Problem set 5

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Problem 1

1... 10

11

11.a A movie should appear in the dataset at least 18 times. Each has a record for the weekend (Friday, Saturday and Sunday) from the opening weekend to at least 6 weekends later (for the ones kept). The ones dropped were not in theaters for more than 6 weekends.

11.b

```
#keeping films that aren't dropped
films_used <- films |>
  filter(dropped != 1)
```

11.c

```
# day when 12 Rounds came in
round_12_date <- as.Date("2009-03-27")

# Define the number of days to add
days_before <- 17984 #number under 12 Rounds "date" column

# Days prior to the
reference_date <- round_12_date - days_before

# Print the new date
print(reference_date)
```

```
## [1] "1959-12-31"
```

11.d

```
films_used_d <- films_used |>
  mutate(movie_date = as.Date(reference_date + date)) |>
  #putting the release_date in the 4th column
  select(title, production_budget, release_yr,
         movie_date, sat_date, everything())

films_used_d[, c("title", "movie_date")]
```

```
## # A tibble: 24,855 x 2
##    title                movie_date
##    <chr>                <date>
##  1 (500) Days of Summer 2009-08-07
##  2 12 Rounds            2009-03-27
##  3 127 Hours            2010-11-25
##  4 13 Going on 30       2004-04-24
##  5 1408                 2007-06-23
##  6 16 Blocks            2006-03-04
##  7 17 Again             2009-04-18
##  8 2 Fast 2 Furious     2003-06-06
##  9 2012                 2009-11-14
## 10 21                   2008-03-27
## # i 24,845 more rows
```

11.e

```
#first using sat_date to get the date for each saturday
films_used_date <- films_used_d |>
  mutate(sat_day = as.Date(reference_date +  sat_date)) |>
  #putting the release_date in the 4th column
  select(title, production_budget, release_yr,
         movie_date, sat_day, everything())

 #making new columns
films_used_date <- films_used_date |>
mutate(sat_dummy = ifelse(movie_date == sat_day, 1, 0),
       #one day before saturday is friday
       fri_dummy = ifelse(movie_date == sat_day - 1, 1, 0),
       #one day
       sun_dummy = ifelse(movie_date == sat_day + 1, 1, 0)) |>
  #rearranging... not needed
  select(title, production_budget, release_yr, movie_date,
         sat_day,sat_dummy, fri_dummy, sun_dummy, everything())

films_used_date[, c("title", "movie_date","sat_day"
                    ,"fri_dummy", "sat_dummy", "sun_dummy")]
```

```
## # A tibble: 24,855 x 6
##    title                movie_date sat_day    fri_dummy sat_dummy sun_dummy
##    <chr>                <date>     <date>         <dbl>     <dbl>     <dbl>
##  1 (500) Days of Summer 2009-08-07 2009-08-07         0         1         0
##  2 12 Rounds            2009-03-27 2009-03-27         0         1         0
##  3 127 Hours            2010-11-25 2010-11-26         1         0         0
##  4 13 Going on 30       2004-04-24 2004-04-23         0         0         1
##  5 1408                 2007-06-23 2007-06-22         0         0         1
##  6 16 Blocks            2006-03-04 2006-03-03         0         0         1
##  7 17 Again             2009-04-18 2009-04-17         0         0         1
##  8 2 Fast 2 Furious     2003-06-06 2003-06-06         0         1         0
##  9 2012                 2009-11-14 2009-11-13         0         0         1
## 10 21                   2008-03-27 2008-03-28         1         0         0
## # i 24,845 more rows
```

11.f

```r
#creating dummies for week using fastDummies
films_used_date <- films_used_date |>
  arrange(title, sat_day) |>
  group_by(title) |>
  # Assign numeric labels to unique elements of sat_day within each title
  mutate(week = as.integer(factor(sat_day)))


#Now using fast dummies...
films_used_date <- dummy_cols(films_used_date, select_columns = 'week')
films_used_date[, c("title", "movie_date" ,"week_1", "week_2")]
```

```
## # A tibble: 24,855 x 4
##    title                movie_date week_1 week_2
##    <chr>                <date>      <int>  <int>
##  1 (500) Days of Summer 2009-08-07      1      0
##  2 (500) Days of Summer 2009-08-06      1      0
##  3 (500) Days of Summer 2009-08-08      1      0
##  4 (500) Days of Summer 2009-08-13      0      1
##  5 (500) Days of Summer 2009-08-14      0      1
##  6 (500) Days of Summer 2009-08-15      0      1
##  7 (500) Days of Summer 2009-08-20      0      0
##  8 (500) Days of Summer 2009-08-22      0      0
##  9 (500) Days of Summer 2009-08-21      0      0
## 10 (500) Days of Summer 2009-08-29      0      0
## # i 24,845 more rows
```

