ComplexityVsTime

2023-09-08

Load Data

```
df = read_csv("../TimeNorm.csv")
```

```
## Rows: 709 Columns: 51
## -- Column specification ------------------------------------------------------
## Delimiter: ","
## chr (11): NGA, PolID, OriginalNGA, PolName, World.Region, Complexity, Dupl, ...
## dbl (34): Time, PropCoded, PolPop, PolTerr, CapPop, levels, government, infr...
## lgl  (6): ConformityLR, ConformityWR, ConformityFR, ConformityER, FreqDR, Co...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
summary(df)
```

```
##       NGA               PolID            OriginalNGA            Time
##  Length:709         Length:709         Length:709         Min.   :-9600
##  Class :character   Class :character   Class :character   1st Qu.:-3400
##  Mode  :character   Mode  :character   Mode  :character   Median :-1300
##                                                           Mean   :-1823
##                                                           3rd Qu.:  300
##                                                           Max.   : 1900
##
##    PropCoded          PolPop          PolTerr           CapPop
##  Min.   : 35.30   Min.   :1.331   Min.   :-0.7632   Min.   :0.9861
##  1st Qu.: 76.50   1st Qu.:3.326   1st Qu.: 2.9350   1st Qu.:2.8970
##  Median : 86.30   Median :4.525   Median : 4.2639   Median :3.8772
##  Mean   : 82.11   Mean   :4.900   Mean   : 4.2682   Mean   :3.9230
##  3rd Qu.: 92.20   3rd Qu.:6.581   3rd Qu.: 5.7924   3rd Qu.:5.0000
##  Max.   :100.00   Max.   :8.534   Max.   : 7.4018   Max.   :6.1995
##
##     levels          government         infrastr          writing
##  Min.   :0.2243   Min.   :0.0000   Min.   :0.0000   Min.   :0.0000
##  1st Qu.:1.3965   1st Qu.:0.1000   1st Qu.:0.2667   1st Qu.:0.1000
##  Median :2.4473   Median :0.2545   Median :0.6000   Median :0.4833
##  Mean   :2.8377   Mean   :0.4087   Mean   :0.5379   Mean   :0.4756
##  3rd Qu.:4.0258   3rd Qu.:0.7444   3rd Qu.:0.8667   3rd Qu.:0.8333
##  Max.   :7.2363   Max.   :1.0000   Max.   :1.0000   Max.   :1.0000
##
##     texts            money             irep        FreqLR        ConformityLR
##  Min.   :0.0000   Min.   :0.000   Min.   :1   Min.   :0.000   Mode:logical
##  1st Qu.:0.0000   1st Qu.:1.000   1st Qu.:1   1st Qu.:1.333   NA's:709
##  Median :0.1000   Median :2.700   Median :1   Median :2.000
##  Mean   :0.4798   Mean   :2.717   Mean   :1   Mean   :1.932
##  3rd Qu.:0.9667   3rd Qu.:5.000   3rd Qu.:1   3rd Qu.:2.000
```

```
##  Max.   :1.0312   Max.   :6.000   Max.   :1   Max.   :5.000
##                                               NA's   :391
##     FreqWR       ConformityWR     FreqFR       ConformityFR     FreqER
##  Min.   :1.000   Mode:logical   Min.   :0.000   Mode:logical   Min.   :0.000
##  1st Qu.:2.667   NA's:709       1st Qu.:5.000   NA's:709       1st Qu.:2.000
##  Median :5.000                  Median :6.000                  Median :2.000
##  Mean   :4.229                  Mean   :5.313                  Mean   :2.007
##  3rd Qu.:6.000                  3rd Qu.:6.000                  3rd Qu.:2.000
##  Max.   :6.000                  Max.   :6.000                  Max.   :6.000
##  NA's   :435                    NA's   :428                    NA's   :431
##  ConformityER    FreqDR       ConformityDR       MHG             BSP
##  Mode:logical   Mode:logical   Mode:logical   Min.   :0.000   Min.   :0.0000
##  NA's:709       NA's:709       NA's:709       1st Qu.:0.100   1st Qu.:0.1000
##                                               Median :0.100   Median :0.1000
##                                               Mean   :0.943   Mean   :0.3371
##                                               3rd Qu.:3.000   3rd Qu.:0.6667
##                                               Max.   :3.000   Max.   :1.0000
##                                               NA's   :2
##  WrittenRecords   ReligiousHier   GeneralMoralisticPunishment
##  Min.   :0.0000   Min.   :0.000   Min.   :0.0000
##  1st Qu.:0.0000   1st Qu.:1.000   1st Qu.:0.0000
##  Median :0.1000   Median :2.000   Median :0.0000
##  Mean   :0.4928   Mean   :2.387   Mean   :0.4189
##  3rd Qu.:1.0000   3rd Qu.:3.125   3rd Qu.:1.0000
##  Max.   :1.0000   Max.   :8.000   Max.   :1.0000
##  NA's   :1        NA's   :165
##  MoralisingHighGods MoralisingGods   DoctrinalMode   Writing
##  Min.   :0.0000     Min.   :0.0000   Min.   :1   Min.   :0.0000
##  1st Qu.:0.0000     1st Qu.:0.0000   1st Qu.:1   1st Qu.:0.0000
##  Median :0.0000     Median :0.0000   Median :1   Median :0.0000
##  Mean   :0.2518     Mean   :0.4189   Mean   :1   Mean   :0.4746
##  3rd Qu.:1.0000     3rd Qu.:1.0000   3rd Qu.:1   3rd Qu.:1.0000
##  Max.   :1.0000     Max.   :1.0000   Max.   :1   Max.   :1.0000
##  NA's   :2                           NA's   :357 NA's   :1
##      Mean            Lower            Upper          PolName
##  Min.   :0.08956   Min.   :0.04268   Min.   :0.1019   Length:709
##  1st Qu.:0.21731   1st Qu.:0.16555   1st Qu.:0.2609   Class :character
##  Median :0.45199   Median :0.41793   Median :0.4744   Mode  :character
##  Mean   :0.49338   Mean   :0.46158   Mean   :0.5252
##  3rd Qu.:0.77994   3rd Qu.:0.76726   3rd Qu.:0.8033
##  Max.   :0.99726   Max.   :0.99407   Max.   :1.0004
##
##      Start           End         World.Region       Complexity
##  Min.   :-9600   Min.   :-7201   Length:709       Length:709
##  1st Qu.:-3800   1st Qu.:-3001   Class :character   Class :character
##  Median :-1550   Median :-1001   Mode  :character   Mode  :character
##  Mean   :-2154   Mean   :-1440
##  3rd Qu.:  251   3rd Qu.:  457
##  Max.   : 1796   Max.   : 1912
##
##     Dupl           Language          Genus              Family
##  Length:709       Length:709       Length:709       Length:709
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
```

```
##
##
##
##       Latitude          Longitude            City            Time.norm
##   Min.   :15.39    Min.   : -3.04    Length:709         Min.    :-8000.0
##   1st Qu.:29.38    1st Qu.: 32.52    Class :character   1st Qu.:-2300.0
##   Median :34.70    Median : 48.24    Mode  :character   Median : -500.0
##   Mean   :34.20    Mean   : 54.35                       Mean    : -821.9
##   3rd Qu.:39.63    3rd Qu.: 67.63                       3rd Qu.: 1000.0
##   Max.   :48.87    Max.   :135.76                       Max.    : 4600.0
##
##   MGUncertainty
##   Min.    :    9.0
##   1st Qu.:  177.0
##   Median :  390.0
##   Mean    :  713.5
##   3rd Qu.:1100.0
##   Max.    :2599.0
##
```

```r
head(df)
```

```
## # A tibble: 6 x 51
##   NGA      PolID    OriginalNGA    Time PropCoded PolPop PolTerr CapPop levels
##   <chr>    <chr>    <chr>         <dbl>     <dbl>  <dbl>   <dbl>  <dbl>  <dbl>
## 1 Deccan  InDecNL  Deccan         -2700      90.2   1.33    3.98   2.70    1.2
## 2 Deccan  InDecNL  Deccan         -2600      90.2   1.33    3.98   2.70    1.2
## 3 Deccan  InDecNL  Deccan         -2500      90.2   1.33    3.98   2.70    1.2
## 4 Deccan  InDecNL  Deccan         -2400      90.2   1.33    3.98   2.70    1.2
## 5 Deccan  InDecNL  Deccan         -2300      90.2   1.33    3.98   2.70    1.2
## 6 Deccan  InDecNL  Deccan         -2200      90.2   1.33    3.98   2.70    1.2
## # i 42 more variables: government <dbl>, infrastr <dbl>, writing <dbl>,
## #   texts <dbl>, money <dbl>, irep <dbl>, FreqLR <dbl>, ConformityLR <lgl>,
## #   FreqWR <dbl>, ConformityWR <lgl>, FreqFR <dbl>, ConformityFR <lgl>,
## #   FreqER <dbl>, ConformityER <lgl>, FreqDR <lgl>, ConformityDR <lgl>,
## #   MHG <dbl>, BSP <dbl>, WrittenRecords <dbl>, ReligiousHier <dbl>,
## #   GeneralMoralisticPunishment <dbl>, MoralisingHighGods <dbl>,
## #   MoralisingGods <dbl>, DoctrinalMode <dbl>, Writing <dbl>, Mean <dbl>, ...
```

