```
. //
. //                          Binomial probit
. //
. // womenwk from IMEUS
. summarize work age married children education
```

Variable	Obs	Mean	Std. Dev.	Min	Max
work	2000	.6715	.4697852	0	1
age	2000	36.208	8.28656	20	59
married	2000	.6705	.4701492	0	1
children	2000	1.6445	1.398963	0	5
education	2000	13.084	3.045912	10	20

```
. probit work age  married children education, nolog
Probit regression                                 Number of obs   =       2000
                                                  LR chi2(4)      =     478.32
                                                  Prob > chi2     =     0.0000
Log likelihood = -1027.0616                       Pseudo R2       =     0.1889
```

work	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	.0347211	.0042293	8.21	0.000	.0264318	.0430105
married	.4308575	.074208	5.81	0.000	.2854125	.5763025
children	.4473249	.0287417	15.56	0.000	.3909922	.5036576
education	.0583645	.0109742	5.32	0.000	.0368555	.0798735
_cons	-2.467365	.1925635	-12.81	0.000	-2.844782	-2.089948

```
. //
. //                            Marginal effects (AMEs)
. //
. margins, dydx(_all)
Average marginal effects                          Number of obs   =       2000
Model VCE    : OIM
Expression   : Pr(work), predict()
dy/dx w.r.t. : age married children education
```

	Delta-method					
	dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	.0100768	.0011647	8.65	0.000	.0077941	.0123595
married	.1250441	.0210541	5.94	0.000	.0837788	.1663094
children	.1298233	.0068418	18.98	0.000	.1164137	.1432329
education	.0169386	.0031183	5.43	0.000	.0108269	.0230504

```
. // marginal effects for specific values of explanatory variables
. margins, dydx(_all) over(children)
Average marginal effects                          Number of obs   =       2000
Model VCE    : OIM
```

```
Expression   : Pr(work), predict()
dy/dx w.r.t. : age married children education
over         : children
```

	Delta-method				
	dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age						
children						
0	.0122895	.0013949	8.81	0.000	.0095555	.0150236
1	.0118794	.0013592	8.74	0.000	.0092154	.0145434
2	.0103799	.0011888	8.73	0.000	.0080498	.0127099
3	.0082797	.0010587	7.82	0.000	.0062047	.0103547
4	.0038001	.00063	6.03	0.000	.0025652	.0050349
5	.0009481	.0002622	3.62	0.000	.0004342	.001462
married						
children						
0	.1525019	.0259523	5.88	0.000	.1016363	.2033675
1	.1474125	.0245563	6.00	0.000	.099283	.1955419
2	.1288045	.0223317	5.77	0.000	.0850352	.1725737
3	.1027434	.0178269	5.76	0.000	.0678032	.1376835
4	.0471552	.0087329	5.40	0.000	.0300391	.0642714
5	.0117653	.0029637	3.97	0.000	.0059567	.017574
children						
children						
0	.1583306	.0094474	16.76	0.000	.1398141	.1768471
1	.1530466	.0099778	15.34	0.000	.1334904	.1726028
2	.1337274	.007549	17.71	0.000	.1189316	.1485231
3	.1066703	.0040684	26.22	0.000	.0986964	.1146441
4	.0489575	.0030526	16.04	0.000	.0429744	.0549406
5	.012215	.0024817	4.92	0.000	.007351	.017079
education						
children						
0	.0206581	.0037314	5.54	0.000	.0133447	.0279715
1	.0199687	.0036937	5.41	0.000	.0127291	.0272083
2	.017448	.0032004	5.45	0.000	.0111753	.0237207
3	.0139178	.0026805	5.19	0.000	.008664	.0191715
4	.0063877	.0013844	4.61	0.000	.0036743	.0091011
5	.0015937	.0005207	3.06	0.002	.0005732	.0026143

```
. margins, dydx(_all) over(married children)
Average marginal effects                        Number of obs   =       2000
Model VCE    : OIM
Expression   : Pr(work), predict()
dy/dx w.r.t. : age married children education
over         : married children
```

