Appendix A - ADS506-01-FA22 - Final Project

Team 1

12/05/2022

RMarkdown global setup

```
knitr::opts_chunk$set(fig.align = 'center')
```

Load packages

```
library(AppliedPredictiveModeling)
#library(BioStatR)
library(car)
library(caret)
library(class)
library(corrplot)
#library(datasets)
library(e1071)
library(here)
library(Hmisc)
library(imputeTS)
library(lubridate)
#library(mlbench)
library(gridExtra)
library(psych)
#library(randomForest)
#library(RANN)
library(reshape2)
#library(rpart)
#library(rpart.plot)
library(scales)
library(tidyverse)
library(timetk)
#library(tsibble)
library(tseries)
library(zoo)

set.seed(1699)
```

Create custom function to generate boxplots and descriptive statistics for continuous variables

```
box_comp <- function(xcol = c(),
                     df = NA,
```

```
                    rtn_met = TRUE,
                    grph_title = "All",
                    box = TRUE) {
# Define function to produce formatted boxplots
sig <- 3
metrics_df01 <- data.frame(metric = c("",
                                      "Total N:",
                                      "Count",
                                      "NA Count",
                                      "Mean",
                                      "Median",
                                      "Standard Deviation",
                                      "Variance",
                                      "Range",
                                      "Min",
                                      "Max",
                                      "25th Percentile",
                                      "75th Percentile",
                                      "Subset w/o Outliers:",
                                      "Count",
                                      "%",
                                      "Outlier %",
                                      "NA Count",
                                      "Mean",
                                      "Median",
                                      "Standard Deviation",
                                      "Variance",
                                      "Range",
                                      "Min",
                                      "Max"
                                      ))
for(var in xcol) {
  df_s1 <- df[, var]
  df_s1s1 <-data.frame(df_s1)
  df_s1_fit <- preProcess(df_s1s1,
                          method = c("center", "scale"))
  df_s1_trans <- predict(df_s1_fit, df_s1s1)

  # Calculate quartiles
  var_iqr_lim <- IQR(df_s1) * 1.5
  var_q1 <- quantile(df_s1, probs = c(.25))
  var_otlow <- var_q1 - var_iqr_lim
  var_q3 <- quantile(df_s1, probs = c(.75))
  var_othigh <- var_q3 + var_iqr_lim

  # Subset non-outlier data
  var_non_otlr_df01 <- subset(df, (abs(df_s1_trans) <= 3))
  #var_non_otlr_df01 <- subset(df, (df_s1 > var_otlow & df_s1 < var_othigh))
  df_s2 <- var_non_otlr_df01[, var]

  # Begin calculating measures of centrality & dispersion
  var_mean <- mean(df_s1, na.remove = TRUE)
  var_non_otlr_df01_trunc_mean <- mean(df_s2, na.remove = TRUE)
```

```r
    var_med <- median(df_s1)
    var_non_otlr_df01_trunc_med <- median(df_s2)
    var_mode <- mode(df_s1)
    var_non_otlr_df01_trunc_mode <- mode(df_s2)
    var_stde <- sd(df_s1)
    var_non_otlr_df01_trunc_stde <- sd(df_s2)
    var_vari <- var(df_s1)
    var_non_otlr_df01_trunc_vari <- var(df_s2)
    var01_min <- min(df[, var])
    var01_max <- max(df[, var])
    var01_range <- var01_max - var01_min
    var02_min <- min(var_non_otlr_df01[, var])
    var02_max <- max(var_non_otlr_df01[, var])
    var02_range <- var02_max - var02_min

    # Configure y-axis min & max to sync graphs
    plot_min <- min(var01_min, var02_min)
    plot_max <- max(var01_max, var02_max)
    nonoutlier_perc <- round((as.numeric(dim(var_non_otlr_df01)[1] /
↪   as.numeric(dim(df)[1]))) * 100, 1)

    # Fill in metrics table
    measure_val01 <- c(paste0("Variable: ", var),
                       "",
                       as.character(dim(df)[1]),
                       sum(is.na(df_s1)),
                       round(var_mean, sig),
                       round(var_med, sig),
                       round(var_stde, sig),
                       round(var_vari, sig),
                       round(var01_range, sig),
                       round(var01_min, sig),
                       round(var01_max, sig),
                       round(var_q1, sig),
                       round(var_q3, sig),
                       "",
                       as.character(dim(var_non_otlr_df01)[1]),
                       paste0(nonoutlier_perc, "%"),
                       paste0(round(100 - nonoutlier_perc, 1), "%"),
                       sum(is.na(df_s2)),
                       round(var_non_otlr_df01_trunc_mean, sig),
                       round(var_non_otlr_df01_trunc_med, sig),
                       round(var_non_otlr_df01_trunc_stde, sig),
                       round(var_non_otlr_df01_trunc_vari, sig),
                       round(var02_range, sig),
                       round(var02_min, sig),
                       round(var02_max, sig)
                       )

    var_name <- paste0("Variable: ", var)
    metrics_df01[, ncol(metrics_df01) + 1] <- measure_val01
}
  # Format boxplot titles based on number of plots
```

```r
  if(box == TRUE) {
    if(length(xcol == 1)) {
      boxplot(df,
              ylab = "Parameter Values",
              main = paste0("Boxplot for ", xcol, " (", grph_title, ")"))
    }
    else {
      boxplot(df,
              ylab = "Parameter Values",
              main = paste0("Boxplot for Multiple Parameters", " (", grph_title, ")"))

    }
  }
  # Return and print metrics table(s)
  if(rtn_met == TRUE) {
    print(metrics_df01)
    return(metrics_df01)
  }
}
```

Import and merge Datasets

```r
# Import 4 separate CSV files
curr_dir01 <- here("data/Ocean Water/water_quality_1990_1999_datasd.csv")
#curr_dir01
curr_dir02 <- here("data/Ocean Water/water_quality_2000_2010_datasd.csv")
#curr_dir02
curr_dir03 <- here("data/Ocean Water/water_quality_2011_2019_datasd.csv")
#curr_dir03
curr_dir04 <- here("data/Ocean Water/water_quality_2020_2021_datasd.csv")
#curr_dir04

#setwd('C:/Users/Connie/Documents/Masters Applied Data Science USD/506/Week2/Final
↪  Project/Ocean WAter')

#owt_df01a <- read_csv("water_quality_1990_1999_datasd.csv", col_types =
↪  cols(date_sample=col_date("%Y-%m-%d")))
#owt_df01b <- read_csv("water_quality_2000_2010_datasd.csv", col_types =
↪  cols(date_sample=col_date("%Y-%m-%d")))
#owt_df01c <- read_csv("water_quality_2011_2019_datasd.csv", col_types =
↪  cols(date_sample=col_date("%Y-%m-%d")))
#owt_df01d <- read_csv("water_quality_2020_2021_datasd.csv", col_types =
↪  cols(date_sample=col_date("%Y-%m-%d")))

owt_df01a <- read.csv(curr_dir01, header = TRUE, sep = ",")
owt_df01b <- read.csv(curr_dir02, header = TRUE, sep = ",")
owt_df01c <- read.csv(curr_dir03, header = TRUE, sep = ",")
owt_df01d <- read.csv(curr_dir04, header = TRUE, sep = ",")


# Merge 4 seperate dataframes into 1
owt_df01 <- rbind(owt_df01a, owt_df01b, owt_df01c, owt_df01d)
```

```r
# Citation: https://gist.github.com/makexu93/05ef0f34306d3ab6c9ca8ddcd702cee1
owt_df01 <- owt_df01[order(owt_df01$date_sample, decreasing = FALSE), ]
row.names(owt_df01) <- NULL

print(head(owt_df01, 17))
```

```
##        sample station depth_m date_sample        time project   parameter
## 1  9011158743      C5     9.0  1990-11-15                PLOO CHLOROPHYLL
## 2  9011158743      C5     9.0  1990-11-15                PLOO     DENSITY
## 3  9011158743      C5     9.0  1990-11-15                PLOO          DO
## 4  9011158743      C5     9.0  1990-11-15                PLOO          PH
## 5  9011158743      C5     9.0  1990-11-15                PLOO    SALINITY
## 6  9011158743      C5     9.0  1990-11-15                PLOO        TEMP
## 7  9011158743      C5     9.0  1990-11-15                PLOO         XMS
## 8  9011158834     I25     6.0  1990-11-15                SBOO CHLOROPHYLL
## 9  9011158834     I25     6.0  1990-11-15                SBOO     DENSITY
## 10 9011158834     I25     6.0  1990-11-15                SBOO          DO
## 11 9011158834     I25     6.0  1990-11-15                SBOO          PH
## 12 9011158834     I25     6.0  1990-11-15                SBOO    SALINITY
## 13 9011158834     I25     6.0  1990-11-15                SBOO        TEMP
## 14 9011158834     I25     6.0  1990-11-15                SBOO         XMS
## 15   KE000001      A1     1.5  1991-01-02 7:18:00 PST    PLOO      ENTERO
## 16   KE000001      A1     1.5  1991-01-02 7:18:00 PST    PLOO       FECAL
## 17  CTD000001      A1     1.5  1991-01-02 7:18:00 PST    PLOO        TEMP
##    qualifier    value      units
## 1               0.870       ug/L
## 2              23.855    sigma-t
## 3               6.550       mg/L
## 4               8.080         pH
## 5              33.617        ppt
## 6              19.430          C
## 7              44.850          %
## 8               1.270       ug/L
## 9              23.853    sigma-t
## 10              7.410       mg/L
## 11              8.180         pH
## 12             33.574        ppt
## 13             19.310          C
## 14             75.600          %
## 15         e  200.000 CFU/100 mL
## 16         > 1200.000 CFU/100 mL
## 17             14.500          C
```

```r
describe(owt_df01)
```

```
##             vars       n   mean      sd min     max   range   se
## sample         1 1236769    NaN      NA Inf    -Inf    -Inf   NA
## station        2 1236769    NaN      NA Inf    -Inf    -Inf   NA
## depth_m        3 1152608  19.38   25.07   1     116     115 0.02
## date_sample    4 1236769    NaN      NA Inf    -Inf    -Inf   NA
## time           5 1236769    NaN      NA Inf    -Inf    -Inf   NA
## project        6 1236769    NaN      NA Inf    -Inf    -Inf   NA
## parameter      7 1236769    NaN      NA Inf    -Inf    -Inf   NA
```

```
## qualifier      8 1236769    NaN      NA Inf    -Inf    -Inf   NA
## value          9 1231466 124.24 1785.21 -37 1100000 1100037 1.61
## units         10 1236769    NaN      NA Inf    -Inf    -Inf   NA
```

```
#write.csv(owt_df01, "C:/Users/acarr/Sync/Programming/Python and R/ADS Markdown
↪  Files/ADS-506 Markdown/Final Project/data/Ocean Water/ocean_df01.csv")
```

Factorize and format column types; print NA counts

```
# List of parameter values
param_lst01 <- c("CHLOROPHYLL",
                 "DENSITY",
                 "DO",
                 "ENTERO",
                 "FECAL",
                 "OG",
                 "PH",
                 "SALINITY",
                 "SUSO",
                 "TEMP",
                 "TOTAL",
                 "XMS")

# List of col names
col_lst01 <- c("sample",
               "station",
               "date_sample",
               "time",
               "project",
               "parameter",
               "qualifier",
               "units")

# Citation: https://www.geeksforgeeks.org/find-columns-and-rows-with-na-in-r-dataframe/
owt_df02 <- owt_df01
for(c in col_lst01) {
  owt_df02[, c] <- as.factor(owt_df02[, c] )
}

# Generate NA summary tables
# Citation: https://www.geeksforgeeks.org/replace-character-value-with-na-in-r/
owt_df02[owt_df02 == ""] <- NA
print(head(owt_df02, 17))
```

```
##        sample station depth_m date_sample        time project   parameter
## 1  9011158743      C5     9.0  1990-11-15        <NA>    PLOO CHLOROPHYLL
## 2  9011158743      C5     9.0  1990-11-15        <NA>    PLOO     DENSITY
## 3  9011158743      C5     9.0  1990-11-15        <NA>    PLOO          DO
## 4  9011158743      C5     9.0  1990-11-15        <NA>    PLOO          PH
## 5  9011158743      C5     9.0  1990-11-15        <NA>    PLOO    SALINITY
## 6  9011158743      C5     9.0  1990-11-15        <NA>    PLOO        TEMP
## 7  9011158743      C5     9.0  1990-11-15        <NA>    PLOO         XMS
## 8  9011158834     I25     6.0  1990-11-15        <NA>    SBOO CHLOROPHYLL
## 9  9011158834     I25     6.0  1990-11-15        <NA>    SBOO     DENSITY
```

```
## 10 9011158834     I25     6.0  1990-11-15        <NA>    SBOO          DO
## 11 9011158834     I25     6.0  1990-11-15        <NA>    SBOO          PH
## 12 9011158834     I25     6.0  1990-11-15        <NA>    SBOO    SALINITY
## 13 9011158834     I25     6.0  1990-11-15        <NA>    SBOO        TEMP
## 14 9011158834     I25     6.0  1990-11-15        <NA>    SBOO         XMS
## 15   KE000001      A1     1.5  1991-01-02 7:18:00 PST    PLOO      ENTERO
## 16   KE000001      A1     1.5  1991-01-02 7:18:00 PST    PLOO       FECAL
## 17  CTD000001      A1     1.5  1991-01-02 7:18:00 PST    PLOO        TEMP
##    qualifier    value      units
## 1       <NA>    0.870       ug/L
## 2       <NA>   23.855    sigma-t
## 3       <NA>    6.550       mg/L
## 4       <NA>    8.080         pH
## 5       <NA>   33.617        ppt
## 6       <NA>   19.430          C
## 7       <NA>   44.850          %
## 8       <NA>    1.270       ug/L
## 9       <NA>   23.853    sigma-t
## 10      <NA>    7.410       mg/L
## 11      <NA>    8.180         pH
## 12      <NA>   33.574        ppt
## 13      <NA>   19.310          C
## 14      <NA>   75.600          %
## 15         e  200.000 CFU/100 mL
## 16         > 1200.000 CFU/100 mL
## 17      <NA>   14.500          C
```

```
owt_df02_na <- sapply(owt_df02, function(x) sum(is.na(x)))
owt_df02_notna <- sapply(owt_df02, function(x) sum(!is.na(x)))
owt_df02_tbl01 <- rbind(owt_df02_notna, owt_df02_na)
owt_df02_tbl02 <- rbind(owt_df02_tbl01, round(prop.table(owt_df02_tbl01, margin = 2), 4))
print("All parameters")
```

```
## [1] "All parameters"
```

```
print(owt_df02_tbl02)
```

```
