DTSC 5301 PROJECT

9/2/2021

Read in Data from GitHub Repository

```
covid_daily_df <- read_csv("https://raw.githubusercontent.com/OpportunityInsights/EconomicTracker/main/
```

```
## Rows: 30447 Columns: 24
```

```
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (20): new_case_count, new_death_count, case_count, death_count, vaccine_...
## dbl  (4): year, month, day, statefips
```

```
##
## 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.
```

```
move_daily_df <- read_csv("https://raw.githubusercontent.com/OpportunityInsights/EconomicTracker/main/da
```

```
## Rows: 28611 Columns: 11
```

```
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (2): gps_parks, gps_transit_stations
## dbl (9): year, month, day, statefips, gps_retail_and_recreation, gps_grocery...
```

```
##
## 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.
```

```
affinity_daily_df <- read_csv("https://raw.githubusercontent.com/OpportunityInsights/EconomicTracker/ma
```

```
## Rows: 31008 Columns: 28
```

```
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (23): freq, spend_all, spend_aap, spend_acf, spend_aer, spend_apg, spend...
## dbl  (5): year, month, day, statefips, provisional
```

```
##
## 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.
```

```
job_listings_weekly_df <- read_csv("https://raw.githubusercontent.com/OpportunityInsights/EconomicTracke
```

```
## Rows: 4488 Columns: 17

## -- Column specification --------------------------------------------------------
## Delimiter: ","
## dbl (17): year, month, day_endofweek, statefips, bg_posts, bg_posts_ss30, bg...

##
## 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.
```

```
employment_daily_df <- read_csv("https://raw.githubusercontent.com/OpportunityInsights/EconomicTracker/m
```

```
## Rows: 27081 Columns: 16

## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (10): emp, emp_incq1, emp_incq2, emp_incq3, emp_incq4, emp_incmiddle, em...
## dbl  (6): year, month, day, statefips, emp_incbelowmed, emp_ss70

##
## 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.
```

```
ui_claims_weekly_df <- read_csv("https://raw.githubusercontent.com/OpportunityInsights/EconomicTracker/m
```

```
## Rows: 4437 Columns: 18

## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr  (6): contclaims_count_peuc, contclaims_count_pua, contclaims_count_comb...
## dbl (12): year, month, day_endofweek, statefips, initclaims_count_regular, c...

##
## 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.
```

```
state_id <- read_csv("https://raw.githubusercontent.com/OpportunityInsights/EconomicTracker/main/data/Ge
```

```
## Rows: 51 Columns: 4

## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (2): statename, stateabbrev
## dbl (2): statefips, state_pop2019

##
## 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.
```

```
#stimulus <- read_csv("")
```

Join the datasets we're interested in into one dataset.

Here we join the datasets of interest based on a shared date and state of measurements.

```
df <- left_join(affinity_daily_df, move_daily_df, by = c("year", "month", "day", "statefips"))

df <- left_join(df, covid_daily_df, by = c("year", "month", "day", "statefips"))

df <- left_join(df, employment_daily_df, by = c("year", "month", "day", "statefips"))
```

```
df <- full_join(df, job_listings_weekly_df, by = c("year", "month", "day" = "day_endofweek", "statefips

df <- full_join(df, ui_claims_weekly_df, by = c("year", "month", "day" = "day_endofweek", "statefips"))

df <- left_join(df, state_id, by = c("statefips"))
```

Combine "month", "day", and "year" columns into a "date" column

```
# https://tidyr.tidyverse.org/reference/unite.html
df <- df %>% unite("date", day:month:year, remove = FALSE, sep = "-")
```

```
## Warning in x:y: numerical expression has 2 elements: only the first used
```

```
# https://lubridate.tidyverse.org/reference/ymd.html
df$date <- dmy(df$date)

df <- df %>% mutate(week = week(date))
```

```
# There's definitely a better way to do this, I just don't know what it is.

df <- df %>%
  select(date, year, month, day, week, statename, stateabbrev, state_pop2019, initclaims_rate_regular, 
  mutate(
    spend_all = as.double(spend_all),
    gps_parks = as.double(gps_parks),
    new_case_count = as.double(new_case_count),
    new_death_count = as.double(new_death_count),
    case_count = as.double(case_count),
    death_count = as.double(death_count),
    gps_transit_stations = as.double(gps_transit_stations),
    emp = as.double(emp),
    contclaims_rate_combined = as.double(contclaims_rate_combined)
  )
```

```
## Warning in mask$eval_all_mutate(quo): NAs introduced by coercion
```

```
## Warning in mask$eval_all_mutate(quo): NAs introduced by coercion

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```

