predict()
```

```
1._at          : x1          =    .6480006 (mean)
                x2          =          3
                x3          =          5
                opinion       =          1
```

```
2._at          : x1          =    .6480006 (mean)
                x2          =          3
                x3          =          5
                opinion       =          2
```

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
._at					
1	.9891283	.0305393	32.39	0.000	.9292724 1.048984
2	.9304941	.1915434	4.86	0.000	.5550758 1.305912



1. The probability of $y_{bin} = 1$ is 98% given that $x_2 = 3$, $x_3 = 5$, the opinion is “strongly agree” and the rest of predictors are set to their mean values.
2. The probability of $y_{bin} = 1$ is 93% given that $x_2 = 3$, $x_3 = 5$, the opinion is “agree” and the rest of predictors are set to their mean values.

Predicted probabilities after logit/probit: categorical variables as predictors

use <http://dss.princeton.edu/training/Panel1101.dta>

```
quietly logit y_bin x1 x2 x3 i.opinion
```

```
margins opinion, atmeans post
```

Categorical variable

```
. margins opinion, atmeans
```

```
Adjusted predictions      Number of obs   =       70
Model VCE      : OIM
```

```
Expression   : Pr(y_bin), predict()
at           : x1           =   .6480006 (mean)
              x2           =   .1338694 (mean)
              x3           =   .761851  (mean)
              1.opinion    =   .2857143 (mean)
              2.opinion    =   .2142857 (mean)
              3.opinion    =   .2714286 (mean)
              4.opinion    =   .2285714 (mean)
```

Variables at mean values

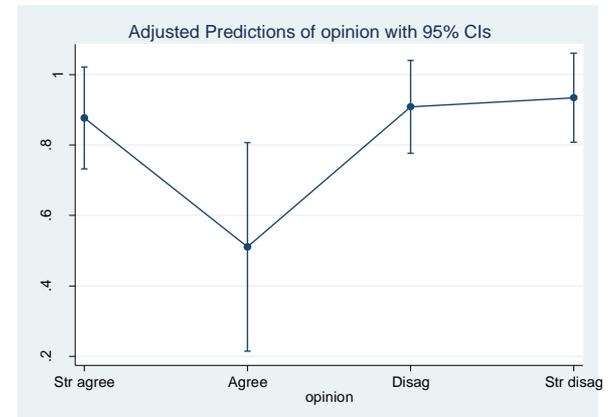
	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
opinion					
Str agree	.8764826	.0739471	11.85	0.000	.731549 1.021416
Agree	.5107928	.1509988	3.38	0.001	.2148405 .8067451
Disag	.907761	.0673524	13.48	0.000	.7757527 1.039769
Str disag	.933931	.0644709	14.49	0.000	.8075704 1.060292



Holding all variables at their mean values. The probability of $y_{bin} = 1$ is:

- 87% among those who “strongly agree”,
- 51% among those who “agree”,
- 91% among those who “disagree” and
- 93% among those who “strongly disagree”

After margins, type **marginsplot** to produce the graph below



Source: <http://www.stata.com/stata12/margins-plots/>

Predicted probabilities after logit/probit: categorical variables as predictors

use <http://dss.princeton.edu/training/Panel1101.dta>