##                 sample station     depth_m date_sample       time project
## owt_df02_notna 1236769 1236769 1152608.000     1236769 1075929.00 1236769
## owt_df02_na          0       0   84161.000           0  160840.00       0
## owt_df02_notna       1       1       0.932           1       0.87       1
## owt_df02_na          0       0       0.068           0       0.13       0
##                parameter   qualifier        value   units
## owt_df02_notna   1236769 394867.0000 1231466.0000 1236769
## owt_df02_na            0 841902.0000    5303.0000       0
## owt_df02_notna         1      0.3193       0.9957       1
## owt_df02_na            0      0.6807       0.0043       0
```

```
owt_df02a <- owt_df02[which(is.na(owt_df02), arr.ind=TRUE), ]
#print(head(owt_df02a, 17))

for(p in param_lst01) {
  df = owt_df02[owt_df02$parameter == p, ]
  print(head(df[which(is.na(df$value), arr.ind=TRUE), ], 17))
  df_na <- sapply(df, function(x) sum(is.na(x)))
```

```r
  df_notna <- sapply(df, function(x) sum(!is.na(x)))
  df_tbl01 <- rbind(df_notna, df_na)
  df_tbl02 <- rbind(df_tbl01, round(prop.table(df_tbl01, margin = 2), 4))
  rownames(df_tbl02) <- c("Not NA n", "NA n", "Not NA %", "NA %")
  print(p)
  print(df_tbl02) # This table w/ null counts and proportions for each feature not
  ↪  displayed for space purposes
}
```

```
##            sample station depth_m date_sample time project   parameter
## 272260 1229972635     B10     1.5  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272267 1229972638     B10    42.7  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272274 1229972633     B10    61.0  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272281 1229972634     B10    79.2  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272288 1229972637     B10    97.5  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272295 1229972636     B10   115.8  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272302 1229972643     B11     1.5  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272309 1229972639     B11    42.7  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272316 1229972642     B11    61.0  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272323 1229972641     B11    79.2  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272330 1229972640     B11    88.4  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272337 1229972644     B13     1.5  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272344 1229972648     B13    42.7  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272351 1229972647     B13    61.0  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272358 1229972646     B13    79.2  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272365 1229972649     B13    97.5  1997-12-29 <NA>    PLOO CHLOROPHYLL
## 272372 1229972645     B13   115.8  1997-12-29 <NA>    PLOO CHLOROPHYLL
##        qualifier value units
## 272260      <NA>    NA  ug/L
## 272267      <NA>    NA  ug/L
## 272274      <NA>    NA  ug/L
## 272281      <NA>    NA  ug/L
## 272288      <NA>    NA  ug/L
## 272295      <NA>    NA  ug/L
## 272302      <NA>    NA  ug/L
## 272309      <NA>    NA  ug/L
## 272316      <NA>    NA  ug/L
## 272323      <NA>    NA  ug/L
## 272330      <NA>    NA  ug/L
## 272337      <NA>    NA  ug/L
## 272344      <NA>    NA  ug/L
## 272351      <NA>    NA  ug/L
## 272358      <NA>    NA  ug/L
## 272365      <NA>    NA  ug/L
## 272372      <NA>    NA  ug/L
## [1] "CHLOROPHYLL"
##          sample station depth_m date_sample       time project parameter
## Not NA n  88471   88471   88471       88471 74093.0000   88471     88471
## NA n          0       0       0           0 14378.0000       0         0
## Not NA %      1       1       1           1     0.8375       1         1
## NA %          0       0       0           0     0.1625       0         0
##          qualifier      value units
## Not NA n         0 87911.0000 88471
```

```
## NA n         88471   560.0000     0
## Not NA %         0     0.9937     1
## NA %             1     0.0063     0
##            sample station depth_m date_sample         time project parameter
## 429235 1018012132     E16     1.5  2001-10-18  8:32:00 PST    PLOO   DENSITY
## 503878  513032821      C8     1.0  2003-05-13 10:30:00 PST    PLOO   DENSITY
## 547108  601042705      C4     1.0  2004-06-01 11:37:00 PST    PLOO   DENSITY
## 720423  702082492      A6     1.0  2008-07-02  9:42:00 PST    PLOO   DENSITY
## 720433  702082490      A6    12.0  2008-07-02  9:42:00 PST    PLOO   DENSITY
## 720443  702082491      A6    18.0  2008-07-02  9:42:00 PST    PLOO   DENSITY
## 720453  702082495      A7     1.0  2008-07-02  9:05:00 PST    PLOO   DENSITY
## 720463  702082493      A7    12.0  2008-07-02  9:05:00 PST    PLOO   DENSITY
## 720473  702082494      A7    18.0  2008-07-02  9:05:00 PST    PLOO   DENSITY
## 720483  702082498      C4     1.0  2008-07-02 11:45:00 PST    PLOO   DENSITY
## 720493  702082496      C4     3.0  2008-07-02 11:45:00 PST    PLOO   DENSITY
## 720503  702082497      C4     9.0  2008-07-02 11:45:00 PST    PLOO   DENSITY
## 720513  702082501      C5     1.0  2008-07-02 11:25:00 PST    PLOO   DENSITY
## 720523  702082499      C5     3.0  2008-07-02 11:25:00 PST    PLOO   DENSITY
## 720533  702082500      C5     9.0  2008-07-02 11:25:00 PST    PLOO   DENSITY
## 720543  702082504      C6     1.0  2008-07-02 11:12:00 PST    PLOO   DENSITY
## 720553  702082502      C6     3.0  2008-07-02 11:12:00 PST    PLOO   DENSITY
##        qualifier value   units
## 429235      <NA>    NA sigma-t
## 503878      <NA>    NA sigma-t
## 547108      <NA>    NA sigma-t
## 720423      <NA>    NA sigma-t
## 720433      <NA>    NA sigma-t
## 720443      <NA>    NA sigma-t
## 720453      <NA>    NA sigma-t
## 720463      <NA>    NA sigma-t
## 720473      <NA>    NA sigma-t
## 720483      <NA>    NA sigma-t
## 720493      <NA>    NA sigma-t
## 720503      <NA>    NA sigma-t
## 720513      <NA>    NA sigma-t
## 720523      <NA>    NA sigma-t
## 720533      <NA>    NA sigma-t
## 720543      <NA>    NA sigma-t
## 720553      <NA>    NA sigma-t
## [1] "DENSITY"
##          sample station depth_m date_sample       time project parameter
## Not NA n  88317   88317   88317       88317 73999.0000   88317     88317
## NA n          0       0       0           0 14318.0000       0         0
## Not NA %      1       1       1           1     0.8379       1         1
## NA %          0       0       0           0     0.1621       0         0
##          qualifier      value units
## Not NA n         0 88256.0000 88317
## NA n         88317    61.0000     0
## Not NA %         0     0.9993     1
## NA %             1     0.0007     0
##            sample station depth_m date_sample         time project parameter
## 82185   CTD014940     A11    42.7  1993-05-06 10:45:00 PST    PLOO        DO
## 168703 1024942994      A1     1.5  1994-10-24  9:10:00 PST    PLOO        DO
## 168713 1024942995      A1     3.0  1994-10-24  9:10:00 PST    PLOO        DO
```

```
## 168723 1024942996      A1     6.1  1994-10-24  9:10:00 PST    PLOO        DO
## 168733 1024942997      A1    12.2  1994-10-24  9:10:00 PST    PLOO        DO
## 168734 1024942998      A1    12.2  1994-10-24  9:10:00 PST    PLOO        DO
## 168748 1024942999      A1    18.3  1994-10-24  9:10:00 PST    PLOO        DO
## 237009  909962654      B2     1.5  1996-09-09 12:11:00 PST    PLOO        DO
## 237017  909962655      B2    12.2  1996-09-09 12:11:00 PST    PLOO        DO
## 237025  909962656      B2    18.3  1996-09-09 12:11:00 PST    PLOO        DO
## 369865  713002413      A1     1.5  2000-07-13 11:06:00 PST    PLOO        DO
## 369878  713002414      A1    12.2  2000-07-13 11:06:00 PST    PLOO        DO
## 369889  713002415      A1    18.3  2000-07-13 11:06:00 PST    PLOO        DO
## 373128  816002467      A7     1.5  2000-08-16  8:49:00 PST    PLOO        DO
## 373140  816002468      A7    12.2  2000-08-16  8:49:00 PST    PLOO        DO
## 373151  816002469      A7    18.3  2000-08-16  8:49:00 PST    PLOO        DO
## 375761  905002505      I6    27.4  2000-09-05 10:41:00 PST    SBOO        DO
##        qualifier value units
## 82185       <NA>    NA  mg/L
## 168703      <NA>    NA  mg/L
## 168713      <NA>    NA  mg/L
## 168723      <NA>    NA  mg/L
## 168733      <NA>    NA  mg/L
## 168734      <NA>    NA  mg/L
## 168748      <NA>    NA  mg/L
## 237009      <NA>    NA  mg/L
## 237017      <NA>    NA  mg/L
## 237025      <NA>    NA  mg/L
## 369865      <NA>    NA  mg/L
## 369878      <NA>    NA  mg/L
## 369889      <NA>    NA  mg/L
## 373128      <NA>    NA  mg/L
## 373140      <NA>    NA  mg/L
## 373151      <NA>    NA  mg/L
## 375761      <NA>    NA  mg/L
## [1] "DO"
##          sample station depth_m date_sample       time project parameter
## Not NA n 109542  109542  109542      109542 83392.0000  109542    109542
## NA n          0       0       0           0 26150.0000       0         0
## Not NA %      1       1       1           1     0.7613       1         1
## NA %          0       0       0           0     0.2387       0         0
##          qualifier      value  units
## Not NA n         0 109437.000 109542
## NA n        109542    105.000      0
## Not NA %         0      0.999      1
## NA %             1      0.001      0
##            sample station depth_m date_sample        time project parameter
## 25057    MO001828      A2     1.0  1991-10-09 8:27:00 PST    PLOO    ENTERO
## 81650    SH000903      D5      NA  1993-05-04        <NA>    PLOO    ENTERO
## 103629 1208931380      A2     3.0  1993-12-08 8:20:00 PST    PLOO    ENTERO
## 103642 1208931381      A2     6.1  1993-12-08 8:20:00 PST    PLOO    ENTERO
## 103655 1208931382      A2    12.2  1993-12-08 8:20:00 PST    PLOO    ENTERO
## 103668 1208931383      A2    18.3  1993-12-08 8:20:00 PST    PLOO    ENTERO
## 103701 1208931385      A2    30.5  1993-12-08 8:20:00 PST    PLOO    ENTERO
## 103714 1208931386      A2    36.6  1993-12-08 8:20:00 PST    PLOO    ENTERO
## 103727 1208931387      A2    42.7  1993-12-08 8:20:00 PST    PLOO    ENTERO
## 103740 1208931388      A2    48.8  1993-12-08 8:20:00 PST    PLOO    ENTERO
```

```
## 103753 1208931389      A2    54.9  1993-12-08 8:20:00 PST    PLOO    ENTERO
## 103812 1208931392      A3     3.0  1993-12-08 9:49:00 PST    PLOO    ENTERO
## 103825 1208931393      A3     6.1  1993-12-08 9:49:00 PST    PLOO    ENTERO
## 103838 1208931394      A3    12.2  1993-12-08 9:49:00 PST    PLOO    ENTERO
## 103851 1208931395      A3    18.3  1993-12-08 9:49:00 PST    PLOO    ENTERO
## 103882 1208931397      A3    30.5  1993-12-08 9:49:00 PST    PLOO    ENTERO
## 103895 1208931398      A3    36.6  1993-12-08 9:49:00 PST    PLOO    ENTERO
##        qualifier value      units
## 25057          e    NA CFU/100 mL
## 81650       <NA>    NA CFU/100 mL
## 103629      <NA>    NA CFU/100 mL
## 103642      <NA>    NA CFU/100 mL
## 103655      <NA>    NA CFU/100 mL
## 103668      <NA>    NA CFU/100 mL
## 103701      <NA>    NA CFU/100 mL
## 103714      <NA>    NA CFU/100 mL
## 103727      <NA>    NA CFU/100 mL
## 103740      <NA>    NA CFU/100 mL
## 103753      <NA>    NA CFU/100 mL
## 103812      <NA>    NA CFU/100 mL
## 103825      <NA>    NA CFU/100 mL
## 103838      <NA>    NA CFU/100 mL
## 103851      <NA>    NA CFU/100 mL
## 103882      <NA>    NA CFU/100 mL
## 103895      <NA>    NA CFU/100 mL
## [1] "ENTERO"
##          sample station     depth_m date_sample        time project parameter
## Not NA n 144341  144341 116186.0000      144341 144012.0000  144341    144341
## NA n          0       0  28155.0000           0    329.0000       0         0
## Not NA %      1       1      0.8049           1      0.9977       1         1
## NA %          0       0      0.1951           0      0.0023       0         0
##           qualifier       value  units
## Not NA n 136251.000 143075.0000 144341
## NA n       8090.000   1266.0000      0
## Not NA %      0.944      0.9912      1
## NA %          0.056      0.0088      0
##            sample station depth_m date_sample        time project parameter
## 39760    MO003378      B3    61.0  1992-03-04 9:23:00 PST    PLOO     FECAL
## 73538    MO002093      A4    79.2  1993-02-03 9:15:00 PST    PLOO     FECAL
## 81651    SH000903      D5      NA  1993-05-04        <NA>    PLOO     FECAL
## 82671    SH001257      D7      NA  1993-05-11 9:43:00 PST    PLOO     FECAL
## 103630 1208931380      A2     3.0  1993-12-08 8:20:00 PST    PLOO     FECAL
## 103643 1208931381      A2     6.1  1993-12-08 8:20:00 PST    PLOO     FECAL
## 103656 1208931382      A2    12.2  1993-12-08 8:20:00 PST    PLOO     FECAL
## 103669 1208931383      A2    18.3  1993-12-08 8:20:00 PST    PLOO     FECAL
## 103702 1208931385      A2    30.5  1993-12-08 8:20:00 PST    PLOO     FECAL
## 103715 1208931386      A2    36.6  1993-12-08 8:20:00 PST    PLOO     FECAL
## 103728 1208931387      A2    42.7  1993-12-08 8:20:00 PST    PLOO     FECAL
## 103741 1208931388      A2    48.8  1993-12-08 8:20:00 PST    PLOO     FECAL
## 103754 1208931389      A2    54.9  1993-12-08 8:20:00 PST    PLOO     FECAL
## 103813 1208931392      A3     3.0  1993-12-08 9:49:00 PST    PLOO     FECAL
## 103826 1208931393      A3     6.1  1993-12-08 9:49:00 PST    PLOO     FECAL
## 103839 1208931394      A3    12.2  1993-12-08 9:49:00 PST    PLOO     FECAL
## 103852 1208931395      A3    18.3  1993-12-08 9:49:00 PST    PLOO     FECAL
```

```