```
glimpse(df)
```

```
## Rows: 31,110
## Columns: 24
## $ date                       <date> 2020-01-01, 2020-01-01, 2020-01-01, 2020-01~
## $ year                       <dbl> 2020, 2020, 2020, 2020, 2020, 2020, 2020, 20~
## $ month                      <dbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,~
## $ day                        <dbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,~
## $ week                       <dbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,~
## $ statename                  <chr> "Alabama", "Alaska", "Arizona", "Arkansas", ~
## $ stateabbrev                <chr> "AL", "AK", "AZ", "AR", "CA", "CO", "CT", "D~
## $ state_pop2019              <dbl> 4903185, 731545, 7278717, 3017804, 39512223,~
## $ initclaims_rate_regular    <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ contclaims_rate_combined   <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ bg_posts                   <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ emp                        <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ spend_all                  <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ gps_retail_and_recreation  <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ gps_grocery_and_pharmacy   <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ gps_parks                  <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ gps_transit_stations       <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ gps_workplaces             <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ gps_residential            <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ gps_away_from_home         <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ new_case_count             <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ new_death_count            <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ case_count                 <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
## $ death_count                <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, ~
```

```
# https://stackoverflow.com/questions/45576805/how-to-replace-all-na-in-a-dataframe-using-tidyrreplace-

#length(df$date)

#colSums(is.na(df))

df <- df %>% replace(is.na(.), 0)
df <- df %>% filter(spend_all != 0)
```

```
df_weekly <- df %>%
  group_by(year, week, stateabbrev) %>%
  summarize(spend_all = mean(spend_all), contclaims_rate_combined = mean(contclaims_rate_combined), bg_
```

```
## `summarise()` has grouped output by 'year', 'week'. You can override using the `.groups` argument.
```

```
df_weekly <- df_weekly %>% mutate(lagged_spend_one = spend_all - lag(spend_all, order_by = date),
                                  lagged_spend_two = spend_all - lag(spend_all, n = 2, order_by = date)
                                  lagged_spend_three = spend_all - lag(spend_all, n = 3, order_by = dat

df_weekly <- left_join(df_weekly, state_id, by = c("stateabbrev"))
```

```
df_weekly <- df_weekly %>% mutate(first_check = (if (date < ymd("2020-04-15") | date >= ymd("2020-07-15
                                                 else 1),
                                  second_check = (if (date < ymd("2021-01-04") | date >= ymd("2021-03-1
                                                  else 1),
                                  third_check = (if (date < ymd("2021-03-18") | date >= ymd("2021-06-18
                                                 else 1))
```

```
sum(sapply(df_weekly, is.infinite))
```

```
## [1] 0
```

```
df_weekly <- df_weekly %>% filter(!is.infinite(third_check))
sum(sapply(df_weekly, is.infinite))
```

```
## [1] 0
```

```
lm <- lm(spend_all ~ 0 + gps_retail_and_recreation + emp + first_check +
           second_check + third_check, df_weekly)
summary(lm)
```

