Ordinal Logistic Regression or Proportional Odds Logistic Regression

Model with NP1 as reference

```
## Call:
## polr(formula = SR ~ FA + H + NP + AGR + TA + RS + DWH + DS, data = lm_DF,
##      Hess = TRUE)
##
## Coefficients:
##            Value Std. Error  t value
## FA     0.286916   0.064831  4.42558
## H      0.487459   0.158627  3.07298
## NP2   -1.163624   0.228147 -5.10033
## NP3   -1.770834   0.254298 -6.96360
## AGR   -0.002689   0.058408 -0.04604
## TA    -0.012061   0.009904 -1.21774
## RS2   -0.324616   0.193921 -1.67396
## DWH2  -0.433941   0.315658 -1.37472
## DS2   -0.386706   0.221411 -1.74655
##
## Intercepts:
##      Value   Std. Error t value
## 1|2 -1.5189  0.9149     -1.6601
## 2|3 -0.2729  0.9134     -0.2988
## 3|4  0.7729  0.9117      0.8477
## 4|5  1.8005  0.9145      1.9688
## 5|6  2.6629  0.9267      2.8735
## 6|7  4.2028  0.9801      4.2881
##
## Residual Deviance: 1194.565
## AIC: 1224.565


##               Value  Std. Error     t value p value
## FA      0.286916471 0.064831410  4.42557817  0.0000
## H       0.487459278 0.158627427  3.07298231  0.0021
## NP2    -1.163624382 0.228146952 -5.10032842  0.0000
## NP3    -1.770833505 0.254298467 -6.96360275  0.0000
## AGR    -0.002689169 0.058407532 -0.04604147  0.9633
## TA     -0.012061002 0.009904397 -1.21774220  0.2233
## RS2    -0.324615731 0.193920670 -1.67396148  0.0941
## DWH2   -0.433941014 0.315657959 -1.37471906  0.1692
## DS2    -0.386705751 0.221411360 -1.74654883  0.0807
## 1|2    -1.518915800 0.914940633 -1.66012498  0.0969
## 2|3    -0.272934635 0.913363289 -0.29882374  0.7651
## 3|4     0.772870869 0.911676968  0.84774640  0.3966
## 4|5     1.800474645 0.914517884  1.96876920  0.0490
## 5|6     2.662907487 0.926700090  2.87353753  0.0041
## 6|7     4.202800008 0.980099010  4.28813821  0.0000
```

Model with NP3 as reference

```
## Call:
## polr(formula = SR ~ FA + H + NP + AGR + TA + RS + DWH + DS, data = lm_DF,
##      Hess = TRUE)
##
## Coefficients:
##           Value Std. Error  t value
## FA     0.286917   0.064831  4.42558
## H      0.487459   0.158627  3.07298
## NP1    1.770828   0.254298  6.96358
## NP2    0.607204   0.239285  2.53758
## AGR   -0.002689   0.058408 -0.04603
## TA    -0.012061   0.009904 -1.21772
## RS2   -0.324610   0.193921 -1.67393
## DWH2  -0.433933   0.315658 -1.37469
## DS2   -0.386710   0.221411 -1.74657
##
## Intercepts:
##      Value  Std. Error t value
## 1|2  0.2519  0.9128     0.2760
## 2|3  1.4979  0.9169     1.6337
## 3|4  2.5437  0.9209     2.7621
## 4|5  3.5713  0.9281     3.8479
## 5|6  4.4338  0.9428     4.7030
## 6|7  5.9736  0.9986     5.9817
##
## Residual Deviance: 1194.565
## AIC: 1224.565


##              Value  Std. Error     t value p value
## FA      0.28691652 0.064831390  4.42558022  0.0000
## H       0.48745942 0.158627336  3.07298497  0.0021
## NP1     1.77082828 0.254298384  6.96358448  0.0000
## NP2     0.60720439 0.239285141  2.53757666  0.0112
## AGR    -0.00268854 0.058407510 -0.04603073  0.9633
## TA     -0.01206075 0.009904394 -1.21771694  0.2233
## RS2    -0.32461038 0.193920585 -1.67393461  0.0941
## DWH2   -0.43393316 0.315657782 -1.37469495  0.1692
## DS2    -0.38671013 0.221411321 -1.74656893  0.0807
## 1|2     0.25193177 0.912770989  0.27600765  0.7825
## 2|3     1.49791335 0.916856784  1.63374845  0.1023
## 3|4     2.54371762 0.920948457  2.76206295  0.0057
## 4|5     3.57132117 0.928119859  3.84790945  0.0001
## 5|6     4.43375114 0.942750171  4.70299690  0.0000
## 6|7     5.97363767 0.998648496  5.98172200  0.0000
```