##        qualifier value      units
## 39760          <    NA CFU/100 mL
## 73538          <    NA CFU/100 mL
## 81651       <NA>    NA CFU/100 mL
## 82671       <NA>    NA CFU/100 mL
## 103630      <NA>    NA CFU/100 mL
## 103643      <NA>    NA CFU/100 mL
## 103656      <NA>    NA CFU/100 mL
## 103669      <NA>    NA CFU/100 mL
## 103702      <NA>    NA CFU/100 mL
## 103715      <NA>    NA CFU/100 mL
## 103728      <NA>    NA CFU/100 mL
## 103741      <NA>    NA CFU/100 mL
## 103754      <NA>    NA CFU/100 mL
## 103813      <NA>    NA CFU/100 mL
## 103826      <NA>    NA CFU/100 mL
## 103839      <NA>    NA CFU/100 mL
## 103852      <NA>    NA CFU/100 mL
## [1] "FECAL"
##          sample station     depth_m date_sample        time project parameter
## Not NA n 137649  137649 109633.0000      137649 137322.0000  137649    137649
## NA n          0       0  28016.0000           0    327.0000       0         0
## Not NA %      1       1      0.7965           1      0.9976       1         1
## NA %          0       0      0.2035           0      0.0024       0         0
##            qualifier      value  units
## Not NA n 127994.0000 136405.000 137649
## NA n       9655.0000   1244.000      0
## Not NA %      0.9299      0.991      1
## NA %          0.0701      0.009      0
##           sample station depth_m date_sample         time project parameter
## 112401 112941961      A1    12.2  1994-01-12  8:36:00 PST    PLOO        OG
## 125289 309941665      A4    79.2  1994-03-09 10:06:00 PST    PLOO        OG
## 136304 503941704      B5     1.5  1994-05-03 10:24:00 PST    PLOO        OG
## 136346 503941705      B5    24.4  1994-05-03 10:24:00 PST    PLOO        OG
## 136396 503941706      B5    61.0  1994-05-03 10:24:00 PST    PLOO        OG
## 136772 504941833      A2    24.4  1994-05-04  8:02:00 PST    PLOO        OG
## 137186 504941844      A6     1.5  1994-05-04  9:17:00 PST    PLOO        OG
## 137212 504941845      A6    12.2  1994-05-04  9:17:00 PST    PLOO        OG
## 137213 504941846      A6    12.2  1994-05-04  9:17:00 PST    PLOO        OG
## 137223 504941847      A6    18.3  1994-05-04  9:17:00 PST    PLOO        OG
## 137485 505941970      A7     1.5  1994-05-05 10:19:00 PST    PLOO        OG
## 137511 505941971      A7    12.2  1994-05-05 10:19:00 PST    PLOO        OG
## 137512 505941972      A7    12.2  1994-05-05 10:19:00 PST    PLOO        OG
## 137522 505941973      A7    18.3  1994-05-05 10:19:00 PST    PLOO        OG
## 137532 505941974      B1     1.5  1994-05-05  7:50:00 PST    PLOO        OG
## 137574 505941975      B1    24.4  1994-05-05  7:50:00 PST    PLOO        OG
## 137575 505941976      B1    24.4  1994-05-05  7:50:00 PST    PLOO        OG
##        qualifier value units
## 112401      <NA>    NA  mg/L
## 125289      <NA>    NA  mg/L
## 136304      <NA>    NA  mg/L
## 136346      <NA>    NA  mg/L
## 136396      <NA>    NA  mg/L
## 136772      <NA>    NA  mg/L
```

```
## 137186      <NA>    NA  mg/L
## 137212      <NA>    NA  mg/L
## 137213      <NA>    NA  mg/L
## 137223      <NA>    NA  mg/L
## 137485      <NA>    NA  mg/L
## 137511      <NA>    NA  mg/L
## 137512      <NA>    NA  mg/L
## 137522      <NA>    NA  mg/L
## 137532      <NA>    NA  mg/L
## 137574      <NA>    NA  mg/L
## 137575      <NA>    NA  mg/L
## [1] "OG"
##          sample station depth_m date_sample      time project parameter
## Not NA n   7944    7944    7944        7944 7940.0000    7944      7944
## NA n          0       0       0           0    4.0000       0         0
## Not NA %      1       1       1           1    0.9995       1         1
## NA %          0       0       0           0    0.0005       0         0
##          qualifier     value units
## Not NA n 7673.0000 7922.0000  7944
## NA n      271.0000   22.0000     0
## Not NA %    0.9659    0.9972     1
## NA %        0.0341    0.0028     0
##            sample station depth_m date_sample         time project parameter
## 168706 1024942994      A1     1.5  1994-10-24  9:10:00 PST    PLOO        PH
## 168716 1024942995      A1     3.0  1994-10-24  9:10:00 PST    PLOO        PH
## 168726 1024942996      A1     6.1  1994-10-24  9:10:00 PST    PLOO        PH
## 168737 1024942997      A1    12.2  1994-10-24  9:10:00 PST    PLOO        PH
## 168738 1024942998      A1    12.2  1994-10-24  9:10:00 PST    PLOO        PH
## 168751 1024942999      A1    18.3  1994-10-24  9:10:00 PST    PLOO        PH
## 332755  923992590      A1     1.5  1999-09-23  7:40:00 PST    PLOO        PH
## 332767  923992591      A1    12.2  1999-09-23  7:40:00 PST    PLOO        PH
## 332778  923992592      A1    18.3  1999-09-23  7:40:00 PST    PLOO        PH
## 332799  923992593      A6     1.5  1999-09-23  8:47:00 PST    PLOO        PH
## 332810  923992594      A6    12.2  1999-09-23  8:47:00 PST    PLOO        PH
## 332821  923992595      A6    18.3  1999-09-23  8:47:00 PST    PLOO        PH
## 332833  923992596      A7     1.5  1999-09-23  7:57:00 PST    PLOO        PH
## 332844  923992597      A7    12.2  1999-09-23  7:57:00 PST    PLOO        PH
## 332855  923992598      A7    18.3  1999-09-23  7:57:00 PST    PLOO        PH
## 332866  923992599      C4     1.5  1999-09-23 10:24:00 PST    PLOO        PH
## 332877  923992600      C4     3.0  1999-09-23 10:24:00 PST    PLOO        PH
##        qualifier value units
## 168706      <NA>    NA    pH
## 168716      <NA>    NA    pH
## 168726      <NA>    NA    pH
## 168737      <NA>    NA    pH
## 168738      <NA>    NA    pH
## 168751      <NA>    NA    pH
## 332755      <NA>    NA    pH
## 332767      <NA>    NA    pH
## 332778      <NA>    NA    pH
## 332799      <NA>    NA    pH
## 332810      <NA>    NA    pH
## 332821      <NA>    NA    pH
## 332833      <NA>    NA    pH
```

```
## 332844      <NA>    NA    pH
## 332855      <NA>    NA    pH
## 332866      <NA>    NA    pH
## 332877      <NA>    NA    pH
## [1] "PH"
##          sample station depth_m date_sample       time project parameter
## Not NA n 107818  107818  107818      107818 81668.0000  107818    107818
## NA n          0       0       0           0 26150.0000       0         0
## Not NA %      1       1       1           1     0.7575       1         1
## NA %          0       0       0           0     0.2425       0         0
##          qualifier       value  units
## Not NA n         0 107564.0000 107818
## NA n        107818    254.0000      0
## Not NA %         0      0.9976      1
## NA %             1      0.0024      0
##            sample station depth_m date_sample         time project parameter
## 82188   CTD014940     A11    42.7  1993-05-06 10:45:00 PST    PLOO  SALINITY
## 168707 1024942994      A1     1.5  1994-10-24  9:10:00 PST    PLOO  SALINITY
## 168717 1024942995      A1     3.0  1994-10-24  9:10:00 PST    PLOO  SALINITY
## 168727 1024942996      A1     6.1  1994-10-24  9:10:00 PST    PLOO  SALINITY
## 168739 1024942997      A1    12.2  1994-10-24  9:10:00 PST    PLOO  SALINITY
## 168740 1024942998      A1    12.2  1994-10-24  9:10:00 PST    PLOO  SALINITY
## 168752 1024942999      A1    18.3  1994-10-24  9:10:00 PST    PLOO  SALINITY
## 369870  713002413      A1     1.5  2000-07-13 11:06:00 PST    PLOO  SALINITY
## 369882  713002414      A1    12.2  2000-07-13 11:06:00 PST    PLOO  SALINITY
## 369893  713002415      A1    18.3  2000-07-13 11:06:00 PST    PLOO  SALINITY
## 373133  816002467      A7     1.5  2000-08-16  8:49:00 PST    PLOO  SALINITY
## 373144  816002468      A7    12.2  2000-08-16  8:49:00 PST    PLOO  SALINITY
## 373155  816002469      A7    18.3  2000-08-16  8:49:00 PST    PLOO  SALINITY
## 429241 1018012132     E16     1.5  2001-10-18  8:32:00 PST    PLOO  SALINITY
## 468131  813022786      C6     6.0  2002-08-13 11:10:00 PST    PLOO  SALINITY
## 503883  513032821      C8     1.0  2003-05-13 10:30:00 PST    PLOO  SALINITY
## 547113  601042705      C4     1.0  2004-06-01 11:37:00 PST    PLOO  SALINITY
##        qualifier value units
## 82188       <NA>    NA   ppt
## 168707      <NA>    NA   ppt
## 168717      <NA>    NA   ppt
## 168727      <NA>    NA   ppt
## 168739      <NA>    NA   ppt
## 168740      <NA>    NA   ppt
## 168752      <NA>    NA   ppt
## 369870      <NA>    NA   ppt
## 369882      <NA>    NA   ppt
## 369893      <NA>    NA   ppt
## 373133      <NA>    NA   ppt
## 373144      <NA>    NA   ppt
## 373155      <NA>    NA   ppt
## 429241      <NA>    NA   ppt
## 468131      <NA>    NA   ppt
## 503883      <NA>    NA   ppt
## 547113      <NA>    NA   ppt
## [1] "SALINITY"
##          sample station depth_m date_sample       time project parameter
## Not NA n 109492  109492  109492      109492 83351.0000  109492    109492
```

```
## NA n          0       0       0           0 26141.0000       0         0
## Not NA %      1       1       1           1     0.7613       1         1
## NA %          0       0       0           0     0.2387       0         0
##          qualifier       value  units
## Not NA n         0 109318.0000 109492
## NA n        109492    174.0000      0
## Not NA %         0      0.9984      1
## NA %             1      0.0016      0
##            sample station depth_m date_sample         time project parameter
## 182188  119951890      B1    61.0  1995-01-19  7:25:00 PST    PLOO      SUSO
## 197840  413951394      B9    97.5  1995-04-13 11:32:00 PST    PLOO      SUSO
## 236137  821961617      B9     1.5  1996-08-21  8:23:00 PST    PLOO      SUSO
## 236146  821961618      B9    42.7  1996-08-21  8:23:00 PST    PLOO      SUSO
## 236171  821961619      B9    97.5  1996-08-21  8:23:00 PST    PLOO      SUSO
## 236208  821961620     E10     1.5  1996-08-21 10:58:00 PST    PLOO      SUSO
## 236217  821961621     E10    42.7  1996-08-21 10:58:00 PST    PLOO      SUSO
## 236242  821961622     E10    88.4  1996-08-21 10:58:00 PST    PLOO      SUSO
## 237106  910961040      A1    12.2  1996-09-10  7:23:00 PST    PLOO      SUSO
## 237115  910961041      A1    18.3  1996-09-10  7:23:00 PST    PLOO      SUSO
## 237125  910961042      A6     1.5  1996-09-10  8:45:00 PST    PLOO      SUSO
## 237143  910961044      A6    18.3  1996-09-10  8:45:00 PST    PLOO      SUSO
## 237153  910961045      A7     1.5  1996-09-10  8:13:00 PST    PLOO      SUSO
## 237162  910961046      A7    12.2  1996-09-10  8:13:00 PST    PLOO      SUSO
## 262334  814971868      A6    18.3  1997-08-14  9:00:00 PST    PLOO      SUSO
## 267067 1015971437      E5    42.7  1997-10-15 12:28:00 PST    PLOO      SUSO
## 278347  311981070     B12     1.5  1998-03-11  7:48:00 PST    PLOO      SUSO
##        qualifier value units
## 182188      <NA>    NA  mg/L
## 197840      <NA>    NA  mg/L
## 236137      <NA>    NA  mg/L
## 236146      <NA>    NA  mg/L
## 236171      <NA>    NA  mg/L
## 236208      <NA>    NA  mg/L
## 236217      <NA>    NA  mg/L
## 236242      <NA>    NA  mg/L
## 237106      <NA>    NA  mg/L
## 237115      <NA>    NA  mg/L
## 237125      <NA>    NA  mg/L
## 237143      <NA>    NA  mg/L
## 237153      <NA>    NA  mg/L
## 237162      <NA>    NA  mg/L
## 262334      <NA>    NA  mg/L
## 267067      <NA>    NA  mg/L
## 278347      <NA>    NA  mg/L
## [1] "SUSO"
##          sample station depth_m date_sample       time project parameter
## Not NA n  27543   27543   27543       27543 27538.0000   27543     27543
## NA n          0       0       0           0     5.0000       0         0
## Not NA %      1       1       1           1     0.9998       1         1
## NA %          0       0       0           0     0.0002       0         0
##           qualifier     value units
## Not NA n  1290.0000 27515.000 27543
## NA n     26253.0000    28.000     0
## Not NA %     0.0468     0.999     1
```

```
## NA %         0.9532     0.001     0
##          sample station depth_m date_sample         time project parameter
## 81483 CTD013369      K4    18.3  1993-05-03  7:07:00 PST    PLOO      TEMP
## 82189 CTD014940     A11    42.7  1993-05-06 10:45:00 PST    PLOO      TEMP
## 82454 CTD013374      K4    18.3  1993-05-06  8:52:00 PST    PLOO      TEMP
## 82871 CTD013384      K4    18.3  1993-05-12  7:36:00 PST    PLOO      TEMP
## 83293 CTD008245      C6     1.5  1993-05-19 12:10:00 PST    PLOO      TEMP
## 83297 CTD008246      C6     3.0  1993-05-19 12:10:00 PST    PLOO      TEMP
## 83301 CTD008247      C6     6.1  1993-05-19 12:10:00 PST    PLOO      TEMP
## 83495 CTD013399      K4    18.3  1993-05-20  7:20:00 PST    PLOO      TEMP
## 83500 CTD008251      C6     1.5  1993-05-21 12:58:00 PST    PLOO      TEMP
## 83504 CTD008252      C6     3.0  1993-05-21 12:58:00 PST    PLOO      TEMP
## 83508 CTD008253      C6     6.1  1993-05-21 12:58:00 PST    PLOO      TEMP
## 83562 CTD004913      A7     1.5  1993-05-24  8:31:00 PST    PLOO      TEMP
## 83567 CTD004914      A7     3.0  1993-05-24  8:31:00 PST    PLOO      TEMP
## 83572 CTD004915      A7     6.1  1993-05-24  8:31:00 PST    PLOO      TEMP
## 83577 CTD004916      A7    12.2  1993-05-24  8:31:00 PST    PLOO      TEMP
## 83582 CTD004917      A7    18.3  1993-05-24  8:31:00 PST    PLOO      TEMP
## 83652 CTD009898      C7    18.3  1993-05-24  9:12:00 PST    PLOO      TEMP
##       qualifier value units
## 81483      <NA>    NA     C
## 82189      <NA>    NA     C
## 82454      <NA>    NA     C
## 82871      <NA>    NA     C
## 83293      <NA>    NA     C
## 83297      <NA>    NA     C
## 83301      <NA>    NA     C
## 83495      <NA>    NA     C
## 83500      <NA>    NA     C
## 83504      <NA>    NA     C
## 83508      <NA>    NA     C
## 83562      <NA>    NA     C
## 83567      <NA>    NA     C
## 83572      <NA>    NA     C
## 83577      <NA>    NA     C
## 83582      <NA>    NA     C
## 83652      <NA>    NA     C
## [1] "TEMP"
##          sample station depth_m date_sample        time project parameter
## Not NA n 139066  139066  139066      139066 112709.0000  139066    139066
## NA n          0       0       0           0  26357.0000       0         0
## Not NA %      1       1       1           1      0.8105       1         1
## NA %          0       0       0           0      0.1895       0         0
##          qualifier       value  units
## Not NA n         0 139046.0000 139066
## NA n        139066     20.0000      0
## Not NA %         0      0.9999      1
## NA %             1      0.0001      0
##            sample station depth_m date_sample        time project parameter
## 81652    SH000903      D5      NA  1993-05-04        <NA>    PLOO     TOTAL
## 82672    SH001257      D7      NA  1993-05-11 9:43:00 PST    PLOO     TOTAL
## 101335 1124931032      C6     1.5  1993-11-24 8:23:00 PST    PLOO     TOTAL
## 103637 1208931380      A2     3.0  1993-12-08 8:20:00 PST    PLOO     TOTAL
## 103650 1208931381      A2     6.1  1993-12-08 8:20:00 PST    PLOO     TOTAL
```

```