	Delta-method				
	dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age						
married#						

children						
0 0	.0101772	.0012324	8.26	0.000	.0077618	.0125926
0 1	.0128782	.0014693	8.76	0.000	.0099984	.015758
0 2	.0125766	.0014342	8.77	0.000	.0097657	.0153876
0 3	.0111407	.0013874	8.03	0.000	.0084214	.01386
0 4	.0066499	.0009966	6.67	0.000	.0046965	.0086033
0 5	.0030729	.0006206	4.95	0.000	.0018567	.0042892
1 0	.0129026	.0014692	8.78	0.000	.0100231	.0157822
1 1	.011531	.0013277	8.68	0.000	.0089288	.0141333
1 2	.0080563	.0009752	8.26	0.000	.0061449	.0099678
1 3	.0053679	.0008026	6.69	0.000	.0037948	.006941
1 4	.0026145	.0005241	4.99	0.000	.0015873	.0036418
1 5	.0008761	.0002533	3.46	0.001	.0003797	.0013725
married						
married#						
children						
0 0	.1262901	.0185512	6.81	0.000	.0899304	.1626498
0 1	.1598069	.026885	5.94	0.000	.1071133	.2125004
0 2	.1560647	.0290645	5.37	0.000	.0990992	.2130301
0 3	.1382456	.0264296	5.23	0.000	.0864445	.1900466
0 4	.0825189	.0178597	4.62	0.000	.0475147	.1175232
0 5	.0381323	.0104974	3.63	0.000	.0175577	.0587069
1 0	.1601096	.0282537	5.67	0.000	.1047334	.2154858
1 1	.1430895	.0238027	6.01	0.000	.0964371	.1897419
1 2	.0999715	.0154146	6.49	0.000	.0697594	.1301837
1 3	.066611	.0095902	6.95	0.000	.0478146	.0854075
1 4	.0324439	.0054681	5.93	0.000	.0217267	.0431611
1 5	.0108718	.0027682	3.93	0.000	.0054462	.0162974
children						
married#						
children						
0 0	.1311169	.0061968	21.16	0.000	.1189715	.1432624
0 1	.1659147	.0101364	16.37	0.000	.1460477	.1857817
0 2	.1620295	.0104555	15.50	0.000	.1415371	.1825219
0 3	.1435293	.007698	18.64	0.000	.1284415	.1586172
0 4	.0856728	.0051047	16.78	0.000	.0756678	.0956779
0 5	.0395897	.0054331	7.29	0.000	.028941	.0502385
1 0	.166229	.0109681	15.16	0.000	.1447319	.1877261
1 1	.1485584	.0100644	14.76	0.000	.1288326	.1682843
1 2	.1037925	.0056113	18.50	0.000	.0927945	.1147904
1 3	.0691569	.0035835	19.30	0.000	.0621334	.0761803
1 4	.0336839	.0036321	9.27	0.000	.0265651	.0408028
1 5	.0112873	.0024416	4.62	0.000	.0065019	.0160728
education						
married#						
children						
0 0	.0171074	.0032533	5.26	0.000	.0107311	.0234838
0 1	.0216477	.0039896	5.43	0.000	.0138283	.029467
0 2	.0211407	.0038668	5.47	0.000	.0135619	.0287195
0 3	.0187269	.0035581	5.26	0.000	.0117532	.0257007
0 4	.0111781	.0022001	5.08	0.000	.006866	.0154902
0 5	.0051655	.0013474	3.83	0.000	.0025246	.0078063

```
        1 0 |   .0216887   .0038982     5.56   0.000     .0140483     .029329
        1 1 |   .0193831   .0035977     5.39   0.000     .0123317    .0264345
        1 2 |   .0135423   .0025446     5.32   0.000     .0085549    .0185297
        1 3 |   .0090232   .0018804     4.80   0.000     .0053378    .0127087
        1 4 |   .0043949   .0011037     3.98   0.000     .0022318     .006558
        1 5 |   .0014727   .0004977     2.96   0.003     .0004973    .0024481
------------+----------------------------------------------------------------

. //
. //                          Binomial logit
. //
. logit work age  married children education, nolog
Logistic regression                               Number of obs   =       2000
                                                  LR chi2(4)      =     476.62
                                                  Prob > chi2     =     0.0000
Log likelihood = -1027.9144                       Pseudo R2       =     0.1882

------------------------------------------------------------------------------
        work |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .0579303    .007221     8.02   0.000     .0437773    .0720833
     married |   .7417775   .1264705     5.87   0.000     .4938998    .9896552
    children |   .7644882   .0515289    14.84   0.000     .6634935     .865483
   education |   .0982513   .0186522     5.27   0.000     .0616936     .134809
       _cons |  -4.159247   .3320401   -12.53   0.000    -4.810034   -3.508461
------------------------------------------------------------------------------

. margins, dydx(_all)
Average marginal effects                          Number of obs   =       2000
Model VCE    : OIM
Expression   : Pr(work), predict()
dy/dx w.r.t. : age married children education

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .0099674   .0011682     8.53   0.000     .0076778    .0122569
     married |    .127629    .021152     6.03   0.000     .0861717    .1690862
    children |   .1315365    .007073    18.60   0.000     .1176736    .1453994
   education |   .0169049   .0031243     5.41   0.000     .0107814    .0230285
------------------------------------------------------------------------------

. //
. //                          Ordered logit
. //
. // panel84extract from IMEUS
. // dia: change in Inc/Asset ratio, 1982-1983
. summarize rating83c ia83 dia
    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
   rating83c |        98    3.479592     1.17736          2          5
        ia83 |        98    10.11473    7.441946  -13.08016   30.74564
         dia |        98    .7075242    4.711211  -10.79014   20.05367

. tabulate rating83c
      Bond |
    rating, |
```