Model with all variables NP1, DWH2 and DS1 as reference

```
## Call:
## polr(formula = SR ~ FA + H + NP + AGR + TA + RS + DWH + DS, data = lm_DF,
##     Hess = TRUE)
##
## Coefficients:
##          Value Std. Error  t value
## FA    0.286917   0.064831  4.42558
## H     0.487460   0.158627  3.07299
## NP3  -1.770836   0.254298 -6.96361
## NP2  -1.163626   0.228147 -5.10033
## AGR  -0.002688   0.058408 -0.04603
## TA   -0.012061   0.009904 -1.21773
## RS2  -0.324615   0.193921 -1.67396
## DWH1  0.433935   0.315658  1.37470
## DS2  -0.386710   0.221411 -1.74657
##
## Intercepts:
##     Value   Std. Error t value
## 1|2 -1.0850  0.8981    -1.2081
## 2|3  0.1610  0.8973     0.1794
## 3|4  1.2068  0.8977     1.3443
## 4|5  2.2344  0.9028     2.4749
## 5|6  3.0969  0.9151     3.3841
## 6|7  4.6367  0.9722     4.7695
##
## Residual Deviance: 1194.565
## AIC: 1224.565


##               Value  Std. Error     t value p value
## FA     0.286916886 0.064831417  4.42558408  0.0000
## H      0.487459646 0.158627383  3.07298549  0.0021
## NP3   -1.770835884 0.254298498 -6.96361126  0.0000
## NP2   -1.163625851 0.228146969 -5.10033447  0.0000
## AGR   -0.002688487 0.058407522 -0.04602981  0.9633
## TA    -0.012060899 0.009904396 -1.21773183  0.2233
## RS2   -0.324615356 0.193920645 -1.67395976  0.0941
## DWH1   0.433934999 0.315657944  1.37470008  0.1692
## DS2   -0.386710429 0.221411370 -1.74656987  0.0807
## 1|2   -1.084971735 0.898081745 -1.20809909  0.2270
## 2|3    0.161006776 0.897291520  0.17943642  0.8576
## 3|4    1.206813838 0.897703103  1.34433515  0.1788
## 4|5    2.234417992 0.902817318  2.47493922  0.0133
## 5|6    3.096851168 0.915106407  3.38414325  0.0007
## 6|7    4.636744122 0.972174137  4.76945842  0.0000
```