## 103663 1208931382      A2    12.2  1993-12-08 8:20:00 PST    PLOO     TOTAL
## 103676 1208931383      A2    18.3  1993-12-08 8:20:00 PST    PLOO     TOTAL
## 103709 1208931385      A2    30.5  1993-12-08 8:20:00 PST    PLOO     TOTAL
## 103722 1208931386      A2    36.6  1993-12-08 8:20:00 PST    PLOO     TOTAL
## 103735 1208931387      A2    42.7  1993-12-08 8:20:00 PST    PLOO     TOTAL
## 103748 1208931388      A2    48.8  1993-12-08 8:20:00 PST    PLOO     TOTAL
## 103761 1208931389      A2    54.9  1993-12-08 8:20:00 PST    PLOO     TOTAL
## 103820 1208931392      A3     3.0  1993-12-08 9:49:00 PST    PLOO     TOTAL
## 103833 1208931393      A3     6.1  1993-12-08 9:49:00 PST    PLOO     TOTAL
## 103846 1208931394      A3    12.2  1993-12-08 9:49:00 PST    PLOO     TOTAL
## 103859 1208931395      A3    18.3  1993-12-08 9:49:00 PST    PLOO     TOTAL
## 103890 1208931397      A3    30.5  1993-12-08 9:49:00 PST    PLOO     TOTAL
##        qualifier value      units
## 81652       <NA>    NA CFU/100 mL
## 82672       <NA>    NA CFU/100 mL
## 101335      <NA>    NA CFU/100 mL
## 103637      <NA>    NA CFU/100 mL
## 103650      <NA>    NA CFU/100 mL
## 103663      <NA>    NA CFU/100 mL
## 103676      <NA>    NA CFU/100 mL
## 103709      <NA>    NA CFU/100 mL
## 103722      <NA>    NA CFU/100 mL
## 103735      <NA>    NA CFU/100 mL
## 103748      <NA>    NA CFU/100 mL
## 103761      <NA>    NA CFU/100 mL
## 103820      <NA>    NA CFU/100 mL
## 103833      <NA>    NA CFU/100 mL
## 103846      <NA>    NA CFU/100 mL
## 103859      <NA>    NA CFU/100 mL
## 103890      <NA>    NA CFU/100 mL
## [1] "TOTAL"
##          sample station     depth_m date_sample        time project parameter
## Not NA n 137584  137584 109594.0000      137584 137257.0000  137584    137584
## NA n          0       0  27990.0000           0    327.0000       0         0
## Not NA %      1       1      0.7966           1      0.9976       1         1
## NA %          0       0      0.2034           0      0.0024       0         0
##            qualifier       value  units
## Not NA n 121659.0000 136141.0000 137584
## NA n      15925.0000   1443.0000      0
## Not NA %      0.8843      0.9895      1
## NA %          0.1157      0.0105      0
##           sample station depth_m date_sample         time project parameter
## 81485  CTD013369      K4    18.3  1993-05-03  7:07:00 PST    PLOO       XMS
## 82191  CTD014940     A11    42.7  1993-05-06 10:45:00 PST    PLOO       XMS
## 82456  CTD013374      K4    18.3  1993-05-06  8:52:00 PST    PLOO       XMS
## 82873  CTD013384      K4    18.3  1993-05-12  7:36:00 PST    PLOO       XMS
## 83497  CTD013399      K4    18.3  1993-05-20  7:20:00 PST    PLOO       XMS
## 83564  CTD004913      A7     1.5  1993-05-24  8:31:00 PST    PLOO       XMS
## 83569  CTD004914      A7     3.0  1993-05-24  8:31:00 PST    PLOO       XMS
## 83574  CTD004915      A7     6.1  1993-05-24  8:31:00 PST    PLOO       XMS
## 83579  CTD004916      A7    12.2  1993-05-24  8:31:00 PST    PLOO       XMS
## 83584  CTD004917      A7    18.3  1993-05-24  8:31:00 PST    PLOO       XMS
## 83654  CTD009898      C7    18.3  1993-05-24  9:12:00 PST    PLOO       XMS
## 283998 526982378     E17    97.5  1998-05-26         <NA>    PLOO       XMS
```

```
## 286055 618982765     B10   115.8  1998-06-18         <NA>    PLOO       XMS
## 286090 618982769     B11    88.4  1998-06-18         <NA>    PLOO       XMS
## 286307 618982818     E17    97.5  1998-06-18         <NA>    PLOO       XMS
## 286342 618982825     E19    88.4  1998-06-18         <NA>    PLOO       XMS
## 291432 827982068     E24   115.8  1998-08-27         <NA>    PLOO       XMS
##        qualifier value units
## 81485       <NA>    NA     %
## 82191       <NA>    NA     %
## 82456       <NA>    NA     %
## 82873       <NA>    NA     %
## 83497       <NA>    NA     %
## 83564       <NA>    NA     %
## 83569       <NA>    NA     %
## 83574       <NA>    NA     %
## 83579       <NA>    NA     %
## 83584       <NA>    NA     %
## 83654       <NA>    NA     %
## 283998      <NA>    NA     %
## 286055      <NA>    NA     %
## 286090      <NA>    NA     %
## 286307      <NA>    NA     %
## 286342      <NA>    NA     %
## 291432      <NA>    NA     %
## [1] "XMS"
##          sample station depth_m date_sample        time project parameter
## Not NA n 139002  139002  139002      139002 112648.0000  139002    139002
## NA n          0       0       0           0  26354.0000       0         0
## Not NA %      1       1       1           1      0.8104       1         1
## NA %          0       0       0           0      0.1896       0         0
##          qualifier       value  units
## Not NA n         0 138876.0000 139002
## NA n        139002    126.0000      0
## Not NA %         0      0.9991      1
## NA %             1      0.0009      0
```

```
# Display value summaries
# Citation: Dave Hurst
params <- owt_df02 %>%
  mutate(unit_def = paste(parameter, qualifier, units)) %>%
  count(unit_def)
print(params)
```

```
##                unit_def      n
## 1   CHLOROPHYLL NA ug/L  88471
## 2    DENSITY NA sigma-t  88317
## 3            DO NA mg/L 109542
## 4   ENTERO < CFU/100 mL  95848
## 5   ENTERO > CFU/100 mL    452
## 6   ENTERO e CFU/100 mL  39766
## 7  ENTERO LA CFU/100 mL     23
## 8  ENTERO NA CFU/100 mL   8090
## 9  ENTERO ND CFU/100 mL      1
## 10 ENTERO NR CFU/100 mL      1
## 11 ENTERO NS CFU/100 mL    160
```

```
## 12   FECAL < CFU/100 mL  85819
## 13   FECAL > CFU/100 mL    746
## 14   FECAL e CFU/100 mL  41255
## 15  FECAL LA CFU/100 mL      8
## 16  FECAL NA CFU/100 mL   9655
## 17  FECAL ND CFU/100 mL      1
## 18  FECAL NR CFU/100 mL      4
## 19  FECAL NS CFU/100 mL    161
## 20            OG < mg/L   7673
## 21           OG NA mg/L    271
## 22             PH NA pH 107818
## 23      SALINITY NA ppt 109492
## 24          SUSO < mg/L   1290
## 25         SUSO NA mg/L  26253
## 26            TEMP NA C 139066
## 27   TOTAL < CFU/100 mL  66655
## 28   TOTAL > CFU/100 mL   2844
## 29  TOTAL >= CFU/100 mL      3
## 30   TOTAL e CFU/100 mL  51924
## 31  TOTAL LA CFU/100 mL     14
## 32  TOTAL NA CFU/100 mL  15925
## 33  TOTAL ND CFU/100 mL     54
## 34  TOTAL NR CFU/100 mL      4
## 35  TOTAL NS CFU/100 mL    161
## 36             XMS NA % 139002
```

Bin `depth_m` variable

```r
owt_df02$date_sample <- as.Date(owt_df02$date_sample, "%Y-%m-%d")

# Create bins for depth_m values
depth_lvls01 <- c("[0,8)",
                  "[8,33)",
                  "[33,47)",
                  "[47,70)",
                  "[70,90)",
                  "[90,112)",
                  "[112,120]",
                  "Unknown")

# Plot distribution of depth_m values
# Citation:
↪  https://community.rstudio.com/t/ggplot-x-axis-y-axis-ticks-labels-breaks-and-limits/119123/2
ggplot(owt_df02, aes(x = depth_m)) +
  geom_histogram(color = "black", bins = 40, aes(y = stat(density))) +
  geom_density(col = "blue") +
  labs(title = "Histogram of `depth_m` Feature") +
  scale_x_continuous(breaks=seq(0,120,1)) +
  theme(plot.title = element_text(hjust = 0.5, size = 12))
```

```
# Create new column with bins
# Citation:
↪  https://www.marsja.se/r-add-column-to-dataframe-based-on-other-columns-conditions-dplyr/
owt_df02 <- mutate(owt_df02, depth_m_bin = case_when(depth_m < 8 ~ "[0,8)",
                                                     depth_m < 33 ~ "[8,33)",
                                                     depth_m < 47 ~ "[33,47)",
                                                     depth_m < 70 ~ "[47,70)",
                                                     depth_m < 90 ~ "[70,90)",
                                                     depth_m < 112 ~ "[90,112)",
                                                     depth_m >= 112 ~ "[112,120]"))

# Replace NAs with "Unknown"
# Citation: https://statisticsglobe.com/r-replace-na-with-0/
owt_df02$depth_m_bin <- replace_na(owt_df02$depth_m_bin, "Unknown")

# Citation: https://www.statology.org/order-bars-ggplot2-bar-chart/
owt_df02$depth_m_bin_factr = factor(owt_df02$depth_m_bin, levels = depth_lvls01)
print(head(owt_df02, 17))
```

```
##        sample station depth_m date_sample        time project   parameter
## 1  9011158743      C5     9.0  1990-11-15        <NA>    PLOO CHLOROPHYLL
## 2  9011158743      C5     9.0  1990-11-15        <NA>    PLOO     DENSITY
## 3  9011158743      C5     9.0  1990-11-15        <NA>    PLOO          DO
## 4  9011158743      C5     9.0  1990-11-15        <NA>    PLOO          PH
## 5  9011158743      C5     9.0  1990-11-15        <NA>    PLOO    SALINITY
## 6  9011158743      C5     9.0  1990-11-15        <NA>    PLOO        TEMP
```

```
## 7  9011158743      C5     9.0  1990-11-15        <NA>    PLOO         XMS
## 8  9011158834     I25     6.0  1990-11-15        <NA>    SBOO CHLOROPHYLL
## 9  9011158834     I25     6.0  1990-11-15        <NA>    SBOO     DENSITY
## 10 9011158834     I25     6.0  1990-11-15        <NA>    SBOO          DO
## 11 9011158834     I25     6.0  1990-11-15        <NA>    SBOO          PH
## 12 9011158834     I25     6.0  1990-11-15        <NA>    SBOO    SALINITY
## 13 9011158834     I25     6.0  1990-11-15        <NA>    SBOO        TEMP
## 14 9011158834     I25     6.0  1990-11-15        <NA>    SBOO         XMS
## 15   KE000001      A1     1.5  1991-01-02 7:18:00 PST    PLOO      ENTERO
## 16   KE000001      A1     1.5  1991-01-02 7:18:00 PST    PLOO       FECAL
## 17  CTD000001      A1     1.5  1991-01-02 7:18:00 PST    PLOO        TEMP
##    qualifier    value      units depth_m_bin depth_m_bin_factr
## 1       <NA>    0.870       ug/L      [8,33)            [8,33)
## 2       <NA>   23.855    sigma-t      [8,33)            [8,33)
## 3       <NA>    6.550       mg/L      [8,33)            [8,33)
## 4       <NA>    8.080         pH      [8,33)            [8,33)
## 5       <NA>   33.617        ppt      [8,33)            [8,33)
## 6       <NA>   19.430          C      [8,33)            [8,33)
## 7       <NA>   44.850          %      [8,33)            [8,33)
## 8       <NA>    1.270       ug/L       [0,8)             [0,8)
## 9       <NA>   23.853    sigma-t       [0,8)             [0,8)
## 10      <NA>    7.410       mg/L       [0,8)             [0,8)
## 11      <NA>    8.180         pH       [0,8)             [0,8)
## 12      <NA>   33.574        ppt       [0,8)             [0,8)
## 13      <NA>   19.310          C       [0,8)             [0,8)
## 14      <NA>   75.600          %       [0,8)             [0,8)
## 15         e  200.000 CFU/100 mL       [0,8)             [0,8)
## 16         > 1200.000 CFU/100 mL       [0,8)             [0,8)
## 17      <NA>   14.500          C       [0,8)             [0,8)
```

```r
# Display transformed bar chart
ggplot(owt_df02, aes(x = depth_m_bin_factr)) +
  geom_bar() +
  labs(title = "Bar of `depth_m_bin` Feature") +
  theme(plot.title = element_text(hjust = 0.5, size = 12))
```

Perform several aggregations on the data for performing EDA at multiple levels

```
# Display aggregations by different features
owt_df02_gb01 <- owt_df02 %>%
  group_by(station) %>%
  summarise(Count = n())

print(owt_df02_gb01[owt_df02_gb01$Count == min(owt_df02_gb01$Count), ])
```

```
## # A tibble: 2 x 2
##   station Count
##   <fct>   <int>
## 1 A15        30
## 2 A16        30
```

```
print(owt_df02_gb01[owt_df02_gb01$Count == max(owt_df02_gb01$Count), ])
```

```
## # A tibble: 1 x 2
##   station Count
##   <fct>   <int>
## 1 A1      55217
```

```
owt_df02_gb02 <- owt_df02 %>%
  group_by(project) %>%
  summarise(Count = n())
```

```r
owt_df02_gb03 <- owt_df02 %>%
  group_by(date_sample) %>%
  summarise(Count = n())

# Main DF1
owt_df02_gb04 <- owt_df02 %>%
  group_by(date_sample, parameter) %>%
  summarise(Avg = mean(value, na.remove = TRUE))
```

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

```r
owt_df02_gb05 <- owt_df02 %>%
  group_by(parameter) %>%
  summarise(Count = n())

owt_df02_gb06 <- owt_df02 %>%
  group_by(depth_m) %>%
  summarise(Count = n())

# Main DF3
owt_df02_gb07 <- owt_df02 %>%
  group_by(date_sample, project, depth_m_bin, parameter) %>%
  summarise(Avg = mean(value, na.remove = TRUE))
```

```
## `summarise()` has grouped output by 'date_sample', 'project', 'depth_m_bin'.
## You can override using the `.groups` argument.
```

```r
owt_df02_gb08 <- owt_df02 %>%
  group_by(depth_m_bin) %>%
  summarise(Count = n())

# Main DF2
owt_df02_gb09 <- owt_df02 %>%
  group_by(date_sample, project, parameter) %>%
  summarise(Avg = mean(value, na.remove = TRUE))
```

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

```r
print(owt_df02_gb01)
```

```
## # A tibble: 157 x 2
##    station Count
##    <fct>   <int>
##  1 A1      55217
##  2 A10      5852
##  3 A11      6602
##  4 A12      5812
##  5 A13      6599
##  6 A14      5886
##  7 A15        30
##  8 A16        30
##  9 A17      2961
## 10 A2       7572
```

```
## # ... with 147 more rows
```

```
print(dim(owt_df02_gb01))
```

```
## [1] 157   2
```

```
print(owt_df02_gb02)
```

```
## # A tibble: 2 x 2
##   project  Count
##   <fct>    <int>
## 1 PLOO    805915
## 2 SBOO    430854
```

```
print(dim(owt_df02_gb02))
```

```
## [1] 2 2
```

```
print(head(owt_df02_gb03, 17))
```

```
## # A tibble: 17 x 2
##    date_sample Count
##    <date>      <int>
##  1 1990-11-15     14
##  2 1991-01-02    195
##  3 1991-01-03    195
##  4 1991-01-07    190
##  5 1991-01-08    181
##  6 1991-01-09    577
##  7 1991-01-10    200
##  8 1991-01-11    174
##  9 1991-01-14    195
## 10 1991-01-16    195
## 11 1991-01-22    194
## 12 1991-01-23    221
## 13 1991-01-28    189
## 14 1991-01-30    195
## 15 1991-02-04    222
## 16 1991-02-06    195
## 17 1991-02-11    195
```

```
print(dim(owt_df02_gb03))
```

```
## [1] 5580    2
```

```
print(head(owt_df02_gb04, 17))
```

```
## # A tibble: 17 x 3
## # Groups:   date_sample [3]
##    date_sample parameter      Avg
##    <date>      <fct>        <dbl>
##  1 1990-11-15  CHLOROPHYLL   1.07
##  2 1990-11-15  DENSITY      23.9
##  3 1990-11-15  DO            6.98
##  4 1990-11-15  PH            8.13
##  5 1990-11-15  SALINITY     33.6
##  6 1990-11-15  TEMP         19.4
```

