

1 Estimate models for Y_{1i} , Y_{2i} , and Y_{3i} assuming that the probability functions follow separate normal distribution function. Interpret your estimated result (sign and meaning, overall test, pseudo R^2 , individual test).

```
. use "C:\Users\Jilllin\OneDrive\Desktop\Thammasat\EE426\Data\assign10.dta"

. probit y1 x1 x2 x3
```

```
Iteration 0: log likelihood = -45.533775
Iteration 1: log likelihood = -35.05321
Iteration 2: log likelihood = -34.122847
Iteration 3: log likelihood = -34.092095
Iteration 4: log likelihood = -34.09209
Iteration 5: log likelihood = -34.09209
```

```
Probit regression                               Number of obs   =           67
                                                LR chi2(3)      =           22.88
                                                Prob > chi2     =           0.0000
Log likelihood = -34.09209                    Pseudo R2       =           0.2513
```

	y1	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
	x1	2.574932	.7958181	3.24	0.001	1.015157	4.134707
	x2	-.5031798	.297949	-1.69	0.091	-1.087149	.0807895
	x3	.3449061	.1616015	2.13	0.033	.028173	.6616392
	_cons	-2.186903	.6334447	-3.45	0.001	-3.428432	-.9453743

Note: 1 failure and 0 successes completely determined.

In this model, x1 and x3 seem to be able the explain the probability of a firm choosing choice 1. Overall model is significant according to LR-chi-squared test. Pseudo R2 is a bit low. Only x2 in not significant is this model.

```
. probit y2 x1 x2 x3
```

```
Iteration 0: log likelihood = -22.432361
Iteration 1: log likelihood = -19.734461
Iteration 2: log likelihood = -19.678976
Iteration 3: log likelihood = -19.678766
Iteration 4: log likelihood = -19.678766
```

```
Probit regression                               Number of obs   =           67
                                                LR chi2(3)      =           5.51
                                                Prob > chi2     =           0.1382
Log likelihood = -19.678766                    Pseudo R2       =           0.1228
```

	y2	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
	x1	1.196021	.8449952	1.42	0.157	-.4601389	2.852182
	x2	-.1604507	.1166507	-1.38	0.169	-.3890818	.0681804
	x3	.1023406	.2083685	0.49	0.623	-.3060541	.5107354
	_cons	.5275558	.5565448	0.95	0.343	-.563252	1.618364

In this model, x1 is the best variable explaining probability of a firm choosing choice 2; however, it is still not significant. Overall and individual test are not significant. Pseudo-R2 is low.

```
. probit y3 x1 x2 x3
```

```
Iteration 0: log likelihood = -39.952416
Iteration 1: log likelihood = -35.846932
Iteration 2: log likelihood = -35.496676
Iteration 3: log likelihood = -35.486934
Iteration 4: log likelihood = -35.486933
```

```
Probit regression                               Number of obs   =           67
                                                LR chi2(3)      =           8.93
                                                Prob > chi2     =          0.0302
Log likelihood = -35.486933                    Pseudo R2       =          0.1118
```

y3	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
x1	1.549326	.6925982	2.24	0.025	.1918581	2.906793
x2	-.33157	.2931093	-1.13	0.258	-.9060538	.2429137
x3	.0952456	.1142564	0.83	0.404	-.128693	.3191841
_cons	-1.713771	.5536004	-3.10	0.002	-2.798808	-.6287342

In this model, x1 is the only significant variable. From LR-chi-squared test, overall model is significant. Pseudo-R2 is low.

2 Estimate models for Y_{1i} , Y_{2i} , and Y_{3i} assuming that the probability functions follow multivariate normal probability distribution function (MV Probit models). Determine whether MVProbit is appropriated. Why?

```
. mvprobit (y1 x1 x2 x3) (y2 x1 x2 x3) (y3 x1 x2 x3)
```

```
Iteration 0: log likelihood = -89.257789
Iteration 1: log likelihood = -88.984177
Iteration 2: log likelihood = -88.982664
Iteration 3: log likelihood = -88.982663
```

```
Multivariate probit (MSL, # draws = 5)       Number of obs   =           67
                                                Wald chi2(9)    =          25.03
Log likelihood = -88.982663                    Prob > chi2     =          0.0029
```

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
y1						
x1	2.592376	.8023984	3.23	0.001	1.019704	4.165048
x2	-.5314422	.3036422	-1.75	0.080	-1.12657	.0636857
x3	.3491611	.1619024	2.16	0.031	.0318383	.6664839
_cons	-2.194319	.6357735	-3.45	0.001	-3.440412	-.9482253

```

y2      |
      x1 |  1.221734  .8478931  1.44  0.150  -.4401059  2.883574
      x2 | -.1557306  .1180077 -1.32  0.187  -.3870215  .0755604
      x3 |  .1054215  .2100288  0.50  0.616  -.3062274  .5170704
      _cons | .5119029  .5577948  0.92  0.359  -.5813547  1.605161
-----+-----
y3      |
      x1 |  1.535622  .6913496  2.22  0.026  .1806018  2.890642
      x2 | -.3542075  .2987204 -1.19  0.236  -.9396887  .2312737
      x3 |  .0956571  .1143892  0.84  0.403  -.1285416  .3198557
      _cons | -1.691533  .5520363 -3.06  0.002  -2.773504  -.6095614
-----+-----
      /atrho21 | .1028098  .306035  0.34  0.737  -.4970077  .7026274
-----+-----
      /atrho31 | .1399288  .2264305  0.62  0.537  -.3038669  .5837245
-----+-----
      /atrho32 | .1014794  .268692  0.38  0.706  -.4251472  .628106
-----+-----
      rho21 | .1024491  .3028229  0.34  0.735  -.4597606  .6060328
-----+-----
      rho31 | .1390226  .2220542  0.63  0.531  -.2948474  .5253672
-----+-----
      rho32 | .1011325  .2659439  0.38  0.704  -.4012578  .5567467
-----+-----
Likelihood ratio test of rho21 = rho31 = rho32 = 0:
      chi2(3) = .550251  Prob > chi2 = 0.9077

```

From the test if rho=0, We cannot reject H0. Hence, MVprobit is not significant in this case.