1983	Freq.	Percent	Cum.
BA_B_C	26	26.53	26.53
BAA	28	28.57	55.10
AA_A	15	15.31	70.41
AAA	29	29.59	100.00
Total	98	100.00	

```
. ologit  rating83c ia83 dia, nolog
```

Ordered logistic regression — Number of obs = 98; LR chi2(2) = 11.54; Prob > chi2 = 0.0031; Log likelihood = -127.27146; Pseudo R2 = 0.0434

rating83c	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ia83	.0939166	.0296196	3.17	0.002	.0358633	.1519699
dia	-.0866925	.0449789	-1.93	0.054	-.1748496	.0014646
/cut1	-.1853053	.3571432			-.8852932	.5146826
/cut2	1.185726	.3882099			.4248488	1.946604
/cut3	1.908412	.4164896			1.092108	2.724717

```
. predict spBA_B_C spBAA  spAA_A spAAA
(option pr assumed; predicted probabilities)
. summarize spAAA,mean
. list sp* rating83c if spAAA==r(max)
```

	spBA_B_C	spBAA	spAA_A	spAAA	rati~83c
31.	.0388714	.0985567	.1096733	.7528986	AAA

```
. summarize spBA_B_C, mean
. list sp* rating83c if spBA_B_C==r(max)
```

	spBA_B_C	spBAA	spAA_A	spAAA	rati~83c
67.	.7158453	.1926148	.0449056	.0466343	AAA

```
. regress whrs kl6 k618 wa we if whrs>0
```

Source	SS	df	MS		
Model	7326995.15	4	1831748.79		
Residual	94793104.2	145	653745.546		
Total	102120099	149	685369.794		

Number of obs = 150; F(4, 145) = 2.80; Prob > F = 0.0281; R-squared = 0.0717; Adj R-squared = 0.0461; Root MSE = 808.55