```
quietly logit y_bin x1 x2 x3 i.opinion i.country
```

```
margins opinion#country, post
```

```
. margins opinion#country,
```

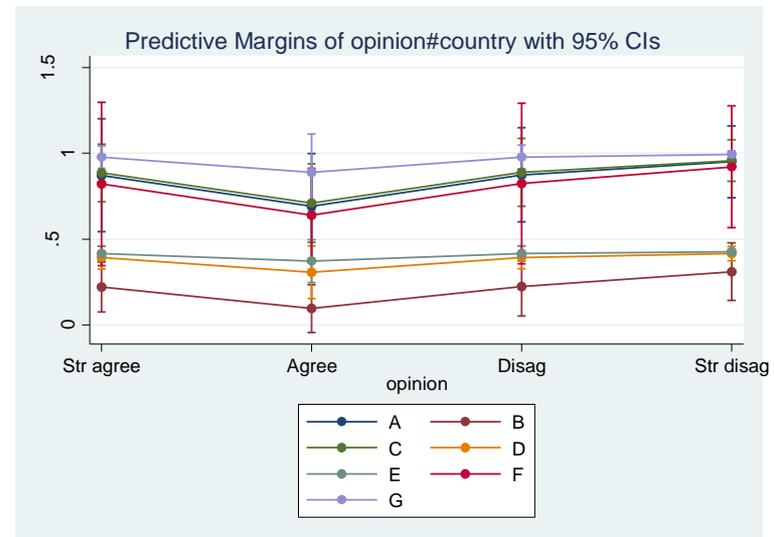
```
Predictive margins          Number of obs   =          70
```

```
Model VCE      : OIM
```

```
Expression    : Pr(y_bin), predict()
```

	Delta-method		z	P> z	[95% Conf. Interval]	
	Margin	Std. Err.				
opinion# country						
Str agree#A	.8722717	.1676835	5.20	0.000	.5436181	1.200925
Str agree#B	.2206027	.0739956	2.98	0.003	.0755741	.3656314
Str agree#C	.8860908	.0855355	10.36	0.000	.7184442	1.053737
Str agree#D	.3920647	.0347693	11.28	0.000	.3239182	.4602113
Str agree#E	.4157172	.0210781	19.72	0.000	.3744049	.4570296
Str agree#F	.8212669	.2431515	3.38	0.001	.3446987	1.297835
Str agree#G	.9779035	.0330825	29.56	0.000	.9130629	1.042744
Agree#A	.6922923	.1568031	4.42	0.000	.3849638	.9996208
Agree#B	.0950865	.07074	1.34	0.179	-.0435612	.2337343
Agree#C	.7094636	.1163811	6.10	0.000	.4813608	.9375665
Agree#D	.307147	.0782601	3.92	0.000	.1537601	.460534
Agree#E	.3715877	.0632413	5.88	0.000	.2476371	.4955382
Agree#F	.6391978	.1394519	4.58	0.000	.3658771	.9125185
Agree#G	.890433	.1141899	7.80	0.000	.666625	1.114241
Disag#A	.8748461	.1403006	6.24	0.000	.5998621	1.14983
Disag#B	.222955	.0875026	2.55	0.011	.0514531	.3944569
Disag#C	.8885042	.1006077	8.83	0.000	.6913168	1.085692
Disag#D	.3929169	.0339031	11.59	0.000	.3264681	.4593657
Disag#E	.4161	.0224011	18.58	0.000	.3721947	.4600053
Disag#F	.8242678	.2382172	3.46	0.001	.3573707	1.291165
Disag#G	.9786051	.0349299	28.02	0.000	.9101439	1.047066
Str disag#A	.951193	.1069996	8.89	0.000	.7414776	1.160908
Str disag#B	.3106484	.0851639	3.65	0.000	.1437303	.4775665
Str disag#C	.9582401	.0615373	15.57	0.000	.8376292	1.078851
Str disag#D	.4160411	.0212865	19.54	0.000	.3743203	.457762
Str disag#E	.4251606	.0078968	53.84	0.000	.4096831	.4406381
Str disag#F	.9216348	.1814934	5.08	0.000	.5659143	1.277355
Str disag#G	.9944189	.0104861	94.83	0.000	.9738664	1.014971

After margins, type **marginsplot** to produce the graph below



Source: <http://www.stata.com/stata12/margins-plots/>

The probability of $y_{bin} = 1$ is:

- 87% among those who “strongly agree” in country A
- 22% among those who “strongly agree”, in country B
- 89% among those who “strongly agree”, in country C



Type `help margins` or `help marginsplot` for more details

Marginal effects after logit/probit:

use <http://dss.princeton.edu/training/Panel101.dta>

quietly logit y_bin x1 x2 x3 **i.opinion**

margins, dydx(*) atmeans post

← Categorical variable

