

EMA Data: Zero Inflated Models with Random Effects

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Negative Binomial Zero Inflated Model

```
library(glmmTMB)
```

```
## Warning in checkMatrixPackageVersion(): Package version inconsistency detected.
```

```
## TMB was built with Matrix version 1.3.2
```

```
## Current Matrix version is 1.2.18
```

```
## Please re-install 'TMB' from source using install.packages('TMB', type = 'source') or ask CRAN for a
```

```
df <- read.csv("~/Data/Muri/SHINE_EMA_Round1_19May2020.csv")
```

```
y <- df$Num_Beer + df$Num_Liquor + df$Num_Wine
```

Regress Num_Alcohol on Condition

```
m <- glmmTMB(y~Condition, data=df, family=nbinom2)
summary(m)
```

```
## Family: nbinom2 ( log )
```

```
## Formula: y ~ Condition
```

```
## Data: df
```

```
##
```

```
##      AIC      BIC   logLik deviance df.resid
```

```
##  3721.4   3740.2  -1856.7   3713.4      815
```

```
##
```

```
##
```

```
## Overdispersion parameter for nbinom2 family (): 2.55
```

```
##
```

```
## Conditional model:
```

```
##              Estimate Std. Error z value Pr(>|z|)
```

```
## (Intercept)      1.33066    0.04471  29.760 < 2e-16 ***
```

```
## Conditionmindful  -0.24853    0.06896  -3.604 0.000313 ***
```

```
## Conditionperspective -0.07663    0.07067  -1.084 0.278184
```

```
## ---
```

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

Compare with lm

```
m <- lm(y~Condition, data=df)
summary(m)
```

```
##
```

```
## Call:
```

```
## lm(formula = y ~ Condition, data = df)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.784 -1.951 -0.951  1.216 56.216
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      3.7835     0.2019  18.743 < 2e-16 ***
## Conditionmindful -0.8326     0.3020  -2.757  0.00596 **
## Conditionperspective -0.2791     0.3161  -0.883  0.37743
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.656 on 816 degrees of freedom
## (11498 observations deleted due to missingness)
## Multiple R-squared:  0.009358, Adjusted R-squared:  0.00693
## F-statistic: 3.854 on 2 and 816 DF, p-value: 0.02158
```

Add Zero Inflation

```
m <- glmmTMB(y~Condition, zi=~Condition, data=df, family=nbinom2)
summary(m)
```

```
## Family: nbinom2 ( log )
## Formula:      y ~ Condition
## Zero inflation: ~Condition
## Data: df
##
##      AIC      BIC  logLik deviance df.resid
##  3727.4   3760.3 -1856.7   3713.4      812
##
##
## Overdispersion parameter for nbinom2 family (): 2.55
##
## Conditional model:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      1.33066     0.04471  29.760 < 2e-16 ***
## Conditionmindful -0.24853     0.06896  -3.604 0.000313 ***
## Conditionperspective -0.07663     0.07067  -1.084 0.278185
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Zero-inflation model:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)     -21.8425   3104.2299  -0.007    0.994
## Conditionmindful  -0.3659   5431.0594   0.000    1.000
## Conditionperspective -0.4739   5684.4211   0.000    1.000
```

Add Random Effects

```
m <- glmmTMB(y~Condition + (1|GROUP.ID), zi=~Condition, data=df, family=nbinom2)
summary(m)
```

```
## Family: nbinom2 ( log )
## Formula:      y ~ Condition + (1 | GROUP.ID)
## Zero inflation: ~Condition
## Data: df
##
##      AIC      BIC   logLik deviance df.resid
##  3695.9   3733.5 -1839.9   3679.9      811
##
## Random effects:
##
## Conditional model:
##   Groups   Name      Variance Std.Dev.
##  GROUP.ID (Intercept) 0.1034   0.3215
## Number of obs: 819, groups:  GROUP.ID, 52
##
## Overdispersion parameter for nbinom2 family (): 2.97
##
## Conditional model:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      1.26770    0.07541  16.811 < 2e-16 ***
## Conditionmindful    -0.34798    0.08270  -4.208 2.58e-05 ***
## Conditionperspective -0.21182    0.08270  -2.561  0.0104 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Zero-inflation model:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)     -21.280   2355.854  -0.009   0.993
## Conditionmindful    -1.264   5791.558   0.000   1.000
## Conditionperspective -1.538   6500.519   0.000   1.000
```