whrs	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
kl6	-421.4822	167.9734	-2.51	0.013	-753.4748	-89.48953
k618	-104.4571	54.18616	-1.93	0.056	-211.5538	2.639668

```
          wa |  -4.784917   9.690502    -0.49   0.622     -23.9378    14.36797
          we |   9.353195   31.23793     0.30   0.765    -52.38731     71.0937
       _cons |   1629.817   615.1301     2.65   0.009     414.0371    2845.597
------------------------------------------------------------------------------

. truncreg whrs kl6 k618 wa we, ll(0) nolog
(note: 100 obs. truncated)

Truncated regression
Limit:   lower =          0                      Number of obs =    150
         upper =       +inf                      Wald chi2(4)  =  10.05
Log likelihood = -1200.9157                      Prob > chi2   = 0.0395

------------------------------------------------------------------------------
        whrs |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         kl6 |  -803.0042   321.3614    -2.50   0.012    -1432.861   -173.1474
        k618 |   -172.875   88.72898    -1.95   0.051    -346.7806    1.030578
          wa |  -8.821122   14.36848    -0.61   0.539    -36.98283    19.34059
          we |   16.52873   46.50375     0.36   0.722    -74.61695    107.6744
       _cons |    1586.26    912.355     1.74   0.082    -201.9233    3374.442
-------------+----------------------------------------------------------------
      /sigma |   983.7262   94.44303    10.42   0.000     798.6213    1168.831
------------------------------------------------------------------------------

. //
. //                          Censored regression (tobit)
. //
. // womenwk from IMEUS
. use womenwk,clear

. regress lwf age married children education
      Source |       SS       df       MS              Number of obs =    2000
-------------+------------------------------           F(  4,  1995) =  134.21
       Model |  937.873188     4  234.468297            Prob > F      =  0.0000
    Residual |  3485.34135  1995  1.74703827            R-squared     =  0.2120
-------------+------------------------------           Adj R-squared =  0.2105
       Total |  4423.21454  1999  2.21271363            Root MSE      =  1.3218

------------------------------------------------------------------------------
         lwf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .0363624    .003862     9.42   0.000     .0287885    .0439362
     married |   .3188214   .0690834     4.62   0.000     .1833381    .4543046
    children |   .3305009   .0213143    15.51   0.000     .2887004    .3723015
   education |   .0843345   .0102295     8.24   0.000     .0642729    .1043961
       _cons |  -1.077738   .1703218    -6.33   0.000    -1.411765   -.7437105
------------------------------------------------------------------------------

. tobit lwf age married children education, ll(0)
Tobit regression                                  Number of obs   =       2000
                                                  LR chi2(4)      =     461.85
                                                  Prob > chi2     =     0.0000
Log likelihood = -3349.9685                       Pseudo R2       =     0.0645

------------------------------------------------------------------------------
         lwf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |    .052157   .0057457     9.08   0.000     .0408888    .0634252
     married |   .4841801   .1035188     4.68   0.000     .2811639    .6871964
```

```
    children |   .4860021   .0317054    15.33   0.000     .4238229    .5481812
   education |   .1149492   .0150913     7.62   0.000     .0853529    .1445454
       _cons |  -2.807696   .2632565   -10.67   0.000    -3.323982   -2.291409
-------------+----------------------------------------------------------------
      /sigma |   1.872811    .040014                      1.794337    1.951285
------------------------------------------------------------------------------

  Obs. summary:        657  left-censored observations at lwf<=0
                      1343     uncensored observations
                         0 right-censored observations
```

```
. margins, predict(pr(0,.)) dydx(_all)
Average marginal effects                        Number of obs   =       2000
Model VCE    : OIM
Expression   : Pr(lwf>0), predict(pr(0,.))
dy/dx w.r.t. : age married children education
```

	Delta-method					
	dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	.0071483	.0007873	9.08	0.000	.0056052	.0086914
married	.0663585	.0142009	4.67	0.000	.0385254	.0941917
children	.0666082	.0044677	14.91	0.000	.0578516	.0753649
education	.0157542	.0020695	7.61	0.000	.0116981	.0198103

```
. //
. //                          Regression with selection (heckman)
. //
. // note sign switch on children from tobit
. // twostep: note children now insignif in wage eqn
. heckman  lw education age children, ///
> select(age married children education) nolog
Heckman selection model                         Number of obs      =      2000
(regression model with sample selection)        Censored obs       =       657
                                                Uncensored obs     =      1343
                                                Wald chi2(3)       =    454.78
Log likelihood = -1052.857                      Prob > chi2        =    0.0000
```

