

Seasonal Difference Exploration

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Explore the seasonal differences

```
load("./dt_long.RData")
load("./ID_in.RData")
load("./beta.res.postmean.RData")

dt_season <-
  dt_long %>%
  drop_na() %>%
  filter(ID %in% ID_in) %>%
  distinct(ID, .keep_all = TRUE) %>%
  select(ID, Season, Month, Nature) %>%
  mutate(Month = factor(Month, levels = month.name))

season_diff <-
  merge(dt_season, beta.res.postmean, by = c("ID")) %>%
  janitor::clean_names()

# Beta0
intercept.fit <- lm(intercept ~ month + season + nature, data = season_diff)
# Beta1
wind_prev.fit <- lm(wind_prev ~ month + season + nature, data = season_diff)
# Beta2
lat_change.fit <- lm(lat_change ~ month + season + nature, data = season_diff)
# Beta3
long_change.fit <- lm(long_change ~ month + season + nature, data = season_diff)
#Beta4
wind_change.fit <- lm(wind_change ~ month + season + nature, data = season_diff)

summary(intercept.fit)

##
## Call:
## lm(formula = intercept ~ month + season + nature, data = season_diff)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.43290 -0.03789  0.00174  0.04044  0.38462
##
## Coefficients:
```

```
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)    4.4726149  0.3984068  11.226 <2e-16 ***
## monthApril     0.0246025  0.1114258   0.221  0.8253
## monthMay       0.0219186  0.0939571   0.233  0.8156
## monthJune      0.0329888  0.0922933   0.357  0.7209
## monthJuly      0.0142084  0.0918984   0.155  0.8772
## monthAugust    -0.0136201  0.0913914  -0.149  0.8816
## monthSeptember -0.0048868  0.0913319  -0.054  0.9573
## monthOctober   0.0128114  0.0914294   0.140  0.8886
## monthNovember  0.0190219  0.0924860   0.206  0.8371
## monthDecember  0.0092909  0.0977992   0.095  0.9243
## season        -0.0003376  0.0001937  -1.743  0.0818 .
## natureET       -0.0021562  0.0279019  -0.077  0.9384
## natureNR       -0.0287362  0.0431032  -0.667  0.5052
## natureSS       0.0140068  0.0186560   0.751  0.4530
## natureTS       0.0079759  0.0145389   0.549  0.5835
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.09029 on 682 degrees of freedom
## Multiple R-squared:  0.02941,    Adjusted R-squared:  0.009489
## F-statistic: 1.476 on 14 and 682 DF,  p-value: 0.114
```

```
summary(wind_prev.fit)
```

```
##
## Call:
## lm(formula = wind_prev ~ month + season + nature, data = season_diff)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.135408 -0.019772  0.002105  0.021968  0.061444
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)    1.322e+00  1.242e-01  10.649 < 2e-16 ***
## monthApril     1.501e-02  3.473e-02   0.432 0.665695
## monthMay       2.391e-03  2.929e-02   0.082 0.934961
## monthJune      6.031e-03  2.877e-02   0.210 0.834022
## monthJuly      1.669e-02  2.865e-02   0.583 0.560364
## monthAugust    2.349e-02  2.849e-02   0.825 0.409864
## monthSeptember 2.609e-02  2.847e-02   0.916 0.359773
## monthOctober   2.146e-02  2.850e-02   0.753 0.451632
## monthNovember  2.406e-02  2.883e-02   0.835 0.404163
## monthDecember  8.984e-03  3.048e-02   0.295 0.768313
## season        -2.171e-04  6.037e-05  -3.597 0.000345 ***
## natureET       7.695e-03  8.697e-03   0.885 0.376607
## natureNR       3.330e-03  1.344e-02   0.248 0.804313
## natureSS       1.383e-03  5.815e-03   0.238 0.812064
## natureTS      -1.510e-03  4.532e-03  -0.333 0.739011
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02814 on 682 degrees of freedom
```

```
## Multiple R-squared:  0.06144,    Adjusted R-squared:  0.04218
## F-statistic: 3.189 on 14 and 682 DF,  p-value: 6.802e-05
```

```
summary(lat_change.fit)
```

```
##
## Call:
## lm(formula = lat_change ~ month + season + nature, data = season_diff)
##
## Residuals:
```

| | Min | 1Q | Median | 3Q | Max |
|--|----------|----------|---------|---------|---------|
| | -0.90354 | -0.07502 | 0.00761 | 0.07648 | 0.97035 |

```
##
## Coefficients:
```