List of 'natural geographical areas' (NGAs)

```r
unique(df$OriginalNGA)
```

```
##  [1] "Deccan"                "Kachi Plain"
##  [3] "Susiana"               "Sogdiana"
##  [5] "Kansai"                "Konya Plain"
##  [7] "Latium"                "Middle Yellow River Valley"
##  [9] "Niger Inland Delta"    "Orkhon Valley"
## [11] "Paris Basin"           "Upper Egypt"
```

Select "Upper Egypt"

```
df_egypt = df |> filter(NGA == "Upper Egypt")
df_egypt
```

```
## # A tibble: 62 x 51
##    NGA         PolID   OriginalNGA  Time PropCoded PolPop PolTerr CapPop levels
##    <chr>       <chr>   <chr>       <dbl>     <dbl>  <dbl>   <dbl>  <dbl>  <dbl>
##  1 Upper Egypt EgBadar Upper Egypt -4400      90.2   2.27    2.04   1.50   1.18
##  2 Upper Egypt EgBadar Upper Egypt -4300      90.2   2.27    2.04   1.50   1.18
##  3 Upper Egypt EgBadar Upper Egypt -4200      90.2   2.27    2.04   1.50   1.18
##  4 Upper Egypt EgBadar Upper Egypt -4100      90.2   2.27    2.04   1.50   1.18
##  5 Upper Egypt EgBadar Upper Egypt -4000      90.2   2.27    2.04   1.50   1.18
##  6 Upper Egypt EgBadar Upper Egypt -3900      90.2   2.27    2.04   1.50   1.18
##  7 Upper Egypt EgNaqa1 Upper Egypt -3800      94.1   1.41    1.34   0.986  1.21
##  8 Upper Egypt EgNaqa1 Upper Egypt -3700      94.1   3.78    3.78   3.14   1.33
##  9 Upper Egypt EgNaqa1 Upper Egypt -3600      94.1   5.21    3.78   4.11   1.46
## 10 Upper Egypt EgNaqa2 Upper Egypt -3500      94.1   4.11    4.01   3.99   2.27
## # i 52 more rows
## # i 42 more variables: government <dbl>, infrastr <dbl>, writing <dbl>,
## #   texts <dbl>, money <dbl>, irep <dbl>, FreqLR <dbl>, ConformityLR <lgl>,
## #   FreqWR <dbl>, ConformityWR <lgl>, FreqFR <dbl>, ConformityFR <lgl>,
## #   FreqER <dbl>, ConformityER <lgl>, FreqDR <lgl>, ConformityDR <lgl>,
## #   MHG <dbl>, BSP <dbl>, WrittenRecords <dbl>, ReligiousHier <dbl>,
## #   GeneralMoralisticPunishment <dbl>, MoralisingHighGods <dbl>, ...
```

Moralizing Gods

```
mg_egypt = read_csv("../PrePostComparison.csv") |> filter(NGA == "Upper Egypt")
```

```
## Rows: 12 Columns: 16
## -- Column specification -----------------------------------------------------
## Delimiter: ","
## chr  (1): NGA
## dbl (15): PostRate, PreRate, PostConfInt, PreConfInt, p, df, n, t, PreMGRitu...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
mg_egypt
```

```
## # A tibble: 1 x 16
##   NGA         PostRate PreRate PostConfInt PreConfInt       p    df     n     t
##   <chr>          <dbl>   <dbl>       <dbl>      <dbl>   <dbl> <dbl> <dbl> <dbl>
## 1 Upper Egypt    0.142   0.345      0.0458     0.0725 0.000107  23.6    15 -4.64
## # i 7 more variables: PreMGRitual <dbl>, PreMGWriting <dbl>,
## #   RangeMGAppear <dbl>, RangeDMAppear <dbl>, RangeWRAppear <dbl>,
## #   MGAppear <dbl>, Difference <dbl>
```

Plot

```
ggplot(df_egypt, aes(x =Time, y = Mean)) + geom_ribbon(aes(ymin = Lower, ymax = Upper), fill = "grey60"
```