```
##
## Call:
## lm(formula = spend_all ~ 0 + gps_retail_and_recreation + emp +
##     first_check + second_check + third_check, data = df_weekly)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.33879 -0.03691  0.01039  0.06654  0.53603
##
## Coefficients:
##                             Estimate Std. Error t value Pr(>|t|)
## gps_retail_and_recreation  3.646e-01  1.410e-02  25.854   <2e-16 ***
## emp                       -7.603e-05  3.102e-02  -0.002    0.998
## first_check               -4.370e-02  4.703e-03  -9.291   <2e-16 ***
## second_check               1.410e-01  4.910e-03  28.714   <2e-16 ***
## third_check                1.546e-01  3.691e-03  41.881   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.09816 on 4483 degrees of freedom
## Multiple R-squared:  0.4737, Adjusted R-squared:  0.4731
## F-statistic: 806.8 on 5 and 4483 DF,  p-value: < 2.2e-16
```

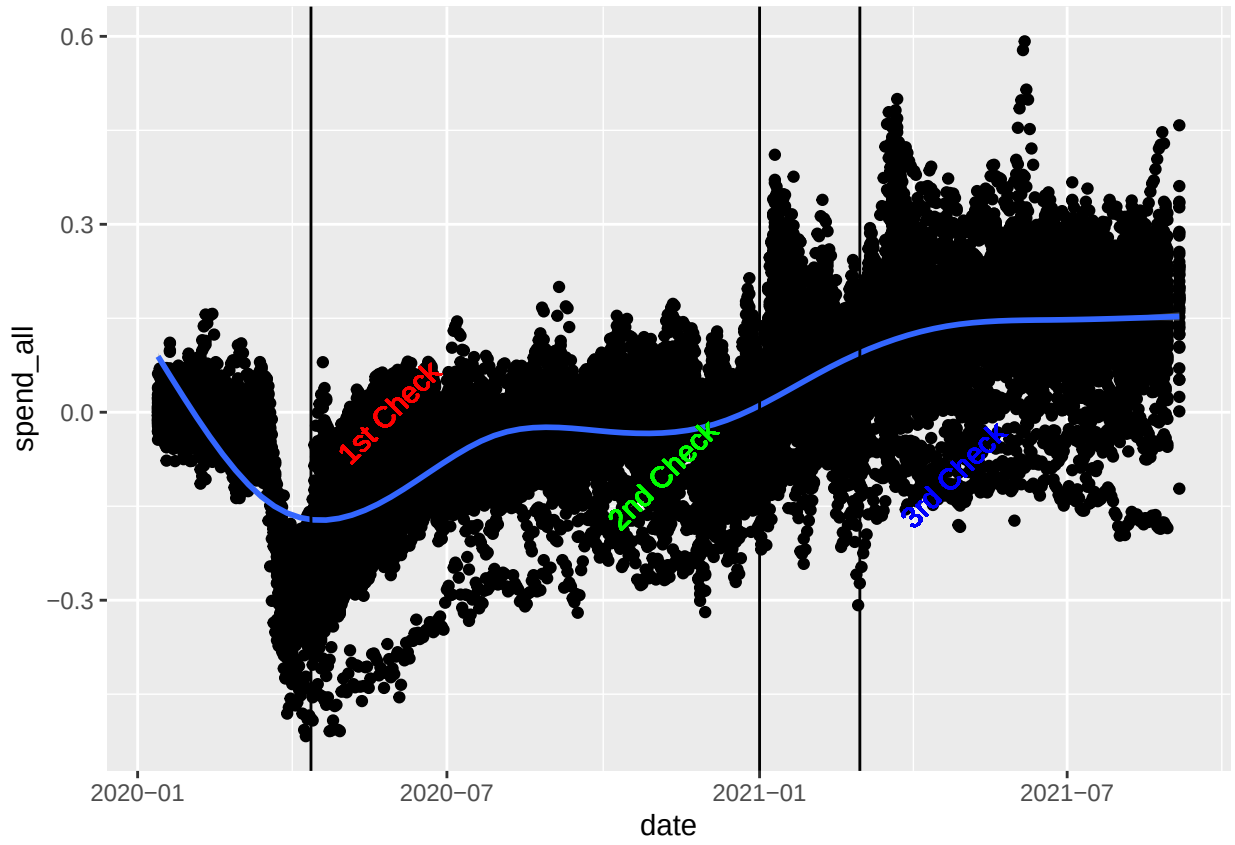
```
view(df_weekly)
```

Plotting spending over time for all states and categories

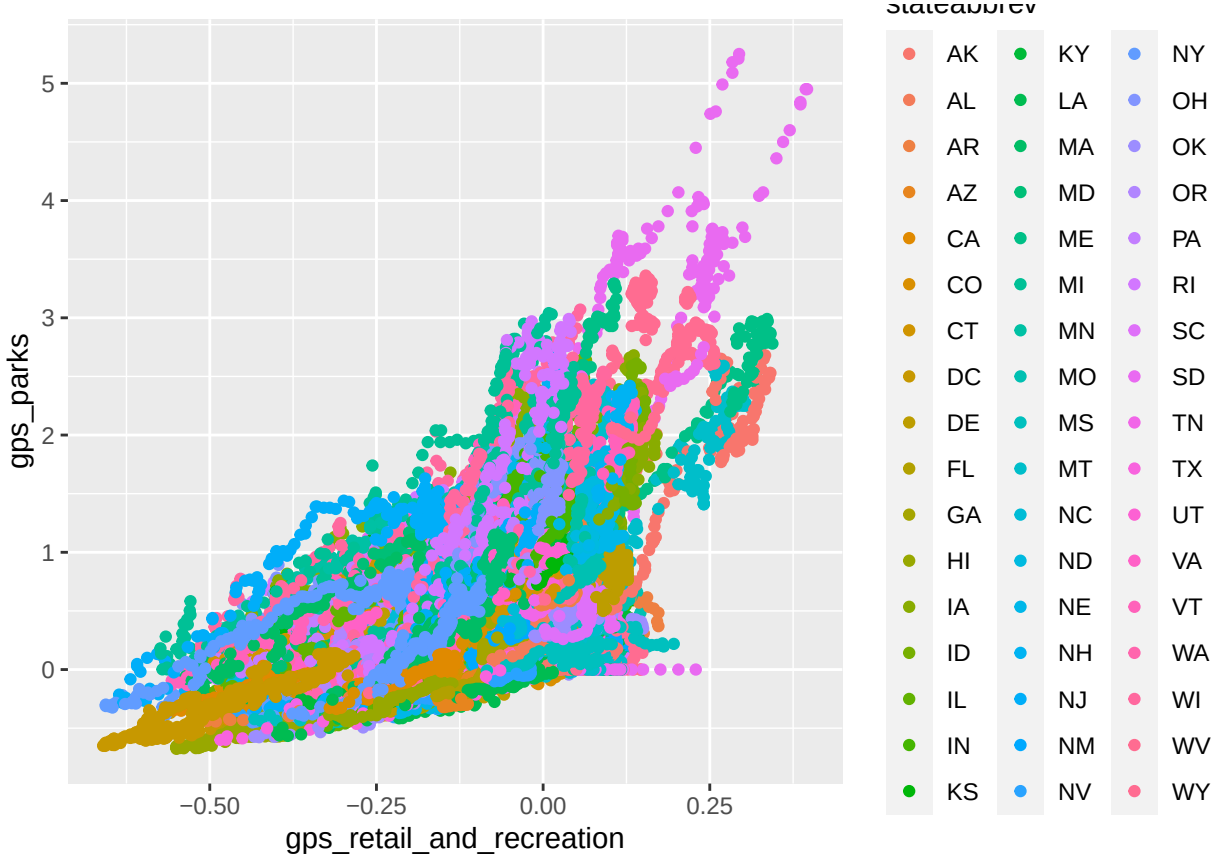
The dates for the stimulus checks were approximated from this article.