```
. margins, dydx(*) atmeans
```

```
Conditional marginal effects      Number of obs   =          70
Model VCE      : OIM
```

```
Expression      : Pr(y_bin), predict()
dy/dx w.r.t.    : x1 x2 x3 2.opinion 3.opinion 4.opinion
at              : x1              = .6480006 (mean)
                  x2              = .1338694 (mean)
                  x3              = .761851  (mean)
                  1.opinion       = .2857143 (mean)
                  2.opinion       = .2142857 (mean)
                  3.opinion       = .2714286 (mean)
                  4.opinion       = .2285714 (mean)
```

Marginal effects show the change in probability when the predictor or independent variable increases by one unit. For continuous variables this represents the instantaneous change given that the 'unit' may be very small. For binary variables, the change is from 0 to 1, so one 'unit' as it is usually thought.

	Delta-method				
	dy/dx	Std. Err.	z	P> z	[95% Conf. Interval]
x1	.1384634	.1093955	1.27	0.206	-.0759478 .3528746
x2	.036904	.0421082	0.88	0.381	-.0456266 .1194346
x3	.04857	.0548416	0.89	0.376	-.0589176 .1560577
opinion					
Agree	-.3656898	.1670551	-2.19	0.029	-.6931118 -.0382678
Disag	.0312784	.0945857	0.33	0.741	-.1541062 .2166629
Str disag	.0574484	.098205	0.58	0.559	-.1350299 .2499268

←

The change in probability for one instant change in x1 is 13 percentage points (pp), in x2 is 3 pp and in x3 is 4 pp. None of the effects here are significant (see column P>|z|, for significance at 95% values should be < 0.05)

Note: dy/dx for factor levels is the discrete change from the base level.



1. The change in probability when opinion goes from 'strongly agree' to 'agree' decreases 36 percentage points or -0.36, and is significant.
2. The change in probability when opinion goes from 'strongly agree' to 'disagree' increases by 3 percentage points or 0.03.
3. The change in probability when opinion goes from 'strongly agree' to 'strongly disagree' increases by 5 percentage points or 0.05.

Type `help margins` for more details

Predicted probabilities after logit/probit: publishing results in a word document using outreg2

use `http://dss.princeton.edu/training/Panel1101.dta`

`quietly logit y_bin x1 x2 x3 i.opinion`
`margins opinion, atmeans post` ← Notice the `post` option

`outreg2 using test.doc, word replace ctitle(Predicted prob.) addnote(NOTE: All predictors at their mean value)`

```
. margins opinion, atmeans vsquish post
```

```
Adjusted predictions          Number of obs   =          70
Model VCE      : OIM

Expression   : Pr(y_bin), predict()
at           : x1             =   .6480006 (mean)
              : x2             =   .1338694 (mean)
              : x3             =   .761851  (mean)
              : 1.opinion      =   .2857143 (mean)
              : 2.opinion      =   .2142857 (mean)
              : 3.opinion      =   .2714286 (mean)
              : 4.opinion      =   .2285714 (mean)
```

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
opinion					
Str agree	.8764826	.0739471	11.85	0.000	.731549 1.021416
Agree	.5107928	.1509988	3.38	0.001	.2148405 .8067451
Disag	.907761	.0673524	13.48	0.000	.7757527 1.039769
Str disag	.933931	.0644709	14.49	0.000	.8075704 1.060292

```
. outreg2 using test.doc, word replace ctitle(Predicted prob.) addnote(NOTE: All
> predictors at their mean value)
```

test.doc ← Windows users click here to open the file `test.doc` in Word.
dir : seeout ← Otherwise follow the Mac instructions.

↑
Mac users click here to go to the directory where `test.doc` is saved, open it with Word

VARIABLES	(1) Predicted prob.
1bn.opinion	0.876*** (0.0739)
2.opinion	0.511*** (0.151)
3.opinion	0.908*** (0.0674)
4.opinion	0.934*** (0.0645)
Observations	70
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	
NOTE: All predictors at their mean value	

Marginal effects after logit/probit: publishing results in a word document using outreg2

use `http://dss.princeton.edu/training/Panel1101.dta`
 quietly logit y_bin x1 x2 x3 i.opinion
 margins, dydx(*) post ← Notice the post option
 outreg2 using test.doc, word replace ctitle(Marginal effects)

