OLR

610811101 陳學蒲

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我採用的是第一個總經變數。

如果要用其他資料，在程式碼中出現 "S.P.500.return"的部分，都要更改為你的資料對應的總經變數名稱。

這個程式，我就不做太多的說明，請各位自行發揮。

程式碼的部分，請到homework1.Rmd中查看。

如果有疑問，可以找我詢問。

```
## [1] "LTR.rating.categories的分布狀況"
```

```
##    d    c   cc  ccc    b   bb  bbb    a   aa  aaa NA's
##   64    0   21  255 2886 3499 3705 1736  285   82  247
```

```
## [1] "去除了缺失值後，LTR.rating.categories的分布狀況"
```

```
##    d    c   cc  ccc    b   bb  bbb    a   aa  aaa
##   58    0   19  244 2682 3328 3478 1707  272   80
```

```
## [1] "25,50,75分位數"
```

```
##   25%   50%   75%
##   "b"  "bb" "bbb"
```

摘要統計量

這邊可以有很多做法，不一定要用我的。

mean

```
##                       d到b         b到bb       bb到bbb      bbb到aaa
## IC             4.19220638   6.83165241   9.34217801  12.63914493
## OM             0.11157450   0.16771551   0.20405446   0.22245122
## TDL            0.49422423   0.42698122   0.33988205   0.28608333
## DP             0.14985015   0.29251248   0.59374082   0.83926314
## MBA            1.42344511   1.47659207   1.52526957   1.74836659
## RDA            0.01000704   0.01020533   0.01077592   0.01565969
## REA           -0.25218005  -0.06012586   0.13818315   0.26814594
## CEA            0.07913118   0.07054828   0.06139270   0.05729554
## CBA            0.10007007   0.09040258   0.07319724   0.07053299
## TA             0.39127944   0.36348297   0.36871748   0.38150704
## beta           1.27751134   1.20561904   1.02308781   0.86176545
## sigma          0.03730244   0.02876619   0.02038019   0.01629671
## size          37.40784968  50.58170103  68.60490410  80.70028438
## S.P.500.return 5.70205411   6.34220445   6.18970558   6.22378979
```

Median

```
##                        d到b        b到bb      bb到bbb     bbb到aaa
## IC                2.24964899   3.28305412   5.03886272   7.07809644
## OM                0.12335489   0.14636498   0.17334108   0.19963272
## TDL               0.47092404   0.39963056   0.32201451   0.28130882
## DP                0.00000000   0.00000000   1.00000000   1.00000000
## MBA               1.20955286   1.26959376   1.31117206   1.42723435
## RDA               0.00000000   0.00000000   0.00000000   0.00000000
## REA              -0.10071411   0.01651629   0.14381837   0.23749063
## CEA               0.04239316   0.04012143   0.04204559   0.04606643
## CBA               0.05845826   0.05234032   0.03962947   0.03720882
## TA                0.36088579   0.31530995   0.31881523   0.32623927
## beta              1.25187191   1.17029772   0.98519127   0.84340136
## sigma             0.03263559   0.02493354   0.01807306   0.01466675
## size             35.87426326  52.01889682  72.10583445  84.71945881
## S.P.500.return   11.39044000  11.39044000  11.39044000  11.39044000
```

model

這邊使用了一個package "oglmx"，他可以固定係數或是是否保留截距項。
但是保留的參數，在model的summary看不到，要去看allparams才有。