```
# https://stackoverflow.com/questions/38815996/r-adding-geom-vline-labels-to-geom-histogram-labels

ggplot(df, aes(x = date, y = spend_all)) +
  geom_point() +
  geom_smooth() +
  geom_vline(xintercept = as.Date("2020-04-12")) +
  geom_vline(xintercept = as.Date("2021-01-01")) +
  geom_vline(xintercept = as.Date("2021-03-01")) +
  geom_text(aes(x = as.Date("2020-05-28"), label = "1st Check"), color = "red", angle = 45, y = 0) +
  geom_text(aes(x = as.Date("2020-11-05"), label = "2nd Check"), color = "green", angle = 45, y = -.1) +
  geom_text(aes(x = as.Date("2021-04-25"), label = "3rd Check"), color = "blue", angle = 45, y = -.1)
```

```
## `geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
```

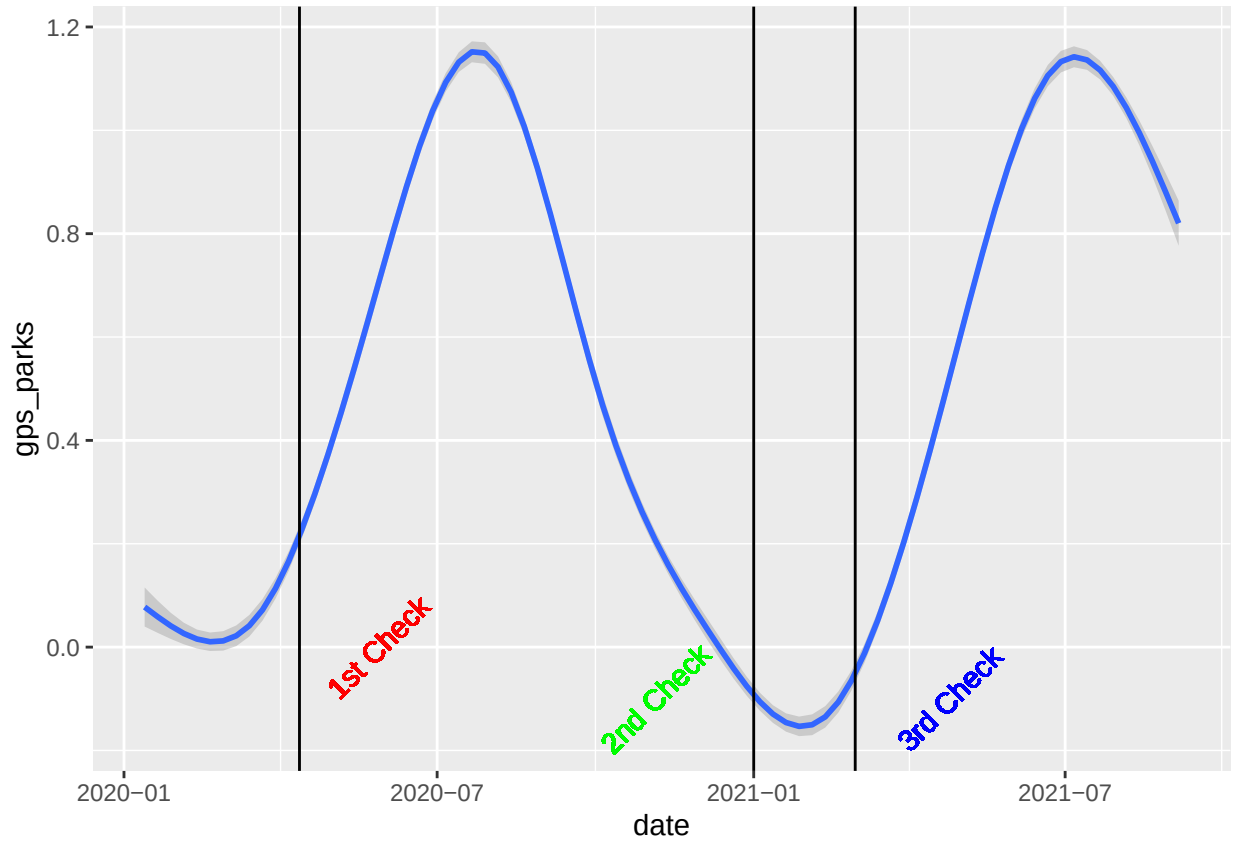