Model with all variables, NP3, DWH1 and DS1 as reference

```
## Call:
## polr(formula = SR ~ FA + H + NP + AGR + TA + RS + DWH + DS, data = lm_DF,
##     Hess = TRUE)
##
## Coefficients:
##           Value Std. Error  t value
## FA     0.286917   0.064831  4.42558
## H      0.487459   0.158627  3.07298
## NP1    1.770828   0.254298  6.96358
## NP2    0.607204   0.239285  2.53758
## AGR   -0.002689   0.058408 -0.04603
## TA    -0.012061   0.009904 -1.21772
## RS2   -0.324610   0.193921 -1.67393
## DWH2  -0.433933   0.315658 -1.37469
## DS2   -0.386710   0.221411 -1.74657
##
## Intercepts:
##      Value  Std. Error t value
## 1|2  0.2519 0.9128     0.2760
## 2|3  1.4979 0.9169     1.6337
## 3|4  2.5437 0.9209     2.7621
## 4|5  3.5713 0.9281     3.8479
## 5|6  4.4338 0.9428     4.7030
## 6|7  5.9736 0.9986     5.9817
##
## Residual Deviance: 1194.565
## AIC: 1224.565


##                Value  Std. Error     t value p value
## FA      0.28691652 0.064831390  4.42558022  0.0000
## H       0.48745942 0.158627336  3.07298497  0.0021
## NP1     1.77082828 0.254298384  6.96358448  0.0000
## NP2     0.60720439 0.239285141  2.53757666  0.0112
## AGR    -0.00268854 0.058407510 -0.04603073  0.9633
## TA     -0.01206075 0.009904394 -1.21771694  0.2233
## RS2    -0.32461038 0.193920585 -1.67393461  0.0941
## DWH2   -0.43393316 0.315657782 -1.37469495  0.1692
## DS2    -0.38671013 0.221411321 -1.74656893  0.0807
## 1|2     0.25193177 0.912770989  0.27600765  0.7825
## 2|3     1.49791335 0.916856784  1.63374845  0.1023
## 3|4     2.54371762 0.920948457  2.76206295  0.0057
## 4|5     3.57132117 0.928119859  3.84790945  0.0001
## 5|6     4.43375114 0.942750171  4.70299690  0.0000
## 6|7     5.97363767 0.998648496  5.98172200  0.0000
```

Model with all variables, NP3, DWH1 and DS1 as reference(New Model)

```
## Call:
## polr(formula = SR ~ Rank + NASA + TA + EM + H + NP + FA + DWH +
##     DS + T, data = lm_DF, Hess = TRUE)
##
## Coefficients:
##            Value Std. Error    t value
## Rank1 -3.572e-01    0.29226  -1.222147
## Rank2  2.041e-01    0.29987   0.680739
## NASA  -2.691e-05    0.01775  -0.001516
## TA    -1.738e-02    0.01448  -1.200957
## EM     2.065e-02    0.02398   0.861393
## H      3.969e-01    0.18866   2.103838
## NP1    1.727e+00    0.26294   6.567412
## NP2    5.546e-01    0.24225   2.289312
## FA     2.751e-01    0.06532   4.211958
## DWH2  -3.965e-01    0.31688  -1.251351
## DS2   -3.621e-01    0.23254  -1.556940
## T2     2.211e-01    0.19922   1.110012
##
## Intercepts:
##     Value    Std. Error t value
## 1|2  0.4415  0.8285      0.5329
## 2|3  1.7033  0.8338      2.0428
## 3|4  2.7591  0.8390      3.2885
## 4|5  3.7883  0.8474      4.4705
## 5|6  4.6447  0.8628      5.3830
## 6|7  6.1889  0.9252      6.6891
##
## Residual Deviance: 1190.456
## AIC: 1226.456


##                 Value Std. Error       t value p value
## Rank1 -3.571813e-01 0.29225733 -1.222146651  0.2217
## Rank2  2.041308e-01 0.29986642  0.680739035  0.4960
## NASA  -2.690827e-05 0.01775486 -0.001515544  0.9988
## TA    -1.738425e-02 0.01447534 -1.200956627  0.2298
## EM     2.065341e-02 0.02397675  0.861393086  0.3890
## H      3.969149e-01 0.18866232  2.103837646  0.0354
## NP1    1.726825e+00 0.26293836  6.567412246  0.0000
## NP2    5.545859e-01 0.24225007  2.289311693  0.0221
## FA     2.751308e-01 0.06532134  4.211958373  0.0000
## DWH2  -3.965239e-01 0.31687656 -1.251351182  0.2108
## DS2   -3.620524e-01 0.23254101 -1.556940127  0.1195
## T2     2.211366e-01 0.19921998  1.110012286  0.2670
## 1|2    4.415005e-01 0.82847360  0.532908318  0.5941
## 2|3    1.703339e+00 0.83384182  2.042760831  0.0411
## 3|4    2.759115e+00 0.83901386  3.288521914  0.0010
## 4|5    3.788276e+00 0.84739505  4.470495771  0.0000
## 5|6    4.644716e+00 0.86284836  5.383003518  0.0000
## 6|7    6.188873e+00 0.92521852  6.689093595  0.0000
```

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