沒有截距項的ordered logistic regression

summary

```
## Ordered Logit Regression
## Log-Likelihood: -11479.24
## No. Iterations: 8
## McFadden's R2: 0.383002
## AIC: 23002.49
##                    Estimate  Std. error  t value  Pr(>|t|)
## (Intercept)       8.6792399   0.2230738  38.9075 < 2.2e-16 ***
## IC                0.0059070   0.0014052   4.2038 2.625e-05 ***
## OM                1.1089542   0.1241165   8.9348 < 2.2e-16 ***
## TDL              -2.9439570   0.1384192 -21.2684 < 2.2e-16 ***
## DP                1.4540394   0.0483550  30.0701 < 2.2e-16 ***
## MBA               0.2899475   0.0275575  10.5215 < 2.2e-16 ***
## RDA               7.7931329   0.8030806   9.7040 < 2.2e-16 ***
## REA               1.3483509   0.0637477  21.1514 < 2.2e-16 ***
## CEA              -3.1189766   0.3877895  -8.0430 8.769e-16 ***
## CBA              -3.3387516   0.2414445 -13.8282 < 2.2e-16 ***
## TA                0.3835807   0.1071818   3.5788 0.0003452 ***
## beta             -1.1680499   0.0403173 -28.9714 < 2.2e-16 ***
## sigma           -35.9171875   1.9707682 -18.2250 < 2.2e-16 ***
## size              0.0529544   0.0011729  45.1500 < 2.2e-16 ***
## S.P.500.return   -0.0041121   0.0011118  -3.6986 0.0002168 ***
## ----- Threshold Parameters -----
##                     Estimate Std. error t value  Pr(>|t|)
## Threshold (cc->ccc)  0.375227   0.084519  4.4395 9.015e-06 ***
## Threshold (ccc->b)   2.557314   0.154675 16.5334 < 2.2e-16 ***
## Threshold (b->bb)    7.839882   0.178049 44.0322 < 2.2e-16 ***
## Threshold (bb->bbb) 10.931235   0.190201 57.4720 < 2.2e-16 ***
## Threshold (bbb->a)  13.752128   0.200695 68.5225 < 2.2e-16 ***
## Threshold (a->aa)   16.407249   0.213004 77.0278 < 2.2e-16 ***
## Threshold (aa->aaa) 18.135984   0.237270 76.4361 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

allparams

```
## $beta
##  [1]   8.679239921   0.005907008   1.108954205  -2.943957013   1.454039440
##  [6]   0.289947548   7.793132887   1.348350884  -3.118976558  -3.338751558
## [11]   0.383580730  -1.168049881 -35.917187520   0.052954412  -0.004112066
##
## $delta
## [1] 0
##
## $threshparam
## [1]  0.0000000  0.3752275  2.5573136  7.8398817 10.9312347 13.7521277 16.4072492
## [8] 18.1359844
```

有截距項的ordered logistic regression

summary

```
## Ordered Logit Regression
## Log-Likelihood: -11479.24
## No. Iterations: 8
## McFadden's R2: 0.383002
## AIC: 23002.49
##                  Estimate  Std. error  t value  Pr(>|t|)
## IC              0.0059070   0.0014052   4.2038 2.625e-05 ***
## OM              1.1089542   0.1241165   8.9348 < 2.2e-16 ***
## TDL            -2.9439570   0.1384192 -21.2684 < 2.2e-16 ***
## DP              1.4540394   0.0483550  30.0701 < 2.2e-16 ***
## MBA             0.2899475   0.0275575  10.5215 < 2.2e-16 ***
## RDA             7.7931329   0.8030806   9.7040 < 2.2e-16 ***
## REA             1.3483509   0.0637477  21.1514 < 2.2e-16 ***
## CEA            -3.1189766   0.3877895  -8.0430 8.769e-16 ***
## CBA            -3.3387516   0.2414445 -13.8282 < 2.2e-16 ***
## TA              0.3835807   0.1071818   3.5788 0.0003452 ***
## beta           -1.1680499   0.0403173 -28.9714 < 2.2e-16 ***
## sigma         -35.9171876   1.9707682 -18.2250 < 2.2e-16 ***
## size            0.0529544   0.0011729  45.1500 < 2.2e-16 ***
## S.P.500.return -0.0041121   0.0011118  -3.6986 0.0002168 ***
## ----- Threshold Parameters -----
##                    Estimate Std. error  t value  Pr(>|t|)
## Threshold (d->cc)  -8.67924    0.22307 -38.9075 < 2.2e-16 ***
## Threshold (cc->ccc) -8.30401   0.21036 -39.4755 < 2.2e-16 ***
## Threshold (ccc->b) -6.12193    0.16361 -37.4172 < 2.2e-16 ***
## Threshold (b->bb)  -0.83936    0.12172  -6.8957 5.361e-12 ***
## Threshold (bb->bbb) 2.25199    0.12328  18.2680 < 2.2e-16 ***
## Threshold (bbb->a)  5.07289    0.13197  38.4408 < 2.2e-16 ***
## Threshold (a->aa)   7.72801    0.14796  52.2292 < 2.2e-16 ***
## Threshold (aa->aaa) 9.45674    0.18065  52.3488 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