```
##  7 1990-11-15  XMS          60.2
##  8 1991-01-02  ENTERO       32.1
##  9 1991-01-02  FECAL       126.
## 10 1991-01-02  TEMP         14.5
## 11 1991-01-02  TOTAL       442.
## 12 1991-01-02  XMS          80.0
## 13 1991-01-03  ENTERO       18.7
## 14 1991-01-03  FECAL        51.3
## 15 1991-01-03  TEMP         14.4
## 16 1991-01-03  TOTAL       181.
## 17 1991-01-03  XMS          83.9
```

```
print(dim(owt_df02_gb04))
```

```
## [1] 36811     3
```

```
print(owt_df02_gb05)
```

```
## # A tibble: 12 x 2
##    parameter    Count
##    <fct>        <int>
##  1 CHLOROPHYLL  88471
##  2 DENSITY      88317
##  3 DO          109542
##  4 ENTERO      144341
##  5 FECAL       137649
##  6 OG            7944
##  7 PH          107818
##  8 SALINITY    109492
##  9 SUSO         27543
## 10 TEMP        139066
## 11 TOTAL       137584
## 12 XMS         139002
```

```
print(dim(owt_df02_gb05))
```

```
## [1] 12  2
```

```
print(owt_df02_gb06)
```

```
## # A tibble: 51 x 2
##    depth_m  Count
##      <dbl>  <int>
##  1     1   119858
##  2     1.5  93937
##  3     2   120007
##  4     3    71058
##  5     6    55762
##  6     6.1  43265
##  7     9    65616
##  8     9.1   3052
##  9    11    23069
## 10    12    80308
## # ... with 41 more rows
```

```r
print(dim(owt_df02_gb06))
```

```
## [1] 51  2
```

```r
print(head(owt_df02_gb07, 17))
```

```
## # A tibble: 17 x 5
## # Groups:   date_sample, project, depth_m_bin [3]
##    date_sample project depth_m_bin parameter      Avg
##    <date>      <fct>   <chr>       <fct>        <dbl>
##  1 1990-11-15  PLOO    [8,33)      CHLOROPHYLL   0.87
##  2 1990-11-15  PLOO    [8,33)      DENSITY      23.9
##  3 1990-11-15  PLOO    [8,33)      DO            6.55
##  4 1990-11-15  PLOO    [8,33)      PH            8.08
##  5 1990-11-15  PLOO    [8,33)      SALINITY     33.6
##  6 1990-11-15  PLOO    [8,33)      TEMP         19.4
##  7 1990-11-15  PLOO    [8,33)      XMS          44.8
##  8 1990-11-15  SBOO    [0,8)       CHLOROPHYLL   1.27
##  9 1990-11-15  SBOO    [0,8)       DENSITY      23.9
## 10 1990-11-15  SBOO    [0,8)       DO            7.41
## 11 1990-11-15  SBOO    [0,8)       PH            8.18
## 12 1990-11-15  SBOO    [0,8)       SALINITY     33.6
## 13 1990-11-15  SBOO    [0,8)       TEMP         19.3
## 14 1990-11-15  SBOO    [0,8)       XMS          75.6
## 15 1991-01-02  PLOO    [0,8)       ENTERO       34.1
## 16 1991-01-02  PLOO    [0,8)       FECAL       135.
## 17 1991-01-02  PLOO    [0,8)       TEMP         14.6
```

```r
print(dim(owt_df02_gb07))
```

```
## [1] 121286      5
```

```r
print(owt_df02_gb08)
```

```
## # A tibble: 8 x 2
##   depth_m_bin  Count
##   <chr>        <int>
## 1 [0,8)       503887
## 2 [112,120]     5908
## 3 [33,47)      55629
## 4 [47,70)      74036
## 5 [70,90)      51358
## 6 [8,33)      434169
## 7 [90,112)     27621
## 8 Unknown      84161
```

```r
print(dim(owt_df02_gb08))
```

```
## [1] 8 2
```

```r
print(head(owt_df02_gb09, 17))
```

```
## # A tibble: 17 x 4
## # Groups:   date_sample, project [3]
##    date_sample project parameter      Avg
##    <date>      <fct>   <fct>        <dbl>
```

```
##  1 1990-11-15  PLOO    CHLOROPHYLL   0.87
##  2 1990-11-15  PLOO    DENSITY      23.9
##  3 1990-11-15  PLOO    DO            6.55
##  4 1990-11-15  PLOO    PH            8.08
##  5 1990-11-15  PLOO    SALINITY     33.6
##  6 1990-11-15  PLOO    TEMP         19.4
##  7 1990-11-15  PLOO    XMS          44.8
##  8 1990-11-15  SBOO    CHLOROPHYLL   1.27
##  9 1990-11-15  SBOO    DENSITY      23.9
## 10 1990-11-15  SBOO    DO            7.41
## 11 1990-11-15  SBOO    PH            8.18
## 12 1990-11-15  SBOO    SALINITY     33.6
## 13 1990-11-15  SBOO    TEMP         19.3
## 14 1990-11-15  SBOO    XMS          75.6
## 15 1991-01-02  PLOO    ENTERO       32.1
## 16 1991-01-02  PLOO    FECAL       126.
## 17 1991-01-02  PLOO    TEMP         14.5
```

```
print(dim(owt_df02_gb09))
```

```
## [1] 48395     4
```

Create custom function to perform df mutation/casting and boxplot display

```
ts_eda <- function(ts_df = NA,
                   form_lead = c(),
                   form_cast = c(),
                   param_lst = c(),
                   l1_col = c(),
                   l1_param = c(),
                   l2_col = c(),
                   l2_param = c(),
                   rtn_met = TRUE,
                   grph_title = "All",
                   box = TRUE,
                   week_agg = FALSE,
                   out_rm = FALSE) {
  # Define function to dcast, print boxplot, and print desc stats for each parameter
  dcast_form <- as.formula(paste(paste(form_lead, collapse = "+"), form_cast, sep = "~"))
  print(dcast_form)
  #print(head(ts_df))

  counter <- 1
  # Loop to dcast parameters to cols
  for(p in param_lst) {
    sym_param <- sym(p)
    print(sym_param)
    param_df <- ts_df[ts_df[, form_cast] == p, ]
    param_df <- param_df %>%
      drop_na()
    #print(param_df)

    #_____________________________________________________________________________
    # If keyword set to TRUE, convert daily TS data to weekly
```

```r
if(week_agg == TRUE) {
  param_df02a <- param_df
  param_df02a$week <- isoweek(param_df02a$date_sample)
  # Citation: https://lubridate.tidyverse.org/reference/round_date.html
  param_df02a$week_end <- ceiling_date(param_df02a$date_sample,
                                       unit = "week",
                                       week_start = getOption("lubridate.week.start",
                                       ↪  1))
  #print(head(param_df02a, 17)
  param_df$date_sample <- param_df02a$week_end
}

# Citation: https://www.datasciencemadesimple.com/melting-casting-r/
param_df_cast <- dcast(param_df, dcast_form, mean)
#print(head(param_df_cast, 17))

#_____________________________________________________________________________
# If keyword set to TRUE, remove outliers
if(out_rm == TRUE) {
  #ts_df_mrgd01c <- na.omit(param_df_cast)
  #print(head(ts_df_mrgd01c, 17))
  #print(dim(ts_df_mrgd01c))
  ts_df_mrgd01c_s1 <- subset(x = param_df_cast, select = p)
  ts_df_mrgd01c_s1_fit <- preProcess(ts_df_mrgd01c_s1,
                                     method = c("center", "scale"))
  ts_df_mrgd01c_s1_trans <- predict(ts_df_mrgd01c_s1_fit,
                                    ts_df_mrgd01c_s1)

  # Subset non-outlier data
  print(dim(param_df_cast))
  param_df_cast <- subset(param_df_cast,
                              (abs(ts_df_mrgd01c_s1_trans) <= 3))
  dfs1b <- param_df_cast[, p]
  #print(head(param_df_cast, 17))
}

# For first item in vector, no merge is needed
if(counter  == 1) {
  ts_df_mrgd <- param_df_cast
}
# For 2-n items in vector, merge dataframes iteratively
else {
  # Merge individual casted parameter df's into 1 df
  # Citation: https://www.geeksforgeeks.org/joining-of-dataframes-in-r-programming/
  ts_df_mrgd <- merge(x = ts_df_mrgd,
                      y = param_df_cast,
                      by = form_lead,
                      all = TRUE)
}

# Run custom function to ID outliers and generate boxplot
#ts_df_mrgd01a <- subset(x = ts_df_mrgd, select = num_var_lst01)
ts_df_mrgd01a <- na.omit(param_df_cast)
```

```
  #print(head(ts_df_mrgd01a, 17))
  print(dim(ts_df_mrgd01a))
  dfs1 <- subset(x = ts_df_mrgd01a, select = p)
  dfs1a <- dfs1
  #print(head(dfs1a, 17))

  dfs1a$Groups <- as.factor(grph_title)
  box_comp(xcol = p,
           df = dfs1,
           rtn_met = rtn_met,
           box = box)
  #dfs_lst <- list(dfs1)
  #print(dfs_lst)

  #_____________________________________________________________________________
  # Create subplots based on additional agg layers
  print(paste0("L2 length = ", length(l2_param)))
  if(length(l2_param) == 0) {
    for(l1 in l1_param) {
      ts_df_mrgd_chl_dmb1 <- ts_df_mrgd01a[(ts_df_mrgd01a[, l1_col] == l1), ]

      # Run custom function to ID outliers and generate boxplot
      #print(head(ts_df_mrgd_chl_dmb1))
      # Citation: https://www.geeksforgeeks.org/handling-errors-in-r-programming/
      dfs2 <- subset(x = ts_df_mrgd_chl_dmb1, select = p)
      dfs2a <- dfs2



      try(dfs2a$Groups <- as.factor(l1))
      try(box_comp(xcol = p,
                   df = dfs2,
                   rtn_met = rtn_met,
                   grph_title = l1,
                   box = box),
          silent = TRUE)
      dfs1a <- rbind(dfs1a, dfs2a)
    }
  }
  else {
    for(l1 in l1_param) {
      for(l2 in l2_param) {
        ts_df_mrgd_chl_dmb1 <- ts_df_mrgd01a[(ts_df_mrgd01a[, l1_col] == l1) &
↪ (ts_df_mrgd01a[, l2_col] == l2), ]

        # Run custom function to ID outliers and generate boxplot
        #print(head(ts_df_mrgd_chl_dmb1))
        # Citation: https://www.geeksforgeeks.org/handling-errors-in-r-programming/
        dfs3 <- subset(x = ts_df_mrgd_chl_dmb1, select = p)
        dfs3a <- dfs3
```

```
          try(dfs3a$Groups <- as.factor(paste0(l1, ": ", l2)))
          try(box_comp(xcol = p,
                       df = dfs3,
                       rtn_met = rtn_met,
                       grph_title = paste0(l1, ": ", l2),
                       box = box),
              silent = TRUE)
          dfs1a <- rbind(dfs1a, dfs3a)
        }
      }
    }
    #_____________________________________________________________________
    #print(dim(dfs1a))
    #print(head(dfs1a, 17))
    bx_form <- as.formula(paste(p, "Groups", sep = "~"))
    #print(bx_form)
    #dfs1a$box_factr = factor(owt_df02$depth_m_bin, levels = depth_lvls01)
    #print(head(dfs1a, 17))
    boxplot(bx_form,
            dfs1a,
            main = "Boxplot(s)")

    counter <- counter + 1
  }
  print(head(ts_df_mrgd, 17))
  print(describe(ts_df_mrgd))

  # Display summary of NA count
  ts_df_na <- sapply(ts_df, function(x) sum(is.na(x)))
  ts_df_notna <- sapply(ts_df, function(x) sum(!is.na(x)))
  ts_df_tbl01 <- rbind(ts_df_notna, ts_df_na)
  ts_df_tbl02 <- rbind(ts_df_tbl01, round(prop.table(ts_df_tbl01, margin = 2), 4))
  rownames(ts_df_tbl02) <- c("Not NA n", "NA n", "Not NA %", "NA %")
  print(ts_df_tbl02) # This table w/ null counts and proportions for each feature not
  ↪  displayed for space purposes
  return(ts_df_mrgd)
}
```

Run custom function on data aggregated by `date_sample` and `parameter`

```
param_lst02 <- c("CHLOROPHYLL",
                 "DENSITY",
                 "DO",
                 "ENTERO",
                 "FECAL",
                 "OG",
                 "PH",
                 "SALINITY",
                 "SUSO",
                 "TEMP",
                 "XMS")
```

```r
owt_df02_gb04_mrgd = ts_eda(ts_df = owt_df02_gb04,
                            form_lead = "date_sample",
                            form_cast = "parameter",
                            param_lst = param_lst02,
                            rtn_met = TRUE,
                            box = FALSE,
                            week_agg = FALSE
                            )
```

```
## date_sample ~ parameter
## <environment: 0x000001f3a5fb3c70>
## CHLOROPHYLL

## Using Avg as value column: use value.var to override.

## [1] 2092    2
##                  metric                    V2
## 1                       Variable: CHLOROPHYLL
## 2              Total N:
## 3                 Count                 2092
## 4              NA Count                    0
## 5                  Mean                 3.91
## 6                Median                2.853
## 7    Standard Deviation                3.411
## 8              Variance               11.633
## 9                 Range               30.064
## 10                  Min                 0.29
## 11                  Max               30.353
## 12      25th Percentile                1.576
## 13      75th Percentile                5.083
## 14 Subset w/o Outliers:
## 15                Count                 2050
## 16                    %                  98%
## 17            Outlier %                   2%
## 18             NA Count                    0
## 19                 Mean                3.626
## 20               Median                2.791
## 21   Standard Deviation                 2.74
## 22             Variance                7.507
## 23                Range               13.676
## 24                  Min                 0.29
## 25                  Max               13.965
## [1] "L2 length = 0"

## DENSITY

