Fit Test Try 2

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$$Y_i = \alpha_{j[i]} + \sum \beta_p X_{pi} + \epsilon_i, for hospitals(i = 1 to N)$$

$$\alpha_j = a + \sum b_k W_{kj} + u_j, for markets(j = 1 to J)$$

```
### load required packages
library(lme4)
```

```
## Loading required package: Matrix
```

```
library(tidyverse)
```

```
## Loading tidyverse: ggplot2
## Loading tidyverse: tibble
## Loading tidyverse: tidyr
## Loading tidyverse: readr
## Loading tidyverse: purrr
## Loading tidyverse: dplyr
```

```
## Conflicts with tidy packages ----------------------------------------------
```

```
## expand(): tidyr, Matrix
## filter(): dplyr, stats
## lag():    dplyr, stats
```

```
### rstan requires having rtools installed
library(rstan)
```

```
## Warning: package 'rstan' was built under R version 3.4.3
```

```
## Loading required package: StanHeaders
```

```
## Warning: package 'StanHeaders' was built under R version 3.4.3
```

```
## rstan (Version 2.16.2, packaged: 2017-07-03 09:24:58 UTC, GitRev: 2e1f913d3ca3)
```

```
## For execution on a local, multicore CPU with excess RAM we recommend calling
## rstan_options(auto_write = TRUE)
## options(mc.cores = parallel::detectCores())
```

```
##
## Attaching package: 'rstan'
```

```
## The following object is masked from 'package:tidyr':
##
##     extract
```

```
###read in data
k12ReducedRG = read_csv("k12ReducedRG.csv")
```

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   episode = col_integer(),
```

```
##   Provider = col_character(),
##   hrr = col_character(),
##   avgagehrr = col_integer(),
##   `Rank for Variable dshpct` = col_integer(),
##   `Rank for Variable cmi` = col_integer(),
##   `Rank for Variable mdadjadmit` = col_integer(),
##   qstarrating = col_integer(),
##   urbanlocation = col_integer(),
##   joinnetwork = col_integer(),
##   jchaoaccredited = col_integer(),
##   qieffort = col_integer(),
##   reform = col_integer(),
##   mdaffiliation = col_integer(),
##   ownershipstatus = col_integer(),
##   hospitalbedsize = col_integer()
## )
```

```
## See spec(...) for full column specifications.
```

Remove missing data for Stan:

```
###remove missing data colums
k12ReducedRG = k12ReducedRG %>%
  select(-reform, -joinnetwork)

###change data to only complete cases
k12ReducedRG = k12ReducedRG[complete.cases(k12ReducedRG),]

dim(k12ReducedRG)
```

```
## [1] 2920   28
```

Get data ready for stan:

```
model1data = list(episode = k12ReducedRG$episode,
                  hrr = as.integer(as.factor(k12ReducedRG$hrr)),
                  K = length(unique(k12ReducedRG$hrr)),
                  N = nrow(k12ReducedRG))
```

```
model1stan = stan("model1.stan", data = model1data,  chains = 4, iter = 2000)
```

Compare max and min from stan simulations to observed data:

```
###Extract Maxes
model1maxes = extract(model1stan, pars = c("maximum"))

###Extract Mins
model1mins = extract(model1stan, pars = c("minimum"))
```

```
###Mean Max
mean(model1maxes$maximum)
```

```
## [1] 30837.41
```

```
###Mean Min
mean(model1mins$minimum)
```

```
## [1] 7430.911
```

```
###Observed Max
max(k12ReducedRG$episode)
```

```
## [1] 41469
```

```
###Observed Min
min(k12ReducedRG$episode)
```

```
## [1] 7119
```