11.g

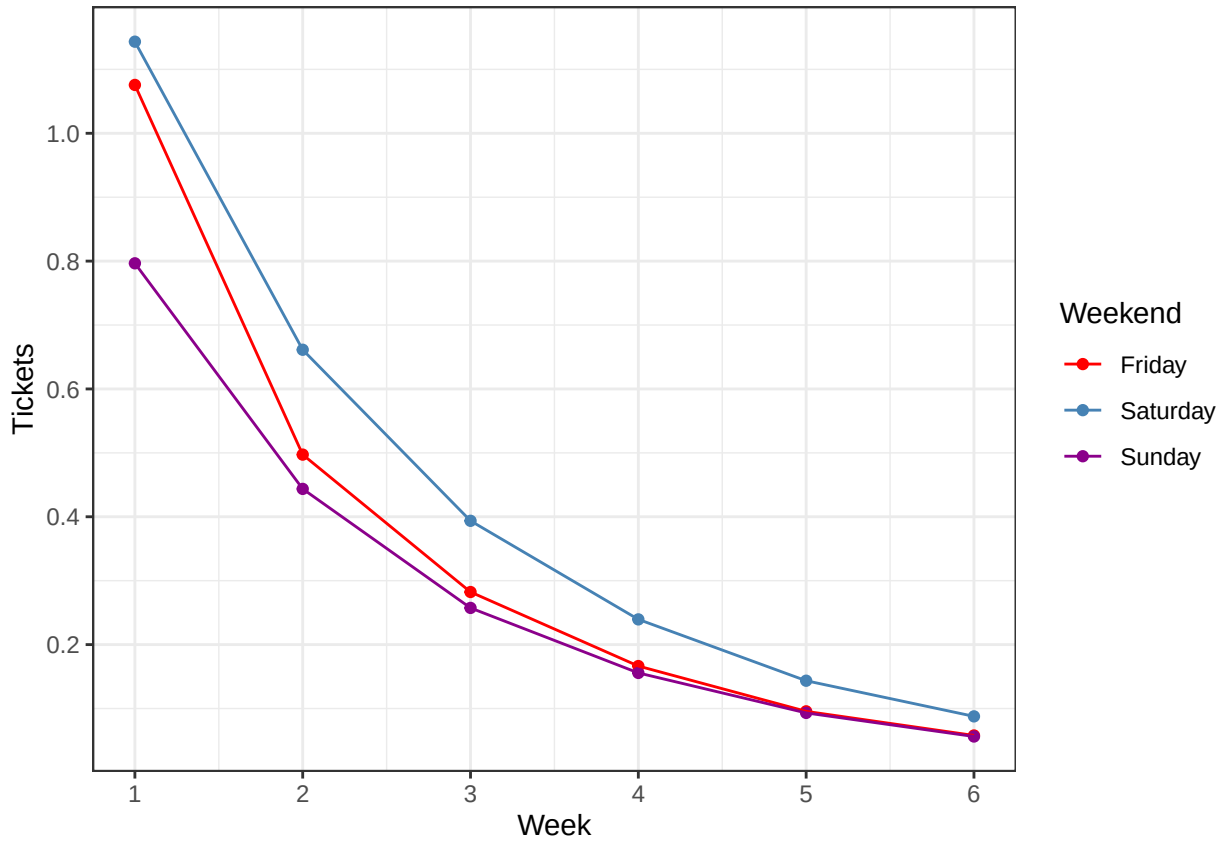
```r
#using the "Fast Dummies" library... to automatically create dummies for year
film <- dummy_cols(films_used_date, select_columns = 'release_yr')

film[, c("title", "release_yr", "release_yr_2009", "release_yr_2010")]
```

```
## # A tibble: 24,855 x 4
##    title                release_yr release_yr_2009 release_yr_2010
##    <chr>                     <dbl>           <int>           <int>
##  1 (500) Days of Summer       2009               1               0
##  2 (500) Days of Summer       2009               1               0
##  3 (500) Days of Summer       2009               1               0
##  4 (500) Days of Summer       2009               1               0
##  5 (500) Days of Summer       2009               1               0
##  6 (500) Days of Summer       2009               1               0
##  7 (500) Days of Summer       2009               1               0
##  8 (500) Days of Summer       2009               1               0
##  9 (500) Days of Summer       2009               1               0
## 10 (500) Days of Summer       2009               1               0
## # i 24,845 more rows
```