## Using Avg as value column: use value.var to override.
```

```
## [1] 2246    2
##                  metric                V2
## 1                       Variable: DENSITY
## 2              Total N:
## 3                 Count             2246
## 4              NA Count                0
## 5                  Mean            24.85
## 6                Median           24.874
## 7    Standard Deviation            0.466
## 8              Variance            0.217
## 9                 Range              3.2
## 10                  Min           22.837
## 11                  Max           26.037
## 12      25th Percentile            24.56
## 13      75th Percentile           25.178
## 14 Subset w/o Outliers:
## 15                Count             2232
## 16                    %            99.4%
## 17            Outlier %             0.6%
## 18             NA Count                0
## 19                 Mean            24.86
## 20               Median           24.877
## 21   Standard Deviation            0.451
## 22             Variance            0.203
## 23                Range            2.583
## 24                  Min           23.454
## 25                  Max           26.037
## [1] "L2 length = 0"
```

```
## DO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2504    2
##                  metric           V2
## 1                       Variable: DO
## 2              Total N:
## 3                 Count         2504
## 4              NA Count            0
## 5                  Mean        7.041
## 6                Median        7.226
## 7    Standard Deviation         0.99
## 8              Variance         0.98
## 9                 Range       10.329
## 10                  Min            0
## 11                  Max       10.329
## 12      25th Percentile        6.451
## 13      75th Percentile        7.722
## 14 Subset w/o Outliers:
## 15                Count         2494
## 16                    %        99.6%
## 17            Outlier %         0.4%
## 18             NA Count            0
## 19                 Mean        7.057
## 20               Median        7.232
## 21   Standard Deviation        0.937
## 22             Variance        0.877
## 23                Range        5.822
## 24                  Min         4.12
## 25                  Max        9.942
## [1] "L2 length = 0"
```

```
## ENTERO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 5197    2
##                  metric               V2
## 1                       Variable: ENTERO
## 2              Total N:
## 3                 Count             5197
## 4              NA Count                0
## 5                  Mean          284.213
## 6                Median            7.333
## 7    Standard Deviation         1325.881
## 8              Variance      1757960.571
## 9                 Range            18000
## 10                  Min                0
## 11                  Max            18000
## 12      25th Percentile             2.75
## 13      75th Percentile           35.455
## 14 Subset w/o Outliers:
## 15                Count             5090
## 16                    %            97.9%
## 17            Outlier %             2.1%
## 18             NA Count                0
## 19                 Mean          112.006
## 20               Median                7
## 21   Standard Deviation          417.536
## 22             Variance       174336.299
## 23                Range         4233.333
## 24                  Min                0
## 25                  Max         4233.333
## [1] "L2 length = 0"
```

```
## FECAL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 5078    2
##                  metric              V2
## 1                       Variable: FECAL
## 2              Total N:
## 3                 Count            5078
## 4              NA Count               0
## 5                  Mean         409.934
## 6                Median          10.564
## 7    Standard Deviation        1513.552
## 8              Variance     2290838.653
## 9                 Range           12000
## 10                  Min               0
## 11                  Max           12000
## 12      25th Percentile           3.404
## 13      75th Percentile          94.095
## 14 Subset w/o Outliers:
## 15                Count            4965
## 16                    %           97.8%
## 17            Outlier %            2.2%
## 18             NA Count               0
## 19                 Mean         208.248
## 20               Median              10
## 21   Standard Deviation         600.094
## 22             Variance      360113.198
## 23                Range            4900
## 24                  Min               0
## 25                  Max            4900
## [1] "L2 length = 0"
```

```
## OG
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 937   2
##                  metric           V2
## 1                       Variable: OG
## 2              Total N:
## 3                 Count          937
## 4              NA Count            0
## 5                  Mean        0.244
## 6                Median          0.2
## 7    Standard Deviation        0.286
## 8              Variance        0.082
## 9                 Range          4.9
## 10                  Min          0.2
## 11                  Max          5.1
## 12      25th Percentile          0.2
## 13      75th Percentile          0.2
## 14 Subset w/o Outliers:
## 15                Count          923
## 16                    %        98.5%
## 17            Outlier %         1.5%
## 18             NA Count            0
## 19                 Mean        0.215
## 20               Median          0.2
## 21   Standard Deviation        0.078
## 22             Variance        0.006
## 23                Range         0.83
## 24                  Min          0.2
## 25                  Max         1.03
## [1] "L2 length = 0"
```

```
## PH
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2469    2
##                  metric           V2
## 1                       Variable: PH
## 2              Total N:
## 3                 Count         2469
## 4              NA Count            0
## 5                  Mean         8.05
## 6                Median        8.071
## 7    Standard Deviation        0.117
## 8              Variance        0.014
## 9                 Range        0.938
## 10                  Min         7.54
## 11                  Max        8.478
## 12      25th Percentile        7.981
## 13      75th Percentile        8.128
## 14 Subset w/o Outliers:
## 15                Count         2435
## 16                    %        98.6%
## 17            Outlier %         1.4%
## 18             NA Count            0
## 19                 Mean        8.053
## 20               Median        8.071
## 21   Standard Deviation        0.108
## 22             Variance        0.012
## 23                Range        0.702
## 24                  Min          7.7
## 25                  Max        8.402
## [1] "L2 length = 0"
```

```
## SALINITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2505    2
##                  metric                 V2
## 1                       Variable: SALINITY
## 2              Total N:
## 3                 Count               2505
## 4              NA Count                  0
## 5                  Mean             33.502
## 6                Median             33.527
## 7    Standard Deviation              0.706
## 8              Variance              0.499
## 9                 Range             34.098
## 10                  Min                  0
## 11                  Max             34.098
## 12      25th Percentile             33.418
## 13      75th Percentile              33.62
## 14 Subset w/o Outliers:
## 15                Count               2502
## 16                    %              99.9%
## 17            Outlier %               0.1%
## 18             NA Count                  0
## 19                 Mean             33.519
## 20               Median             33.527
## 21   Standard Deviation              0.165
## 22             Variance              0.027
## 23                Range              1.888
## 24                  Min              32.21
## 25                  Max             34.098
## [1] "L2 length = 0"
```

```
## SUSO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 976   2
##                  metric             V2
## 1                       Variable: SUSO
## 2              Total N:
## 3                 Count            976
## 4              NA Count              0
## 5                  Mean          4.993
## 6                Median           4.67
## 7    Standard Deviation          2.164
## 8              Variance          4.681
## 9                 Range          15.48
## 10                  Min            0.2
## 11                  Max          15.68
## 12      25th Percentile          3.583
## 13      75th Percentile          6.083
## 14 Subset w/o Outliers:
## 15                Count            966
## 16                    %            99%
## 17            Outlier %             1%
## 18             NA Count              0
## 19                 Mean          4.906
## 20               Median          4.639
## 21   Standard Deviation          1.991
## 22             Variance          3.966
## 23                Range         11.172
## 24                  Min            0.2
## 25                  Max         11.372
## [1] "L2 length = 0"
```

```
## TEMP
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 3373    2
##                  metric             V2
## 1                       Variable: TEMP
## 2              Total N:
## 3                 Count           3373
## 4              NA Count              0
## 5                  Mean         14.843
## 6                Median         14.661
## 7    Standard Deviation          1.879
## 8              Variance           3.53
## 9                 Range         22.568
## 10                  Min              0
## 11                  Max         22.568
## 12      25th Percentile         13.561
## 13      75th Percentile         15.964
## 14 Subset w/o Outliers:
## 15                Count           3357
## 16                    %          99.5%
## 17            Outlier %           0.5%
## 18             NA Count              0
## 19                 Mean          14.82
## 20               Median          14.65
## 21   Standard Deviation          1.821
## 22             Variance          3.315
## 23                Range          9.794
## 24                  Min         10.666
## 25                  Max          20.46
## [1] "L2 length = 0"
```

```
## XMS
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 3344    2
##                  metric            V2
## 1                       Variable: XMS
## 2              Total N:
## 3                 Count          3344
## 4              NA Count             0
## 5                  Mean        79.402
## 6                Median          80.4
## 7    Standard Deviation         6.979
## 8              Variance        48.713
## 9                 Range        92.456
## 10                  Min             0
## 11                  Max        92.456
## 12      25th Percentile        76.156
## 13      75th Percentile        84.084
## 14 Subset w/o Outliers:
## 15                Count          3302
## 16                    %         98.7%
## 17            Outlier %          1.3%
## 18             NA Count             0
## 19                 Mean        79.791
## 20               Median        80.486
## 21   Standard Deviation         5.988
## 22             Variance        35.857
## 23                Range         33.88
## 24                  Min        58.577
## 25                  Max        92.456
## [1] "L2 length = 0"
```

```
##    date_sample CHLOROPHYLL DENSITY      DO    ENTERO     FECAL OG    PH
## 1   1990-11-15        1.07  23.854 6.98000        NA        NA NA 8.130
## 2   1991-01-02          NA      NA      NA  32.05128 125.64103 NA    NA
## 3   1991-01-03          NA      NA      NA  18.71795  51.28205 NA    NA
## 4   1991-01-07          NA      NA      NA 106.15385  80.76923 NA    NA
## 5   1991-01-08          NA      NA      NA  40.00000  40.55556 NA    NA
## 6   1991-01-09          NA      NA 5.47625  20.33898  40.50847 NA 8.195
## 7   1991-01-10          NA      NA 5.50000  40.22727  78.18182 NA    NA
## 8   1991-01-11          NA      NA 5.36000  83.92857 446.07143 NA    NA
## 9   1991-01-14          NA      NA      NA  33.84615  95.64103 NA    NA
## 10  1991-01-16          NA      NA      NA  12.56410  23.58974 NA    NA
## 11  1991-01-22          NA      NA      NA  20.51282  31.02564 NA    NA
## 12  1991-01-23          NA      NA      NA  43.12500 108.54167 NA    NA
## 13  1991-01-28          NA      NA      NA 183.07692 427.69231 NA    NA
## 14  1991-01-30          NA      NA      NA 125.38462 429.48718 NA    NA
## 15  1991-02-04          NA      NA      NA  16.29167  16.75000 NA    NA
## 16  1991-02-06          NA      NA      NA  17.38462  12.51282 NA    NA
## 17  1991-02-11          NA      NA      NA  51.89744  55.43590 NA    NA
##    SALINITY SUSO     TEMP      XMS
## 1  33.59550   NA 19.37000 60.22500
## 2        NA   NA 14.50769 80.02564
## 3        NA   NA 14.39231 83.89744
## 4        NA   NA 14.54103 78.97436
## 5        NA   NA 13.43000 80.20000
## 6  33.51938   NA 14.26889 86.21111
## 7  33.49300   NA 13.75000 80.45833
## 8  33.49100   NA 14.38400 84.40000
## 9        NA   NA 14.51282 72.02564
## 10       NA   NA 14.57692 68.35897
## 11       NA   NA 14.50769 76.51282
## 12       NA   NA 14.06923 78.71053
## 13       NA   NA 14.29487 82.43590
## 14       NA   NA 14.17436 81.23077
## 15       NA   NA 14.46154 72.12821
## 16       NA   NA 14.46154 69.53846
## 17       NA   NA 13.82564 79.23077
##             vars    n   mean      sd median trimmed   mad   min      max
## date_sample    1 5450    NaN      NA     NA     NaN    NA   Inf     -Inf
## CHLOROPHYLL    2 2092   3.91    3.41   2.85    3.33  2.28  0.29    30.35
## DENSITY        3 2246  24.85    0.47  24.87   24.87  0.46 22.84    26.04
```

```
## DO             4 2504   7.04    0.99   7.23    7.11  0.86  0.00    10.33
## ENTERO         5 5197 284.21 1325.88   7.33   25.74  7.91  0.00 18000.00
## FECAL          6 5078 409.93 1513.55  10.56   69.45 12.57  0.00 12000.00
## OG             7  937   0.24    0.29   0.20    0.20  0.00  0.20     5.10
## PH             8 2469   8.05    0.12   8.07    8.06  0.10  7.54     8.48
## SALINITY       9 2505  33.50    0.71  33.53   33.52  0.15  0.00    34.10
## SUSO          10  976   4.99    2.16   4.67    4.80  1.80  0.20    15.68
## TEMP          11 3373  14.84    1.88  14.66   14.75  1.78  0.00    22.57
## XMS           12 3344  79.40    6.98  80.40   80.08  5.76  0.00    92.46
##                range   skew kurtosis    se
## date_sample     -Inf     NA       NA    NA
## CHLOROPHYLL    30.06   2.25     7.84  0.07
## DENSITY         3.20  -0.42     0.25  0.01
## DO             10.33  -1.05     3.72  0.02
## ENTERO      18000.00   6.95    53.47 18.39
## FECAL       12000.00   5.81    36.94 21.24
## OG              4.90  10.89   144.21  0.01
## PH              0.94  -0.66     1.32  0.00
## SALINITY       34.10 -42.97  2021.03  0.01
## SUSO           15.48   1.09     2.23  0.07
## TEMP           22.57   0.35     1.15  0.03
## XMS            92.46  -1.86     9.43  0.12
##          date_sample parameter       Avg
## Not NA n       36811     36811 35669.000
## NA n               0         0  1142.000
## Not NA %           1         1     0.969
## NA %               0         0     0.031
```

```
owt_df02_gb04_wkly = ts_eda(ts_df = owt_df02_gb04,
                            form_lead = "date_sample",
                            form_cast = "parameter",
                            param_lst = param_lst02,
                            rtn_met = TRUE,
                            box = FALSE,
                            week_agg = TRUE
                            )
```

```
## date_sample ~ parameter
## <environment: 0x000001f3abcb9b70>
## CHLOROPHYLL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1071    2
##                 metric                    V2
## 1                      Variable: CHLOROPHYLL
## 2             Total N:
## 3                Count                  1071
## 4             NA Count                     0
## 5                 Mean                 3.664
## 6               Median                 2.778
## 7    Standard Deviation                  2.98
## 8             Variance                 8.879
## 9                Range                22.399
## 10                 Min                 0.393
```

```
## 11                  Max                22.792
## 12      25th Percentile                  1.56
## 13      75th Percentile                 4.744
## 14 Subset w/o Outliers:
## 15                Count                  1049
## 16                    %                 97.9%
## 17            Outlier %                  2.1%
## 18             NA Count                     0
## 19                 Mean                 3.423
## 20               Median                 2.726
## 21   Standard Deviation                 2.465
## 22             Variance                 6.074
## 23                Range                12.205
## 24                  Min                 0.393
## 25                  Max                12.599
## [1] "L2 length = 0"
```

```
## DENSITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1098    2
##                  metric                V2
## 1                       Variable: DENSITY
## 2             Total N:
## 3                Count              1098
## 4             NA Count                 0
## 5                 Mean             24.78
## 6               Median            24.807
## 7    Standard Deviation             0.467
## 8             Variance             0.218
## 9                Range             3.139
## 10                 Min            22.837
## 11                 Max            25.976
## 12      25th Percentile            24.489
## 13      75th Percentile              25.1
## 14 Subset w/o Outliers:
## 15                Count              1089
## 16                    %             99.2%
## 17            Outlier %              0.8%
## 18             NA Count                 0
## 19                 Mean            24.793
```

```
## 20                Median            24.812
## 21   Standard Deviation             0.448
## 22             Variance             0.201
## 23                Range             2.545
## 24                  Min            23.431
## 25                  Max            25.976
## [1] "L2 length = 0"
```

```
## DO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1203    2
##                  metric           V2
## 1                       Variable: DO
## 2              Total N:
## 3                 Count         1203
## 4              NA Count            0
## 5                  Mean        7.102
## 6                Median        7.259
## 7    Standard Deviation        0.876
## 8              Variance        0.767
## 9                 Range        9.468
## 10                  Min            0
## 11                  Max        9.468
## 12      25th Percentile        6.632
## 13      75th Percentile         7.71
## 14 Subset w/o Outliers:
## 15                Count         1196
## 16                    %        99.4%
## 17            Outlier %         0.6%
## 18             NA Count            0
## 19                 Mean        7.125
## 20               Median        7.265
## 21   Standard Deviation        0.821
## 22             Variance        0.674
## 23                Range        4.942
## 24                  Min        4.527
## 25                  Max        9.468
## [1] "L2 length = 0"
```

```