```
. margins, dydx(*) post
```

```
Average marginal effects          Number of obs   =          70
Model VCE      : OIM
```

```
Expression      : Pr(y_bin), predict()
dy/dx w.r.t.    : x1 x2 x3 2.opinion 3.opinion 4.opinion
```

	Delta-method					
	dy/dx	Std. Err.	z	P> z	[95% Conf. Interval]	
x1	.1411603	.1137246	1.24	0.215	-.0817359	.3640564
x2	.0376228	.0440405	0.85	0.393	-.048695	.1239406
x3	.049516	.058822	0.84	0.400	-.065773	.1648051
opinion						
Agree	-.3564299	.1565868	-2.28	0.023	-.6633343	-.0495255
Disag	.0338245	.1022902	0.33	0.741	-.1666607	.2343096
Str disag	.0628003	.1062941	0.59	0.555	-.1455323	.2711329

Note: dy/dx for factor levels is the discrete change from the base level.

```
. outreg2 using test.doc, word replace ctitle(Marginal effects)
```

```
test.doc
dir : seeout
```

Windows users click here to open the file test.doc in Word.
 Otherwise follow the Mac instructions.

Mac users click here to go to the directory where test.doc is saved, open it with Word

VARIABLES	(1) Marginal effects
x1	0.141 (0.114)
x2	0.0376 (0.0440)
x3	0.0495 (0.0588)
2.opinion	-0.356** (0.157)
3.opinion	0.0338 (0.102)
4.opinion	0.0628 (0.106)
Observations	70

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Predicted probabilities after ordinal logit/probit

use <http://dss.princeton.edu/training/Panel1101.dta>
`ologit opinion x1 x2 x3`

```
margins, predict(outcome(1)) atmeans post
margins, predict(outcome(2)) atmeans post
margins, predict(outcome(3)) atmeans post
margins, predict(outcome(4)) atmeans post
```

```
. margins, predict(outcome(1)) atmeans
```

```
Adjusted predictions      Number of obs   =       70
Model VCE      : OIM

Expression   : Pr(opinion==1), predict(outcome(1))
at          : x1          =   .6480006 (mean)
           : x2          =   .1338694 (mean)
           : x3          =   .761851 (mean)
```

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_cons	.2800935	.0541271	5.17	0.000	.1740064 .3861805



The probability of opinion = 1 given that the rest of the variables are at their mean values is 28%

In ordinal logit/probit the outcome (dependent) variable has categories in meaningful order. In this example, the variable opinion has four categories: 1 "Strongly agree" 2 "Agree" 3 "Disagree" and 4 "Strongly disagree"

```
. margins, predict(outcome(2)) atmeans
```

```
Adjusted predictions      Number of obs   =       70
Model VCE      : OIM

Expression   : Pr(opinion==2), predict(outcome(2))
at          : x1          =   .6480006 (mean)
           : x2          =   .1338694 (mean)
           : x3          =   .761851 (mean)
```

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_cons	.219505	.0502736	4.37	0.000	.1209706 .3180394

```
. margins, predict(outcome(3)) atmeans

Adjusted predictions      Number of obs   =       70
Model VCE      : OIM

Expression   : Pr(opinion==3), predict(outcome(3))
at          : x1          =   .6480006 (mean)
           : x2          =   .1338694 (mean)
           : x3          =   .761851 (mean)
```

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_cons	.2788256	.0546476	5.10	0.000	.1717183 .3859328