11.h

```r
#combine the weekends
film |>
 mutate(weekend = case_when(
   sat_dummy == 1 ~ "Saturday",
   fri_dummy == 1 ~ "Friday",
   sun_dummy == 1 ~ "Sunday"
 )) |>
  group_by(week, weekend) |>
  summarize(mean = mean(tickets))|>
  ggplot(aes(x = week, y = mean, color = as.factor(weekend))) +
  geom_point() +
  geom_line() +
  scale_color_manual(values = c("Saturday" = "#4682B4",
                                "Friday" = "red",
                                "Sunday" = "#8B008B")) +
  labs(color = "Weekend",
       y = "Tickets",
       x = "Week") +
  scale_x_continuous(breaks = scales::pretty_breaks(n = 6)) +  # Set x-axis ticks
  scale_y_continuous(breaks = scales::pretty_breaks(n = 6)) +  # Set y-axis ticks
  theme_bw()
```



12

NOT NEEDED

13

```
#subset colnames that have the hh in them
holiday <- str_subset(colnames(film), "hh")

#make the things in holiday "add"
holiday_dummy <- str_c(holiday, collapse = " + ")

#day of the week dummies
weekend_dummy <- str_c(str_subset(colnames(film), "dummy"), collapse = " + ")

#week of the year dummies
week_dummy <- str_c(str_subset(colnames(film), "week_"), collapse = " + ")

#year of the week dummy
year_dummy <- str_c(str_subset(colnames(film), "release_yr_"), collapse = " + ")

#combine
mod1 <- glue("tickets ~ {weekend_dummy} + {week_dummy} + {year_dummy} + {holiday_dummy}")

#fit a regression model
reg_mod1 <- lm(as.formula(mod1), data = film)


film <- film |>
  mutate(pred_tickets = predict(reg_mod1, film)) |>
  mutate(abnormal_viewership = tickets - pred_tickets)

film[, c("tickets","pred_tickets", "abnormal_viewership", "sat_day")]
```

```
## # A tibble: 24,855 x 4
##    tickets pred_tickets abnormal_viewership sat_day
##      <dbl>        <dbl>               <dbl> <date>
##  1  0.185         1.07              -0.890  2009-08-07
##  2  0.159         0.991             -0.833  2009-08-07
##  3  0.155         0.933             -0.777  2009-08-07
##  4  0.126         0.518             -0.393  2009-08-14
##  5  0.153         0.602             -0.449  2009-08-14
##  6  0.117         0.460             -0.343  2009-08-14
##  7  0.0981        0.296             -0.198  2009-08-21
##  8  0.0808        0.237             -0.156  2009-08-21
##  9  0.125         0.379             -0.254  2009-08-21
## 10  0.0660        0.114             -0.0478 2009-08-28
## # i 24,845 more rows
```