lw	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lw						
education	.0397189	.0024525	16.20	0.000	.0349121	.0445256
age	.0075872	.0009748	7.78	0.000	.0056767	.0094977
children	-.0180477	.0064544	-2.80	0.005	-.0306981	-.0053973
_cons	2.305499	.0653024	35.30	0.000	2.177509	2.43349
select						
age	.0350233	.0042344	8.27	0.000	.0267241	.0433225
married	.4547724	.0735876	6.18	0.000	.3105434	.5990014
children	.4538372	.0288398	15.74	0.000	.3973122	.5103621
education	.0565136	.0110025	5.14	0.000	.0349492	.0780781
_cons	-2.478055	.1927823	-12.85	0.000	-2.855901	-2.100208
/athrho	.3377674	.1152251	2.93	0.003	.1119304	.5636045
/lnsigma	-1.375543	.0246873	-55.72	0.000	-1.423929	-1.327156

```
         rho |   .3254828   .1030183                      .1114653    .5106469
       sigma |   .2527024   .0062385                      .2407662    .2652304
      lambda |   .0822503   .0273475                      .0286501    .1358505
-------------+----------------------------------------------------------------
LR test of indep. eqns. (rho = 0):   chi2(1) =     5.53   Prob > chi2 = 0.0187
------------------------------------------------------------------------------

. heckman  lw education age children, ///
> select(age married children education) twostep
Heckman selection model -- two-step estimates   Number of obs      =      2000
(regression model with sample selection)        Censored obs       =       657
                                                Uncensored obs     =      1343
                                                Wald chi2(3)       =    405.68
                                                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
             lw |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
lw              |
   education    |   .0427067    .003106    13.75   0.000     .0366191    .0487944
         age    |    .009322   .0014343     6.50   0.000     .0065108    .0121333
    children    |  -.0019549   .0115202    -0.17   0.865    -.0245341    .0206242
       _cons    |   2.124787   .1249789    17.00   0.000     1.879833    2.369741
----------------+-------------------------------------------------------------
select          |
         age    |   .0347211   .0042293     8.21   0.000     .0264318    .0430105
     married    |   .4308575    .074208     5.81   0.000     .2854125    .5763025
    children    |   .4473249   .0287417    15.56   0.000     .3909922    .5036576
   education    |   .0583645   .0109742     5.32   0.000     .0368555    .0798735
       _cons    |  -2.467365   .1925635   -12.81   0.000    -2.844782   -2.089948
----------------+-------------------------------------------------------------
mills           |
      lambda    |   .1822815   .0638285     2.86   0.004       .05718     .307383
----------------+-------------------------------------------------------------
         rho    |    0.66698
       sigma    |  .27329216
      lambda    |  .18228151   .0638285
------------------------------------------------------------------------------

. //
. //                        Binomial probit with selection (heckprob)
. //
. // hmda from IMEUS
. summarize approve fanfred loanamt vacancy med_income appr_value ///
> black appl_income debt_inc_r, sep(0)
    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
     approve |      2380    .8802521    .3247347         0          1
     fanfred |      2095    .3331742    .4714608         0          1
     loanamt |      2380    139.1353    83.42097         2        980
     vacancy |      2380    .4365546    .4960626         0          1
  med_income |      2380    .8294118    .3762278         0          1
  appr_value |      2380    198.5426    152.9863        25       4316
       black |      2380     .142437    .3495712         0          1
 appl_income |      2380     13.9406    116.9485         0   999.9994
  debt_inc_r |      2380    33.08136    10.72573         0        300
```

```
. heckprob fanfred loanamt vacancy med_income appr_value, ///
>  sel(approve= black appl_income debt_inc_r) nolog
```

Probit model with sample selection — Number of obs = 2380; Censored obs = 285; Uncensored obs = 2095; Wald chi2(4) = 80.69; Log likelihood = -2063.066; Prob > chi2 = 0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
fanfred						
loanamt	-.0026434	.0008029	-3.29	0.001	-.0042169	-.0010698
vacancy	-.2163306	.0609798	-3.55	0.000	-.3358488	-.0968124
med_income	.2671338	.0893349	2.99	0.003	.0920407	.4422269
appr_value	-.0014358	.0005099	-2.82	0.005	-.0024351	-.0004364
_cons	.1684829	.1182054	1.43	0.154	-.0631954	.4001612
approve						
black	-.7343534	.081858	-8.97	0.000	-.8947921	-.5739147
appl_income	-.0006596	.000236	-2.80	0.005	-.0011221	-.0001971
debt_inc_r	-.0262367	.0036441	-7.20	0.000	-.033379	-.0190944
_cons	2.236424	.1319309	16.95	0.000	1.977844	2.495004
/athrho	-.6006626	.271254	-2.21	0.027	-1.132311	-.0690146
rho	-.5375209	.1928809			-.8118086	-.0689052

LR test of indep. eqns. (rho = 0): chi2(1) = 4.99 Prob > chi2 = 0.0255