```
. margins, predict(outcome(4)) atmeans

Adjusted predictions      Number of obs   =       70
Model VCE      : OIM

Expression   : Pr(opinion==4), predict(outcome(4))
at          : x1          =   .6480006 (mean)
           : x2          =   .1338694 (mean)
           : x3          =   .761851 (mean)
```

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_cons	.221576	.0501011	4.42	0.000	.1233796 .3197723



The probability of opinion = 4 given that the rest of the variables are at their mean values is 22%

Predicted probabilities after ordinal logit/probit: setting predictors to specific value

use <http://dss.princeton.edu/training/Panel101.dta>
ologit opinion x1 x2 x3

```
margins, predict(outcome(1)) at(x3=5) atmeans post
margins, predict(outcome(2)) at(x3=5) atmeans post
margins, predict(outcome(3)) at(x3=5) atmeans post
margins, predict(outcome(4)) at(x3=5) atmeans post
```

```
. margins, predict(outcome(1)) at(x3=5) atmeans
```

```
Adjusted predictions      Number of obs   =           70
Model VCE      : OIM

Expression   : Pr(opinion==1), predict(outcome(1))
at          : x1      =   .6480006 (mean)
           : x2      =   .1338694 (mean)
           : x3      =           5
```

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_cons	.2092897	.1191718	1.76	0.079	-.0242826 .4428621



The probability of opinion = 1, x3=5 and the rest of the variables are at their mean values is 21%

```
. margins, predict(outcome(3)) at(x3=5) atmeans
```

```
Adjusted predictions      Number of obs   =           70
Model VCE      : OIM

Expression   : Pr(opinion==3), predict(outcome(3))
at          : x1      =   .6480006 (mean)
           : x2      =   .1338694 (mean)
           : x3      =           5
```

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_cons	.3005314	.063336	4.75	0.000	.1763952 .4246676

In ordinal logit/probit the outcome (dependent) variable has categories in meaningful order. In this example, the variable opinion has four categories: 1 "Strongly agree" 2 "Agree" 3 "Disagree" and 4 "Strongly disagree"

```
. margins, predict(outcome(2)) at(x3=5) atmeans
```

```
Adjusted predictions      Number of obs   =           70
Model VCE      : OIM

Expression   : Pr(opinion==2), predict(outcome(2))
at          : x1      =   .6480006 (mean)
           : x2      =   .1338694 (mean)
           : x3      =           5
```

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_cons	.1951933	.0665121	2.93	0.003	.0648321 .3255545

```
. margins, predict(outcome(4)) at(x3=5) atmeans
```

```
Adjusted predictions      Number of obs   =           70
Model VCE      : OIM

Expression   : Pr(opinion==4), predict(outcome(4))
at          : x1      =   .6480006 (mean)
           : x2      =   .1338694 (mean)
           : x3      =           5
```

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_cons	.2949855	.1450564	2.03	0.042	.0106803 .5792908



The probability of opinion = 4, x3=5 and the rest of the variables are at their mean values is 29%

Odds ratio: publishing regression output (outreg2)

In the case of logit models with odds ratios, you need to use the option `eform`, see below

```
use "H:\public_html\Stata\Panel101.dta", clear
logit y_bin x1
outreg2 using mymod.doc, replace ctitle(Logit coeff)
```

```
. outreg2 using mymod.doc, replace ctitle(Logit coeff)
  mymod.doc
  dir : seeout
```

```
logit y_bin x1, or
outreg2 using mymod.doc, append ctitle(Odds ratio) eform
```

```
. outreg2 using mymod.doc, append ctitle(Odds ratio) eform
  mymod.doc
  dir : seeout
```

Windows users click here to open the file `mymod.doc` in Word (you can replace this name for your own). Otherwise follow the Mac instructions.

Mac users click here to go to the directory where `mymod.doc` is saved, open it with Word (you can replace this name for your own)



EQUATION	VARIABLES	(1) Logit coeff	(2) Odds ratio
y_bin	x1	0.493 (0.645)	1.637 (1.055)
	Constant	1.082** (0.482)	2.952** (1.422)
	Observations	70	70

For more details/options type

```
help outreg2
```

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1