14

```
weather <- read_dta("data/weather_collapsed_all.dta")

#adding www to the column names
```

```r
original_cols <- colnames(weather)

# adding prefix using the paste
colnames(weather) <- paste("www", original_cols, sep = "_")

weather
```

```
## # A tibble: 1,644 x 112
##    www_sat_date www_snow_0 www_rain_0 www_mat5_10_0 www_mat5_15_0 www_mat5_20_0
##    <date>            <dbl>      <dbl>         <dbl>         <dbl>         <dbl>
##  1 1982-01-02       0.165      0.533       0.0391         0.0276        0.0318
##  2 1982-01-09       0.422      0.0916      0.464          0.0742        0.0529
##  3 1982-01-16       0.255      0.0538      0.386          0.0455        0.0352
##  4 1982-01-23       0.216      0.0675      0.158          0.0589        0.0388
##  5 1982-01-30       0.288      0.470       0.0616         0.0299        0.0372
##  6 1982-02-06       0.0699     0.0269      0.0227         0.0434        0.121
##  7 1982-02-13       0.0907     0.159       0.000875       0.00193       0.00840
##  8 1982-02-20       0.232      0.216       0.00264        0             0
##  9 1982-02-27       0.0608     0.0838      0.00423        0.00282       0.00687
## 10 1982-03-06       0.293      0.392       0.0174         0.0219        0.0680
## # i 1,634 more rows
## # i 106 more variables: www_mat5_25_0 <dbl>, www_mat5_30_0 <dbl>,
## #   www_mat5_35_0 <dbl>, www_mat5_40_0 <dbl>, www_mat5_45_0 <dbl>,
## #   www_mat5_50_0 <dbl>, www_mat5_55_0 <dbl>, www_mat5_60_0 <dbl>,
## #   www_mat5_65_0 <dbl>, www_mat5_70_0 <dbl>, www_mat5_75_0 <dbl>,
## #   www_mat5_80_0 <dbl>, www_mat5_85_0 <dbl>, www_mat5_90_0 <dbl>,
## #   www_mat5_95_0 <dbl>, www_prec_0_0 <dbl>, www_prec_1_0 <dbl>, ...
```

```r
weather_film <- film |>
  left_join(weather,
            #combine on dates, automatically filters out dates that don't match
            by = c("movie_date" = "www_sat_date"))

weather_film |>
  select(contains("www"))
```

```
## # A tibble: 24,855 x 111
##    www_snow_0 www_rain_0 www_mat5_10_0 www_mat5_15_0 www_mat5_20_0 www_mat5_25_0
##         <dbl>      <dbl>         <dbl>         <dbl>         <dbl>         <dbl>
##  1         NA     NA               NA            NA            NA            NA
##  2         NA     NA               NA            NA            NA            NA
##  3          0      0.287            0             0             0             0
##  4         NA     NA               NA            NA            NA            NA
##  5         NA     NA               NA            NA            NA            NA
##  6          0      0.287            0             0             0             0
##  7         NA     NA               NA            NA            NA            NA
##  8          0      0.290            0             0             0             0
##  9         NA     NA               NA            NA            NA            NA
## 10          0      0.276            0             0             0             0
## # i 24,845 more rows
## # i 105 more variables: www_mat5_30_0 <dbl>, www_mat5_35_0 <dbl>,
## #   www_mat5_40_0 <dbl>, www_mat5_45_0 <dbl>, www_mat5_50_0 <dbl>,
## #   www_mat5_55_0 <dbl>, www_mat5_60_0 <dbl>, www_mat5_65_0 <dbl>,
```

```
## #   www_mat5_70_0 <dbl>, www_mat5_75_0 <dbl>, www_mat5_80_0 <dbl>,
## #   www_mat5_85_0 <dbl>, www_mat5_90_0 <dbl>, www_mat5_95_0 <dbl>,
## #   www_prec_0_0 <dbl>, www_prec_1_0 <dbl>, www_prec_2_0 <dbl>, ...
```

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```
# Select columns with names containing "www_"
www_columns <- str_subset(colnames(weather_film), "www_")

# Create a copy of the original dataframe
df <- weather_film

# Define regression formula with dummy variables
regressors <-  glue("~ {weekend_dummy} + {week_dummy} + {year_dummy} + {holiday_dummy}")

# Iterate over columns with names containing "www_"
for (columns in www_columns) {
  # Construct regression formula
  model <- paste(columns, regressors)

  # Generate names for predicted values and residuals
  pred_name <- paste("pred", columns, sep = "_")
  resid_name <- paste("resid", columns, sep = "_")

  # Add predicted values and residuals to the dataframe
  df <- df |>
      mutate(!!pred_name := predict(lm(as.formula(model), data = df), df)) |>
    #residuals = column - predicted_value_for_column
      mutate(!!resid_name := eval(parse(text = columns)) - eval(parse(text = pred_name)))
}

#remove the predicted and original values, keeping only the residuals
new_weather <- df |>
  select(-c(contains("pred_www"), starts_with("www")))
```

16

```
#combine
mod2 <- glue("tickets ~ {weekend_dummy} + {week_dummy} + {year_dummy} + {holiday_dummy}")

#fit a regression model
week_2_data <- new_weather |>
  filter(week_2 == 1)

reg_mod2 <- lm(as.formula(mod1), data = week_2_data)


new_weather_film <- new_weather |>
  mutate(pred_tickets_wk_2 = predict(reg_mod2, new_weather)) |>
  mutate(abnormal_viewership_wk_2 = tickets - pred_tickets_wk_2)
```

```
new_weather_film[, c("tickets", "pred_tickets_wk_2", "week_2", "abnormal_viewership_wk_2")]
```

```
## # A tibble: 24,855 x 4
##    tickets pred_tickets_wk_2 week_2 abnormal_viewership_wk_2
##      <dbl>             <dbl>  <int>                    <dbl>
##  1  0.185              0.615      0                   -0.431
##  2  0.159              0.455      0                   -0.297
##  3  0.155              0.394      0                   -0.238
##  4  0.126              0.455      1                   -0.330
##  5  0.153              0.615      1                   -0.462
##  6  0.117              0.394      1                   -0.277
##  7  0.0981             0.455      0                   -0.357
##  8  0.0808             0.394      0                   -0.313
##  9  0.125              0.615      0                   -0.490
## 10  0.0660             0.394      0                   -0.328
## # i 24,845 more rows
```

17

17.a

21

```
movies <- read_csv("data/movie_lens_20m/movie.csv")
ratings <- read_csv("data/movie_lens_20m/rating.csv")
```