1 Estimate models for Y1i, Y2i, and Y3i 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\acer\Downloads\assign10 (1).dta", clear

. probit y1 x1 x2 x3, nolog

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.
```

- x1 and x3 can explain the probability of a firm choosing choice 1.
- Overall model is significant (`Prob > chi2 = 0.0000`)
- Pseudo R2 is a quite low

```
.  probit y2 x1 x2 x3, nolog
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
```

- All of x are insignificance, however x1 might be the best variable explaining probability of a firm choosing choice 2
- Overall test are not significant. (`Prob > chi2 = 0.1382`)
- Pseudo-R2 is very low.

```
.  probit y3 x1 x2 x3, nolog

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
------------------------------------------------------------------------------
```

- x1 is the only significant variable.
- overall model is significant
- Pseudo-R2 is very low.

2 Estimate models for Y1i, Y2i, and Y3i 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), nolog

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    .5170703
       _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
```

Since p-value is greater than 0.05, we cannot reject H0. It means that there is no correlation between the disturbance terms. Three separate Probit models can be applied.