Remove Zero Inflation

```
m <- glmmTMB(y~Condition + (1|GROUP.ID), data=df, family=nbinom2)
summary(m)
```

```
## Family: nbinom2 ( log )
## Formula:      y ~ Condition + (1 | GROUP.ID)
## Data: df
##
##      AIC      BIC   logLik deviance df.resid
##  3689.9   3713.4 -1839.9   3679.9      814
##
## Random effects:
##
## Conditional model:
##   Groups   Name      Variance Std.Dev.
##  GROUP.ID (Intercept) 0.1034   0.3215
## Number of obs: 819, groups:  GROUP.ID, 52
##
## Overdispersion parameter for nbinom2 family (): 2.97
##
## Conditional model:
##              Estimate Std. Error z value Pr(>|z|)
```

```
## (Intercept)          1.26769    0.07541   16.810 < 2e-16 ***
## Conditionmindful     -0.34797    0.08270   -4.207 2.58e-05 ***
## Conditionperspective -0.21183    0.08270   -2.561  0.0104 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Regress Num_Alcohol on Condition and Craving

```
m <- glmmTMB(y~Condition + Craving_Alc, data=df, family=nbinom2)
summary(m)
```

```
## Family: nbinom2 ( log )
## Formula:          y ~ Condition + Craving_Alc
## Data: df
##
##      AIC      BIC   logLik deviance df.resid
##  3544.3   3567.6  -1767.2   3534.3      774
##
##
## Overdispersion parameter for nbinom2 family (): 2.54
##
## Conditional model:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      1.385305   0.049321  28.088 < 2e-16 ***
## Conditionmindful  -0.277951   0.070117  -3.964 7.37e-05 ***
## Conditionperspective -0.065376   0.074534  -0.877  0.3804
## Craving_Alc       -0.002818   0.001297  -2.172  0.0298 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Add Zero Inflation

```
m <- glmmTMB(y~Condition + Craving_Alc, zi=~Condition + Craving_Alc, data=df, family=nbinom2)
summary(m)
```

```
## Family: nbinom2 ( log )
## Formula:          y ~ Condition + Craving_Alc
## Zero inflation:    ~Condition + Craving_Alc
## Data: df
##
##      AIC      BIC   logLik deviance df.resid
##  3552.3   3594.2  -1767.2   3534.3      770
##
##
## Overdispersion parameter for nbinom2 family (): 2.54
##
## Conditional model:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)      1.385305   0.049321  28.088 < 2e-16 ***
## Conditionmindful  -0.277951   0.070117  -3.964 7.37e-05 ***
## Conditionperspective -0.065376   0.074534  -0.877  0.3804
## Craving_Alc       -0.002818   0.001297  -2.172  0.0298 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Zero-inflation model:
##           Estimate Std. Error z value Pr(>|z|)
## (Intercept)      -22.3871   6035.0341  -0.004    0.997
## Conditionmindful    1.4892   6601.4519   0.000    1.000
## Conditionperspective -0.6534 12050.5062   0.000    1.000
## Craving_Alc        -0.1058    566.1740   0.000    1.000
```

Add Random Effects

```
m <- glmmTMB(y~Condition + Craving_Alc + (1|GROUP.ID), zi=~Condition + Craving_Alc, data=df, family=nbinom2)
summary(m)
```

```
## Family: nbinom2 ( log )
## Formula:          y ~ Condition + Craving_Alc + (1 | GROUP.ID)
## Zero inflation:    ~Condition + Craving_Alc
## Data: df
##
##      AIC      BIC   logLik deviance df.resid
##  3512.9   3559.5  -1746.4   3492.9      769
##
## Random effects:
##
## Conditional model:
## Groups   Name      Variance Std.Dev.
## GROUP.ID (Intercept) 0.1271   0.3565
## Number of obs: 779, groups:  GROUP.ID, 51
##
## Overdispersion parameter for nbinom2 family (): 3.07
##
## Conditional model:
##           Estimate Std. Error z value Pr(>|z|)
## (Intercept)    1.340840   0.081674  16.417 < 2e-16 ***
## Conditionmindful -0.379188   0.083941  -4.517 6.26e-06 ***
## Conditionperspective -0.220507   0.086488  -2.550 0.010786 *
## Craving_Alc     -0.004985   0.001394  -3.577 0.000347 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Zero-inflation model:
##           Estimate Std. Error z value Pr(>|z|)
## (Intercept)     -21.1486   5793.7917  -0.004    0.997
## Conditionmindful    0.2463   5742.9632   0.000    1.000
## Conditionperspective -0.6255   9024.4441   0.000    1.000
## Craving_Alc       -0.4644   3812.2884   0.000    1.000
```