## ENTERO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1614    2
##                  metric               V2
## 1                       Variable: ENTERO
## 2              Total N:
## 3                 Count             1614
## 4              NA Count                0
## 5                  Mean          214.198
## 6                Median           12.258
## 7    Standard Deviation          718.919
## 8              Variance        516845.04
## 9                 Range         7646.278
## 10                  Min                2
## 11                  Max         7648.278
## 12      25th Percentile            5.434
## 13      75th Percentile           45.567
## 14 Subset w/o Outliers:
## 15                Count             1557
## 16                    %            96.5%
## 17            Outlier %             3.5%
## 18             NA Count                0
## 19                 Mean           91.784
## 20               Median           11.698
## 21   Standard Deviation           275.13
## 22             Variance        75696.459
## 23                Range         2344.566
## 24                  Min                2
## 25                  Max         2346.566
## [1] "L2 length = 0"
```

```
## FECAL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1614    2
##                  metric              V2
## 1                       Variable: FECAL
## 2              Total N:
## 3                 Count            1614
## 4              NA Count               0
## 5                  Mean         304.597
## 6                Median          23.303
## 7    Standard Deviation          826.25
## 8              Variance      682689.747
## 9                 Range         6443.07
## 10                  Min               2
## 11                  Max         6445.07
## 12      25th Percentile           6.236
## 13      75th Percentile         156.176
## 14 Subset w/o Outliers:
## 15                Count            1562
## 16                    %           96.8%
## 17            Outlier %            3.2%
## 18             NA Count               0
## 19                 Mean         177.977
## 20               Median          20.506
## 21   Standard Deviation         421.323
## 22             Variance       177512.97
## 23                Range        2737.584
## 24                  Min               2
## 25                  Max        2739.584
## [1] "L2 length = 0"
```

```
## OG
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 351   2
##                  metric           V2
## 1                       Variable: OG
## 2              Total N:
## 3                 Count          351
## 4              NA Count            0
## 5                  Mean        0.244
## 6                Median          0.2
## 7    Standard Deviation        0.227
## 8              Variance        0.052
## 9                 Range         2.45
## 10                  Min          0.2
## 11                  Max         2.65
## 12      25th Percentile          0.2
## 13      75th Percentile          0.2
## 14 Subset w/o Outliers:
## 15                Count          345
## 16                    %        98.3%
## 17            Outlier %         1.7%
## 18             NA Count            0
## 19                 Mean        0.218
## 20               Median          0.2
## 21   Standard Deviation        0.068
## 22             Variance        0.005
## 23                Range        0.697
## 24                  Min          0.2
## 25                  Max        0.897
## [1] "L2 length = 0"
```

```
## PH
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1205    2
##                  metric           V2
## 1                       Variable: PH
## 2              Total N:
## 3                 Count         1205
## 4              NA Count            0
## 5                  Mean        8.062
## 6                Median        8.081
## 7    Standard Deviation         0.11
## 8              Variance        0.012
## 9                 Range        0.788
## 10                  Min        7.592
## 11                  Max         8.38
## 12      25th Percentile        7.998
## 13      75th Percentile        8.134
## 14 Subset w/o Outliers:
## 15                Count         1193
## 16                    %          99%
## 17            Outlier %           1%
## 18             NA Count            0
## 19                 Mean        8.066
## 20               Median        8.082
## 21   Standard Deviation        0.102
## 22             Variance         0.01
## 23                Range        0.644
## 24                  Min        7.735
## 25                  Max         8.38
## [1] "L2 length = 0"
```

```
## SALINITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1198    2
##                  metric                 V2
## 1                       Variable: SALINITY
## 2              Total N:
## 3                 Count               1198
## 4              NA Count                  0
## 5                  Mean             33.501
## 6                Median             33.521
## 7    Standard Deviation               0.42
## 8              Variance              0.177
## 9                 Range             13.596
## 10                  Min             20.385
## 11                  Max             33.981
## 12      25th Percentile             33.418
## 13      75th Percentile             33.615
## 14 Subset w/o Outliers:
## 15                Count               1195
## 16                    %              99.7%
## 17            Outlier %               0.3%
## 18             NA Count                  0
## 19                 Mean             33.516
## 20               Median             33.522
## 21   Standard Deviation              0.161
## 22             Variance              0.026
## 23                Range               1.36
## 24                  Min             32.621
## 25                  Max             33.981
## [1] "L2 length = 0"
```

```
## SUSO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 367   2
##                  metric             V2
## 1                       Variable: SUSO
## 2              Total N:
## 3                 Count            367
## 4              NA Count              0
## 5                  Mean          4.914
## 6                Median          4.637
## 7    Standard Deviation           1.85
## 8              Variance          3.424
## 9                 Range         13.509
## 10                  Min            0.2
## 11                  Max         13.709
## 12      25th Percentile          3.699
## 13      75th Percentile          6.067
## 14 Subset w/o Outliers:
## 15                Count            363
## 16                    %          98.9%
## 17            Outlier %           1.1%
## 18             NA Count              0
## 19                 Mean          4.838
## 20               Median          4.611
## 21   Standard Deviation          1.708
## 22             Variance          2.918
## 23                Range         10.009
## 24                  Min            0.2
## 25                  Max         10.209
## [1] "L2 length = 0"
```

```
## TEMP
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1547    2
##                  metric             V2
## 1                       Variable: TEMP
## 2              Total N:
## 3                 Count           1547
## 4              NA Count              0
## 5                  Mean         15.145
## 6                Median         14.915
## 7    Standard Deviation          1.783
## 8              Variance          3.179
## 9                 Range         11.605
## 10                  Min         10.963
## 11                  Max         22.568
## 12      25th Percentile         13.883
## 13      75th Percentile         16.258
## 14 Subset w/o Outliers:
## 15                Count           1538
## 16                    %          99.4%
## 17            Outlier %           0.6%
## 18             NA Count              0
## 19                 Mean          15.11
## 20               Median         14.897
## 21   Standard Deviation           1.73
## 22             Variance          2.992
## 23                Range           9.52
## 24                  Min         10.963
## 25                  Max         20.483
## [1] "L2 length = 0"
```

```
## XMS
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1540    2
##                  metric            V2
## 1                       Variable: XMS
## 2              Total N:
## 3                 Count          1540
## 4              NA Count             0
## 5                  Mean        78.614
## 6                Median        79.642
## 7    Standard Deviation         6.152
## 8              Variance        37.845
## 9                 Range        51.708
## 10                  Min        38.282
## 11                  Max         89.99
## 12      25th Percentile        75.699
## 13      75th Percentile        82.824
## 14 Subset w/o Outliers:
## 15                Count          1519
## 16                    %         98.6%
## 17            Outlier %          1.4%
## 18             NA Count             0
## 19                 Mean        78.961
## 20               Median        79.742
## 21   Standard Deviation         5.384
## 22             Variance        28.987
## 23                Range        29.778
## 24                  Min        60.212
## 25                  Max         89.99
## [1] "L2 length = 0"
```

```
##    date_sample CHLOROPHYLL DENSITY       DO      ENTERO     FECAL OG       PH
## 1   1990-11-19        1.07  23.854 6.980000          NA        NA NA 8.130000
## 2   1991-01-07          NA      NA       NA   25.384615  88.46154 NA       NA
## 3   1991-01-14          NA      NA 5.445417   58.129735 137.21730 NA 8.195000
## 4   1991-01-21          NA      NA       NA   23.205128  59.61538 NA       NA
## 5   1991-01-28          NA      NA       NA   31.818910  69.78365 NA       NA
## 6   1991-02-04          NA      NA       NA  154.230769 428.58974 NA       NA
## 7   1991-02-11          NA      NA       NA   16.838141  14.63141 NA       NA
## 8   1991-02-18          NA      NA 5.597500   45.317879 112.33029 NA 8.173333
## 9   1991-02-25          NA      NA       NA    9.083333  16.10737 NA       NA
## 10  1991-03-04          NA      NA       NA   16.512821  15.05128 NA       NA
## 11  1991-03-11          NA      NA 4.808333   43.496041 247.95270 NA 8.201667
## 12  1991-03-18          NA      NA       NA   32.542347 179.98990 NA       NA
## 13  1991-03-25          NA      NA       NA 1370.111538 517.44812 NA       NA
## 14  1991-04-01          NA      NA       NA   15.025641  33.15385 NA       NA
## 15  1991-04-08          NA      NA       NA   38.837607 136.90598 NA       NA
## 16  1991-04-15          NA      NA 4.730833   43.944524 190.35018 NA 8.138333
## 17  1991-04-22          NA      NA       NA   24.313390  77.44160 NA       NA
##    SALINITY SUSO     TEMP      XMS
## 1  33.59550   NA 19.37000 60.22500
## 2        NA   NA 14.45000 81.96154
## 3  33.50113   NA 14.07478 82.04876
## 4        NA   NA 14.54487 70.19231
## 5        NA   NA 14.28846 77.61167
## 6        NA   NA 14.23462 81.83333
## 7        NA   NA 14.46154 70.83333
## 8  33.51717   NA 14.00639 79.30243
## 9        NA   NA 14.05769 79.71518
## 10       NA   NA 14.24231 82.44872
## 11 33.48729   NA 13.93447 70.49667
## 12       NA   NA 12.97995 68.95260
## 13       NA   NA 13.11026 69.92308
## 14       NA   NA 13.46667 75.12719
## 15       NA   NA 13.19487 81.09818
## 16 33.55379   NA 13.33149 71.94475
## 17       NA   NA 12.97949 74.71053
##             vars    n   mean     sd median trimmed   mad   min     max   range
## date_sample    1 1616    NaN     NA     NA     NaN    NA   Inf    -Inf    -Inf
## CHLOROPHYLL    2 1071   3.66   2.98   2.78    3.16  2.07  0.39   22.79   22.40
## DENSITY        3 1098  24.78   0.47  24.81   24.80  0.45 22.84   25.98    3.14
```

```
## DO             4 1203   7.10   0.88   7.26    7.18  0.74  0.00    9.47    9.47
## ENTERO         5 1614 214.20 718.92  12.26   35.21 13.56  2.00 7648.28 7646.28
## FECAL          6 1614 304.60 826.25  23.30   86.48 29.92  2.00 6445.07 6443.07
## OG             7  351   0.24   0.23   0.20    0.20  0.00  0.20    2.65    2.45
## PH             8 1205   8.06   0.11   8.08    8.07  0.10  7.59    8.38    0.79
## SALINITY       9 1198  33.50   0.42  33.52   33.52  0.15 20.38   33.98   13.60
## SUSO          10  367   4.91   1.85   4.64    4.81  1.61  0.20   13.71   13.51
## TEMP          11 1547  15.14   1.78  14.92   15.04  1.75 10.96   22.57   11.61
## XMS           12 1540  78.61   6.15  79.64   79.25  5.14 38.28   89.99   51.71
##               skew kurtosis    se
## date_sample     NA       NA    NA
## CHLOROPHYLL   1.97     5.38  0.09
## DENSITY      -0.45     0.37  0.01
## DO           -1.19     4.14  0.03
## ENTERO        4.84    26.56 17.89
## FECAL         4.13    18.61 20.57
## OG            7.92    70.11  0.01
## PH           -0.84     1.63  0.00
## SALINITY    -25.63   791.34  0.01
## SUSO          0.79     1.80  0.10
## TEMP          0.59     0.20  0.05
## XMS          -1.47     4.30  0.16
##          date_sample parameter       Avg
## Not NA n       36811     36811 35669.000
## NA n               0         0  1142.000
## Not NA %           1         1     0.969
## NA %               0         0     0.031
```

```
owt_df02_gb04_wkly02 = ts_eda(ts_df = owt_df02_gb04,
                              form_lead = "date_sample",
                              form_cast = "parameter",
                              param_lst = param_lst02,
                              rtn_met = TRUE,
                              box = FALSE,
                              week_agg = TRUE,
                              out_rm = TRUE
                              )
```

```
## date_sample ~ parameter
## <environment: 0x000001f3bfe83078>
## CHLOROPHYLL

## Using Avg as value column: use value.var to override.

## [1] 1071    2
## [1] 1049    2
##                  metric                    V2
## 1                       Variable: CHLOROPHYLL
## 2              Total N:
## 3                 Count                  1049
## 4              NA Count                     0
## 5                  Mean                 3.423
## 6                Median                 2.726
## 7    Standard Deviation                 2.465
## 8              Variance                 6.074
```

```
## 9                 Range                12.205
## 10                  Min                 0.393
## 11                  Max                12.599
## 12      25th Percentile                 1.552
## 13      75th Percentile                  4.55
## 14 Subset w/o Outliers:
## 15                Count                  1035
## 16                    %                 98.7%
## 17            Outlier %                  1.3%
## 18             NA Count                     0
## 19                 Mean                  3.31
## 20               Median                 2.699
## 21   Standard Deviation                 2.278
## 22             Variance                 5.188
## 23                Range                10.373
## 24                  Min                 0.393
## 25                  Max                10.767
## [1] "L2 length = 0"
```

```
## DENSITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1098    2
## [1] 1089    2
##                  metric                V2
## 1                       Variable: DENSITY
## 2              Total N:
## 3                 Count              1089
## 4              NA Count                 0
## 5                  Mean            24.793
## 6                Median            24.812
## 7    Standard Deviation             0.448
## 8              Variance             0.201
## 9                 Range             2.545
## 10                  Min            23.431
## 11                  Max            25.976
## 12      25th Percentile              24.5
## 13      75th Percentile            25.103
## 14 Subset w/o Outliers:
## 15                Count              1088
## 16                    %             99.9%
```

```
## 17            Outlier %              0.1%
## 18             NA Count                 0
## 19                 Mean            24.794
## 20               Median            24.813
## 21   Standard Deviation             0.446
## 22             Variance             0.199
## 23                Range             2.522
## 24                  Min            23.454
## 25                  Max            25.976
## [1] "L2 length = 0"
```

```
## DO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1203    2
## [1] 1196    2
##                  metric           V2
## 1                       Variable: DO
## 2              Total N:
## 3                 Count         1196
## 4              NA Count            0
## 5                  Mean        7.125
## 6                Median        7.265
## 7    Standard Deviation        0.821
## 8              Variance        0.674
## 9                 Range        4.942
## 10                  Min        4.527
## 11                  Max        9.468
## 12      25th Percentile        6.657
## 13      75th Percentile        7.714
## 14 Subset w/o Outliers:
## 15                Count         1192
## 16                    %        99.7%
## 17            Outlier %         0.3%
## 18             NA Count            0
## 19                 Mean        7.133
## 20               Median        7.267
## 21   Standard Deviation        0.809
## 22             Variance        0.654
## 23                Range        4.778
## 24                  Min         4.69
```

```
## 25                  Max        9.468
## [1] "L2 length = 0"
```

```
## ENTERO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1614    2
## [1] 1557    2
##                  metric               V2
## 1                       Variable: ENTERO
## 2              Total N:
## 3                 Count             1557
## 4              NA Count                0
## 5                  Mean           91.784
## 6                Median           11.698
## 7    Standard Deviation           275.13
## 8              Variance        75696.459
## 9                 Range         2344.566
## 10                  Min                2
## 11                  Max         2346.566
## 12      25th Percentile            5.128
## 13      75th Percentile           38.694
## 14 Subset w/o Outliers:
## 15                Count             1516
## 16                    %            97.4%
## 17            Outlier %             2.6%
## 18             NA Count                0
## 19                 Mean           52.359
## 20               Median           11.146
## 21   Standard Deviation          118.074
## 22             Variance        13941.503
## 23                Range          909.627
## 24                  Min                2
## 25                  Max          911.627
## [1] "L2 length = 0"
```

```
## FECAL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1614    2
## [1] 1562    2
##                  metric              V2
## 1                       Variable: FECAL
## 2              Total N:
## 3                 Count            1562
## 4              NA Count               0
## 5                  Mean         177.977
## 6                Median          20.506
## 7    Standard Deviation         421.323
## 8              Variance       177512.97
## 9                 Range        2737.584
## 10                  Min               2
## 11                  Max        2739.584
## 12      25th Percentile           6.048
## 13      75th Percentile         129.582
## 14 Subset w/o Outliers:
## 15                Count            1509
## 16                    %           96.6%
## 17            Outlier %            3.4%
## 18             NA Count               0
## 19                 Mean         111.629
## 20               Median          18.395
## 21   Standard Deviation          219.97
## 22             Variance       48386.762
## 23                Range        1436.388
## 24                  Min               2
## 25                  Max        1438.388
## [1] "L2 length = 0"
```

```
## OG
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 351   2
## [1] 345   2
##                  metric           V2
## 1                       Variable: OG
## 2              Total N:
## 3                 Count          345
## 4              NA Count            0
## 5                  Mean        0.218
## 6                Median          0.2
## 7    Standard Deviation        0.068
## 8              Variance        0.005
## 9                 Range        0.697
## 10                  Min          0.2
## 11                  Max        0.897
## 12      25th Percentile          0.2
## 13      75th Percentile          0.2
## 14 Subset w/o Outliers:
## 15                Count          337
## 16                    %        97.7%
## 17            Outlier %         2.3%
## 18             NA Count            0
## 19                 Mean        0.209
## 20               Median          0.2
## 21   Standard Deviation         0.03
## 22             Variance        0.001
## 23                Range        0.219
## 24                  Min          0.2
## 25                  Max        0.419
## [1] "L2 length = 0"
```