| | Estimate | Std. Error | t value | Pr(> t) |
|----------------|------------|------------|---------|----------|
| (Intercept) | 8.069e-02 | 6.805e-01 | 0.119 | 0.906 |
| monthApril | 1.459e-02 | 1.903e-01 | 0.077 | 0.939 |
| monthMay | 5.984e-02 | 1.605e-01 | 0.373 | 0.709 |
| monthJune | -5.503e-03 | 1.576e-01 | -0.035 | 0.972 |
| monthJuly | -4.465e-03 | 1.570e-01 | -0.028 | 0.977 |
| monthAugust | -4.852e-02 | 1.561e-01 | -0.311 | 0.756 |
| monthSeptember | -3.464e-02 | 1.560e-01 | -0.222 | 0.824 |
| monthOctober | -2.586e-02 | 1.562e-01 | -0.166 | 0.869 |
| monthNovember | 2.520e-02 | 1.580e-01 | 0.159 | 0.873 |
| monthDecember | -5.250e-02 | 1.671e-01 | -0.314 | 0.753 |
| season | 1.464e-05 | 3.308e-04 | 0.044 | 0.965 |
| natureET | -6.146e-02 | 4.766e-02 | -1.290 | 0.198 |
| natureNR | 1.207e-02 | 7.363e-02 | 0.164 | 0.870 |
| natureSS | 2.600e-03 | 3.187e-02 | 0.082 | 0.935 |
| natureTS | -1.445e-02 | 2.483e-02 | -0.582 | 0.561 |

```
##
## Residual standard error: 0.1542 on 682 degrees of freedom
## Multiple R-squared:  0.02433,    Adjusted R-squared:  0.004304
## F-statistic: 1.215 on 14 and 682 DF,  p-value: 0.259
```

```
summary(long_change.fit)
```

```
##
## Call:
## lm(formula = long_change ~ month + season + nature, data = season_diff)
##
## Residuals:
```

| | Min | 1Q | Median | 3Q | Max |
|--|----------|----------|---------|---------|---------|
| | -0.30851 | -0.03786 | 0.00582 | 0.04176 | 0.51206 |

```
##
## Coefficients:
```

| | Estimate | Std. Error | t value | Pr(> t) |
|-------------|------------|------------|---------|----------|
| (Intercept) | -0.8167737 | 0.3602753 | -2.267 | 0.0237 * |
| monthApril | 0.0440972 | 0.1007613 | 0.438 | 0.6618 |
| monthMay | 0.0590220 | 0.0849644 | 0.695 | 0.4875 |
| monthJune | 0.0565121 | 0.0834600 | 0.677 | 0.4986 |
| monthJuly | 0.0345491 | 0.0831028 | 0.416 | 0.6777 |
| monthAugust | 0.0120729 | 0.0826444 | 0.146 | 0.8839 |

```
## monthSeptember 0.0220058 0.0825905 0.266 0.7900
## monthOctober 0.0351145 0.0826787 0.425 0.6712
## monthNovember 0.0298988 0.0836342 0.357 0.7208
## monthDecember 0.0448177 0.0884389 0.507 0.6125
## season 0.0002094 0.0001751 1.195 0.2323
## natureET -0.0298804 0.0252314 -1.184 0.2367
## natureNR -0.0339546 0.0389778 -0.871 0.3840
## natureSS 0.0136893 0.0168704 0.811 0.4174
## natureTS -0.0224699 0.0131474 -1.709 0.0879 .
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08165 on 682 degrees of freedom
## Multiple R-squared: 0.05026, Adjusted R-squared: 0.03076
## F-statistic: 2.578 on 14 and 682 DF, p-value: 0.001249
```

```
summary(wind_change.fit)
```

```
##
## Call:
## lm(formula = wind_change ~ month + season + nature, data = season_diff)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.40196 -0.04479 -0.00275  0.04672  0.35723
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.019e-01  3.888e-01   0.776   0.438
## monthApril    3.745e-02  1.087e-01   0.344   0.731
## monthMay     -1.189e-02  9.170e-02  -0.130   0.897
## monthJune     2.494e-02  9.008e-02   0.277   0.782
## monthJuly     1.483e-02  8.969e-02   0.165   0.869
## monthAugust   3.182e-02  8.920e-02   0.357   0.721
## monthSeptember 4.450e-02  8.914e-02   0.499   0.618
## monthOctober  3.568e-02  8.923e-02   0.400   0.689
## monthNovember 2.071e-02  9.026e-02   0.229   0.819
## monthDecember 8.542e-03  9.545e-02   0.089   0.929
## season        8.167e-05  1.890e-04   0.432   0.666
## natureET     -1.850e-02  2.723e-02  -0.679   0.497
## natureNR      7.376e-05  4.207e-02   0.002   0.999
## natureSS     -1.925e-02  1.821e-02  -1.057   0.291
## natureTS     -1.340e-02  1.419e-02  -0.944   0.345
##
## Residual standard error: 0.08812 on 682 degrees of freedom
## Multiple R-squared: 0.01967, Adjusted R-squared: -0.0004559
## F-statistic: 0.9773 on 14 and 682 DF, p-value: 0.4749
```