

# Arthritis - Cumulative Logit Model

February 5, 2020

A simple data frame for the arthritis data is created with the numbers given for the individual cells.

```
> arthritis <- data.frame(drug=c(rep("new agent", 24+37+21+19+6),
+ rep("active control", 11+51+22+21+7)),
+ assessment=c(rep(1,24), rep(2,37), rep(3,21), rep(4,19), rep(5,6), rep(1,11),
+ rep(2,51), rep(3,22), rep(4,21), rep(5,7)))
> library(VGAM)
```

Now a cumulative model is fitted.

```
> cumart <- vglm(assessment ~ drug, family=cumulative(parallel=TRUE, link="logit"),
+               data=arthritis)
> summary(cumart)
```

Call:

```
vglm(formula = assessment ~ drug, family = cumulative(parallel = TRUE,
link = "logit"), data = arthritis)
```

Pearson residuals:

	Min	1Q	Median	3Q	Max
logitlink(P[Y<=1])	-0.664	-0.609	-0.286	-0.199	2.421
logitlink(P[Y<=2])	-1.744	-0.627	0.339	0.908	1.031
logitlink(P[Y<=3])	-2.078	0.200	0.316	0.354	1.146
logitlink(P[Y<=4])	-4.246	0.140	0.156	0.224	0.614

Coefficients:

	Estimate	Std. Error	z value	Pr(> z )
(Intercept):1	-1.802	0.224	-8.03	1.0e-15 ***
(Intercept):2	0.115	0.180	0.64	0.52
(Intercept):3	1.008	0.195	5.18	2.2e-07 ***
(Intercept):4	2.631	0.306	8.59	< 2e-16 ***
drugnew agent	0.291	0.245	1.19	0.23

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Names of linear predictors: logitlink(P[Y<=1]), logitlink(P[Y<=2]),  
logitlink(P[Y<=3]), logitlink(P[Y<=4])

Residual deviance: 637 on 871 degrees of freedom

Log-likelihood: -318 on 871 degrees of freedom

Number of Fisher scoring iterations: 4

Warning: Hauck-Donner effect detected in the following estimate(s):  
'(Intercept):4'

Exponentiated coefficients:

drugnew agent  
1.34