allparams

```
## $beta
##  [1]   0.005907008   1.108954207  -2.943957015   1.454039440   0.289947548
##  [6]   7.793132888   1.348350885  -3.118976560  -3.338751559   0.383580731
## [11]  -1.168049882 -35.917187569   0.052954412  -0.004112066
##
## $delta
## [1] 0
##
## $threshparam
## [1] -8.6792399 -8.3040125 -6.1219263 -0.8393582  2.2519948  5.0728877  7.7280093
## [8]  9.4567444
```

首項係數為1的ordered logistic regression

summary

```
## Ordered Logit Regression
## Log-Likelihood: -49359.66
## No. Iterations: 9
## McFadden's R2: -1.653033
## AIC: 98761.32
##                  Estimate   Std. error   t value  Pr(>|t|)
## OM             -4.0284403    0.1701544  -23.6752   <2e-16 ***
## TDL             6.9713479    0.1866057   37.3587   <2e-16 ***
## DP              2.7738571    0.0720542   38.4968   <2e-16 ***
## MBA            -1.9043526    0.0453507  -41.9917   <2e-16 ***
## RDA            14.2443405    1.3392552   10.6360   <2e-16 ***
## REA            -0.2076697    0.0887622   -2.3396   0.0193 *
## CEA            -9.8859422    0.5126439  -19.2842   <2e-16 ***
## CBA           -10.0872702    0.3797795  -26.5609   <2e-16 ***
## TA              4.5458998    0.1483917   30.6345   <2e-16 ***
## beta           -2.0687578    0.0577070  -35.8493   <2e-16 ***
## sigma         -48.2087902    2.7230448  -17.7040   <2e-16 ***
## size            0.1010102    0.0017641   57.2578   <2e-16 ***
## S.P.500.return  0.0011808    0.0015837    0.7456   0.4559
## ----- Threshold Parameters -----
##                      Estimate Std. error t value  Pr(>|t|)
## Threshold (d->cc)    -4.77922    0.25609 -18.662 < 2.2e-16 ***
## Threshold (cc->ccc)  -4.44057    0.24568 -18.074 < 2.2e-16 ***
## Threshold (ccc->b)   -2.46161    0.21096 -11.669 < 2.2e-16 ***
## Threshold (b->bb)     5.49250    0.16983  32.342 < 2.2e-16 ***
## Threshold (bb->bbb)  11.32177    0.18238  62.079 < 2.2e-16 ***
## Threshold (bbb->a)   16.82221    0.20210  83.237 < 2.2e-16 ***
## Threshold (a->aa)    32.58239    0.33800  96.397 < 2.2e-16 ***
## Threshold (aa->aaa)  41.47893    0.64876  63.936 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

allparams

```
## $beta
##  [1]   1.000000000  -4.028440326   6.971347948   2.773857118  -1.904352623
##  [6]  14.244340526  -0.207669665  -9.885942156 -10.087270237   4.545899771
## [11]  -2.068757824 -48.208790205   0.101010191   0.001180803
##
## $delta
## [1] 0
##
## $threshparam
## [1] -4.779224 -4.440572 -2.461608  5.492501 11.321771 16.822212 32.582389
## [8] 41.478933
```