```
ggplot(df, aes(x = gps_retail_and_recreation, y = gps_parks)) +
  geom_point(aes(color = stateabbrev))
```

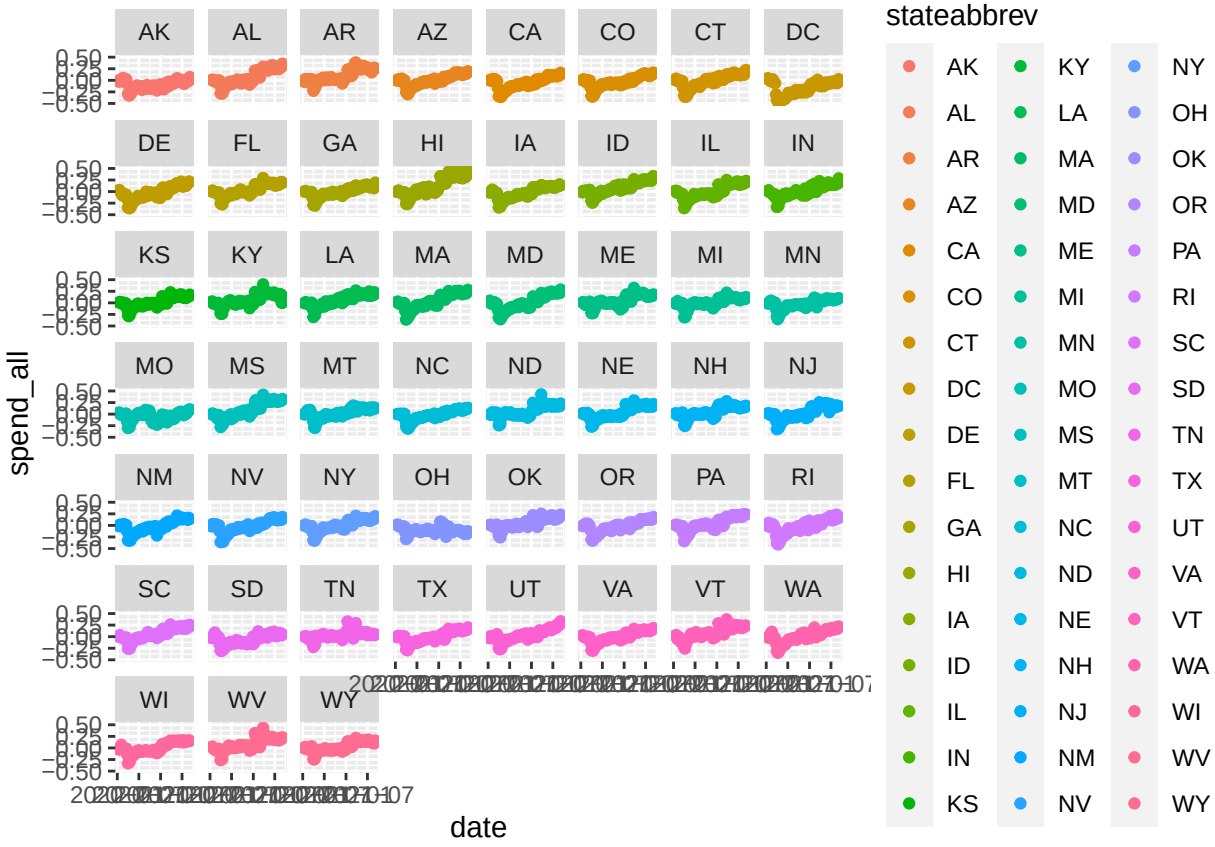



```
# https://stackoverflow.com/questions/38815996/r-adding-geom-vline-labels-to-geom-histogram-labels

ggplot(df, aes(x = date, y = gps_parks)) +
  geom_smooth() +
  geom_vline(xintercept = as.Date("2020-04-12")) +
  geom_vline(xintercept = as.Date("2021-01-01")) +
  geom_vline(xintercept = as.Date("2021-03-01")) +
  geom_text(aes(x = as.Date("2020-05-28"), label = "1st Check"), color = "red", angle = 45, y = 0) +
  geom_text(aes(x = as.Date("2020-11-05"), label = "2nd Check"), color = "green", angle = 45, y = -.1) +
  geom_text(aes(x = as.Date("2021-04-25"), label = "3rd Check"), color = "blue", angle = 45, y = -.1)
```

```
## `geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
```




```
# https://stackoverflow.com/questions/38815996/r-adding-geom-vline-labels-to-geom-histogram-labels

ggplot(df_weekly, aes(x = date, y = spend_all, color = stateabbrev)) +
  geom_point() +
  facet_wrap(. ~ stateabbrev)
```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OH
OK
OR
PA
RI
SC
SD
TN
TX
UT
VA
VT
WA
WI
WV
WY
spend_all
date
stateabbrev
AK
AL
AR
AZ
CA
CO
CT
DC
DE
FL
GA
HI
IA
ID
IL
IN
KS
KY
LA
MA
MD
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NC
ND
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