```
## PH
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1205    2
## [1] 1193    2
##                  metric           V2
## 1                       Variable: PH
## 2              Total N:
## 3                 Count         1193
## 4              NA Count            0
## 5                  Mean        8.066
## 6                Median        8.082
## 7    Standard Deviation        0.102
## 8              Variance         0.01
## 9                 Range        0.644
## 10                  Min        7.735
## 11                  Max         8.38
## 12      25th Percentile            8
## 13      75th Percentile        8.135
## 14 Subset w/o Outliers:
## 15                Count         1185
## 16                    %        99.3%
## 17            Outlier %         0.7%
## 18             NA Count            0
## 19                 Mean        8.068
## 20               Median        8.082
## 21   Standard Deviation        0.099
## 22             Variance         0.01
## 23                Range        0.602
## 24                  Min        7.761
## 25                  Max        8.363
## [1] "L2 length = 0"
```

```
## SALINITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1198    2
## [1] 1195    2
##                  metric                 V2
## 1                       Variable: SALINITY
## 2              Total N:
## 3                 Count               1195
## 4              NA Count                  0
## 5                  Mean             33.516
## 6                Median             33.522
## 7    Standard Deviation              0.161
## 8              Variance              0.026
## 9                 Range               1.36
## 10                  Min             32.621
## 11                  Max             33.981
## 12      25th Percentile             33.419
## 13      75th Percentile             33.615
## 14 Subset w/o Outliers:
## 15                Count               1188
## 16                    %              99.4%
## 17            Outlier %               0.6%
## 18             NA Count                  0
## 19                 Mean              33.52
## 20               Median             33.523
## 21   Standard Deviation              0.152
## 22             Variance              0.023
## 23                Range              0.939
## 24                  Min             33.042
## 25                  Max             33.981
## [1] "L2 length = 0"
```

```
## SUSO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 367   2
## [1] 363   2
##                  metric             V2
## 1                       Variable: SUSO
## 2              Total N:
## 3                 Count            363
## 4              NA Count              0
## 5                  Mean          4.838
## 6                Median          4.611
## 7    Standard Deviation          1.708
## 8              Variance          2.918
## 9                 Range         10.009
## 10                  Min            0.2
## 11                  Max         10.209
## 12      25th Percentile          3.697
## 13      75th Percentile          5.977
## 14 Subset w/o Outliers:
## 15                Count            361
## 16                    %          99.4%
## 17            Outlier %           0.6%
## 18             NA Count              0
## 19                 Mean          4.808
## 20               Median          4.607
## 21   Standard Deviation          1.666
## 22             Variance          2.775
## 23                Range          9.685
## 24                  Min            0.2
## 25                  Max          9.885
## [1] "L2 length = 0"
```

```
## TEMP
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1547    2
## [1] 1538    2
##                  metric             V2
## 1                       Variable: TEMP
## 2              Total N:
## 3                 Count           1538
## 4              NA Count              0
## 5                  Mean          15.11
## 6                Median         14.897
## 7    Standard Deviation           1.73
## 8              Variance          2.992
## 9                 Range           9.52
## 10                  Min         10.963
## 11                  Max         20.483
## 12      25th Percentile         13.876
## 13      75th Percentile         16.244
## 14 Subset w/o Outliers:
## 15                Count           1534
## 16                    %          99.7%
## 17            Outlier %           0.3%
## 18             NA Count              0
## 19                 Mean         15.097
## 20               Median         14.893
## 21   Standard Deviation          1.711
## 22             Variance          2.926
## 23                Range          9.335
## 24                  Min         10.963
## 25                  Max         20.298
## [1] "L2 length = 0"
```

```
## XMS
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1540    2
## [1] 1519    2
##                  metric            V2
## 1                       Variable: XMS
## 2              Total N:
## 3                 Count          1519
## 4              NA Count             0
## 5                  Mean        78.961
## 6                Median        79.742
## 7    Standard Deviation         5.384
## 8              Variance        28.987
## 9                 Range        29.778
## 10                  Min        60.212
## 11                  Max         89.99
## 12      25th Percentile        75.922
## 13      75th Percentile         82.87
## 14 Subset w/o Outliers:
## 15                Count          1511
## 16                    %         99.5%
## 17            Outlier %          0.5%
## 18             NA Count             0
## 19                 Mean        79.053
## 20               Median         79.78
## 21   Standard Deviation         5.246
## 22             Variance         27.52
## 23                Range        27.089
## 24                  Min        62.901
## 25                  Max         89.99
## [1] "L2 length = 0"
```

```
##    date_sample CHLOROPHYLL DENSITY       DO      ENTERO     FECAL OG       PH
## 1   1990-11-19        1.07  23.854 6.980000          NA        NA NA 8.130000
## 2   1991-01-07          NA      NA       NA   25.384615  88.46154 NA       NA
## 3   1991-01-14          NA      NA 5.445417   58.129735 137.21730 NA 8.195000
## 4   1991-01-21          NA      NA       NA   23.205128  59.61538 NA       NA
## 5   1991-01-28          NA      NA       NA   31.818910  69.78365 NA       NA
## 6   1991-02-04          NA      NA       NA  154.230769 428.58974 NA       NA
## 7   1991-02-11          NA      NA       NA   16.838141  14.63141 NA       NA
## 8   1991-02-18          NA      NA 5.597500   45.317879 112.33029 NA 8.173333
## 9   1991-02-25          NA      NA       NA    9.083333  16.10737 NA       NA
## 10  1991-03-04          NA      NA       NA   16.512821  15.05128 NA       NA
## 11  1991-03-11          NA      NA 4.808333   43.496041 247.95270 NA 8.201667
## 12  1991-03-18          NA      NA       NA   32.542347 179.98990 NA       NA
## 13  1991-03-25          NA      NA       NA 1370.111538 517.44812 NA       NA
## 14  1991-04-01          NA      NA       NA   15.025641  33.15385 NA       NA
## 15  1991-04-08          NA      NA       NA   38.837607 136.90598 NA       NA
## 16  1991-04-15          NA      NA 4.730833   43.944524 190.35018 NA 8.138333
## 17  1991-04-22          NA      NA       NA   24.313390  77.44160 NA       NA
##    SALINITY SUSO     TEMP      XMS
## 1  33.59550   NA 19.37000 60.22500
## 2        NA   NA 14.45000 81.96154
## 3  33.50113   NA 14.07478 82.04876
## 4        NA   NA 14.54487 70.19231
## 5        NA   NA 14.28846 77.61167
## 6        NA   NA 14.23462 81.83333
## 7        NA   NA 14.46154 70.83333
## 8  33.51717   NA 14.00639 79.30243
## 9        NA   NA 14.05769 79.71518
## 10       NA   NA 14.24231 82.44872
## 11 33.48729   NA 13.93447 70.49667
## 12       NA   NA 12.97995 68.95260
## 13       NA   NA 13.11026 69.92308
## 14       NA   NA 13.46667 75.12719
## 15       NA   NA 13.19487 81.09818
## 16 33.55379   NA 13.33149 71.94475
## 17       NA   NA 12.97949 74.71053
##             vars    n   mean     sd median trimmed   mad   min     max   range
## date_sample    1 1615    NaN     NA     NA     NaN    NA   Inf    -Inf    -Inf
## CHLOROPHYLL    2 1049   3.42   2.46   2.73    3.06  1.98  0.39   12.60   12.21
## DENSITY        3 1089  24.79   0.45  24.81   24.81  0.44 23.43   25.98    2.54
```

```
## DO             4 1196   7.12   0.82   7.27    7.19  0.74  4.53    9.47    4.94
## ENTERO         5 1557  91.78 275.13  11.70   25.40 12.59  2.00 2346.57 2344.57
## FECAL          6 1562 177.98 421.32  20.51   68.76 25.72  2.00 2739.58 2737.58
## OG             7  345   0.22   0.07   0.20    0.20  0.00  0.20    0.90    0.70
## PH             8 1193   8.07   0.10   8.08    8.07  0.09  7.74    8.38    0.64
## SALINITY       9 1195  33.52   0.16  33.52   33.52  0.15 32.62   33.98    1.36
## SUSO          10  363   4.84   1.71   4.61    4.78  1.57  0.20   10.21   10.01
## TEMP          11 1538  15.11   1.73  14.90   15.02  1.73 10.96   20.48    9.52
## XMS           12 1519  78.96   5.38  79.74   79.38  5.05 60.21   89.99   29.78
##              skew kurtosis    se
## date_sample    NA       NA    NA
## CHLOROPHYLL  1.30     1.35  0.08
## DENSITY     -0.27    -0.11  0.01
## DO          -0.65     0.23  0.02
## ENTERO       5.13    29.25  6.97
## FECAL        3.79    15.29 10.66
## OG           5.74    40.06  0.00
## PH          -0.50     0.51  0.00
## SALINITY    -0.54     1.78  0.00
## SUSO         0.37     0.29  0.09
## TEMP         0.48    -0.16  0.04
## XMS         -0.73     0.33  0.14
##          date_sample parameter       Avg
## Not NA n       36811     36811 35669.000
## NA n               0         0  1142.000
## Not NA %           1         1     0.969
## NA %               0         0     0.031
```

Run custom function on data aggregated by date_sample, project and parameter

```
owt_df02_gb09_mrgd = ts_eda(ts_df = owt_df02_gb09,
                            form_lead = c("date_sample", "project"),
                            form_cast = "parameter",
                            param_lst = param_lst02,
                            l1_col = c("project"),
                            l1_param = c("PLOO", "SBOO"),
                            rtn_met = FALSE,
                            box = FALSE,
                            week_agg = FALSE
                            )
```

```
## date_sample + project ~ parameter
## <environment: 0x000001f3a8ba4548>
## CHLOROPHYLL

## Using Avg as value column: use value.var to override.

## [1] 3023    3
## [1] "L2 length = 0"

## DENSITY

## Using Avg as value column: use value.var to override.
```

```
## [1] 3177    3
## [1] "L2 length = 0"
```

```
## DO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 3434    3
## [1] "L2 length = 0"
```

```
## ENTERO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 6776    3
## [1] "L2 length = 0"
```

```
## FECAL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 6594    3
## [1] "L2 length = 0"
```

```
## OG
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 937   3
## [1] "L2 length = 0"
```

```
## PH
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 3396    3
## [1] "L2 length = 0"
```

```
## SALINITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 3434    3
## [1] "L2 length = 0"
```

```
## SUSO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 977   3
## [1] "L2 length = 0"
```

```
## TEMP
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 4524    3
## [1] "L2 length = 0"
```

```
## XMS
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 4494    3
## [1] "L2 length = 0"
```

```
##    date_sample project CHLOROPHYLL DENSITY      DO    ENTERO     FECAL OG    PH
```

```
## 1   1990-11-15    PLOO        0.87  23.855 6.55000        NA        NA NA 8.080
## 2   1990-11-15    SBOO        1.27  23.853 7.41000        NA        NA NA 8.180
## 3   1991-01-02    PLOO          NA      NA      NA  32.05128 125.64103 NA    NA
## 4   1991-01-03    PLOO          NA      NA      NA  18.71795  51.28205 NA    NA
## 5   1991-01-07    PLOO          NA      NA      NA 106.15385  80.76923 NA    NA
## 6   1991-01-08    PLOO          NA      NA      NA  40.00000  40.55556 NA    NA
## 7   1991-01-09    PLOO          NA      NA 5.47625  20.33898  40.50847 NA 8.195
## 8   1991-01-10    PLOO          NA      NA 5.50000  40.22727  78.18182 NA    NA
## 9   1991-01-11    PLOO          NA      NA 5.36000  83.92857 446.07143 NA    NA
## 10  1991-01-14    PLOO          NA      NA      NA  33.84615  95.64103 NA    NA
## 11  1991-01-16    PLOO          NA      NA      NA  12.56410  23.58974 NA    NA
## 12  1991-01-22    PLOO          NA      NA      NA  20.51282  31.02564 NA    NA
## 13  1991-01-23    PLOO          NA      NA      NA  43.12500 108.54167 NA    NA
## 14  1991-01-28    PLOO          NA      NA      NA 183.07692 427.69231 NA    NA
## 15  1991-01-30    PLOO          NA      NA      NA 125.38462 429.48718 NA    NA
## 16  1991-02-04    PLOO          NA      NA      NA  16.29167  16.75000 NA    NA
## 17  1991-02-06    PLOO          NA      NA      NA  17.38462  12.51282 NA    NA
##    SALINITY SUSO     TEMP      XMS
## 1  33.61700   NA 19.43000 44.85000
## 2  33.57400   NA 19.31000 75.60000
## 3        NA   NA 14.50769 80.02564
## 4        NA   NA 14.39231 83.89744
## 5        NA   NA 14.54103 78.97436
## 6        NA   NA 13.43000 80.20000
## 7  33.51938   NA 14.26889 86.21111
## 8  33.49300   NA 13.75000 80.45833
## 9  33.49100   NA 14.38400 84.40000
## 10       NA   NA 14.51282 72.02564
## 11       NA   NA 14.57692 68.35897
## 12       NA   NA 14.50769 76.51282
## 13       NA   NA 14.06923 78.71053
## 14       NA   NA 14.29487 82.43590
## 15       NA   NA 14.17436 81.23077
## 16       NA   NA 14.46154 72.12821
## 17       NA   NA 14.46154 69.53846
##             vars    n   mean      sd median trimmed  mad   min      max
## date_sample    1 7037    NaN      NA     NA     NaN   NA   Inf     -Inf
## project*       2 7037   1.43    0.50   1.00    1.42 0.00  1.00     2.00
## CHLOROPHYLL    3 3023   4.01    3.81   2.81    3.31 2.27  0.29    36.05
## DENSITY        4 3177  24.79    0.47  24.82   24.81 0.45 22.71    26.04
## DO             5 3434   7.15    0.97   7.31    7.22 0.82  0.00    10.81
## ENTERO         6 6776 253.64 1249.91   5.27   18.53 4.84  0.00 18000.00
## FECAL          7 6594 355.65 1401.82   7.07   48.93 7.51  0.00 12000.00
## OG             8  937   0.24    0.29   0.20    0.20 0.00  0.20     5.10
## PH             9 3396   8.07    0.11   8.08    8.07 0.10  7.54     8.48
## SALINITY      10 3434  33.50    0.61  33.52   33.51 0.15  0.00    34.10
## SUSO          11  977   4.99    2.16   4.67    4.80 1.80  0.20    15.68
## TEMP          12 4524  14.97    1.91  14.78   14.87 1.80  0.00    22.97
## XMS           13 4494  78.31    8.29  79.96   79.37 6.18  0.00    92.46
##                range   skew kurtosis    se
## date_sample     -Inf     NA       NA    NA
## project*        1.00   0.26    -1.93  0.01
## CHLOROPHYLL    35.76   2.56     9.61  0.07
## DENSITY         3.33  -0.46     0.38  0.01
```

```
## DO             10.81  -0.89     3.49  0.02
## ENTERO      18000.00   7.41    61.01 15.18
## FECAL       12000.00   6.25    43.27 17.26
## OG              4.90  10.89   144.21  0.01
## PH              0.94  -0.67     1.45  0.00
## SALINITY       34.10 -48.98  2674.00  0.01
## SUSO           15.48   1.09     2.23  0.07
## TEMP           22.97   0.43     0.95  0.03
## XMS            92.46  -2.00     7.54  0.12
##          date_sample project parameter        Avg
## Not NA n       48395   48395     48395 47222.0000
## NA n               0       0         0  1173.0000
## Not NA %           1       1         1     0.9758
## NA %               0       0         0     0.0242
```

```
owt_df02_gb09_wkly = ts_eda(ts_df = owt_df02_gb09,
                            form_lead = c("date_sample", "project"),
                            form_cast = "parameter",
                            param_lst = param_lst02,
                            l1_col = c("project"),
                            l1_param = c("PLOO", "SBOO"),
                            rtn_met = FALSE,
                            box = FALSE,
                            week_agg = TRUE
                            )
```

```
## date_sample + project ~ parameter
## <environment: 0x000001f3acce6ea8>
## CHLOROPHYLL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1967    3
## [1] "L2 length = 0"
```

```
## DENSITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2000    3
## [1] "L2 length = 0"
```

```
## DO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2101    3
## [1] "L2 length = 0"
```

```
## ENTERO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2786    3
## [1] "L2 length = 0"
```

```
## FECAL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2786    3
## [1] "L2 length = 0"
```

```
## OG
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 351   3
## [1] "L2 length = 0"
```

```
## PH
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2105    3
## [1] "L2 length = 0"
```

```
## SALINITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2097    3
## [1] "L2 length = 0"
```

```
## SUSO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 369   3
## [1] "L2 length = 0"
```

```
## TEMP
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2616    3
## [1] "L2 length = 0"
```

```
## XMS
## Using Avg as value column: use value.var to override.
```

```
## [1] 2606    3
## [1] "L2 length = 0"
```

```
##    date_sample project CHLOROPHYLL DENSITY       DO      ENTERO     FECAL OG
## 1   1990-11-19    PLOO        0.87  23.855 6.550000          NA        NA NA
## 2   1990-11-19    SBOO        1.27  23.853 7.410000          NA        NA NA
## 3   1991-01-07    PLOO          NA      NA       NA   25.384615  88.46154 NA
## 4   1991-01-14    PLOO          NA      NA 5.445417   58.129735 137.21730 NA
## 5   1991-01-21    PLOO          NA      NA       NA   23.205128  59.61538 NA
## 6   1991-01-28    PLOO          NA      NA       NA   31.818910  69.78365 NA
## 7   1991-02-04    PLOO          NA      NA       NA  154.230769 428.58974 NA
## 8   1991-02-11    PLOO          NA      NA       NA   16.838141  14.63141 NA
## 9   1991-02-18    PLOO          NA      NA 5.597500   45.317879 112.33029 NA
## 10  1991-02-25    PLOO          NA      NA       NA    9.083333  16.10737 NA
## 11  1991-03-04    PLOO          NA      NA       NA   16.512821  15.05128 NA
## 12  1991-03-11    PLOO          NA      NA 4.808333   43.496041 247.95270 NA
## 13  1991-03-18    PLOO          NA      NA       NA   32.542347 179.98990 NA
## 14  1991-03-25    PLOO          NA      NA       NA 1370.111538 517.44812 NA
## 15  1991-04-01    PLOO          NA      NA       NA   15.025641  33.15385 NA
## 16  1991-04-08    PLOO          NA      NA       NA   38.837607 136.90598 NA
## 17  1991-04-15    PLOO          NA      NA 4.730833   43.944524 190.35018 NA
##          PH SALINITY SUSO     TEMP      XMS
## 1  8.080000 33.61700   NA 19.43000 44.85000
## 2  8.180000 33.57400   NA 19.31000 75.60000
```

```
## 3        NA       NA   NA 14.45000 81.96154
## 4  8.195000 33.50113   NA 14.07478 82.04876
## 5        NA       NA   NA 14.54487 70.19231
## 6        NA       NA   NA 14.28846 77.61167
## 7        NA       NA   NA 14.23462 81.83333
## 8        NA       NA   NA 14.46154 70.83333
## 9  8.173333 33.51717   NA 14.00639 79.30243
## 10       NA       NA   NA 14.05769 79.71518
## 11       NA       NA   NA 14.24231 82.44872
## 12 8.201667 33.48729   NA 13.93447 70.49667
## 13       NA       NA   NA 12.97995 68.95260
## 14       NA       NA   NA 13.11026 69.92308
## 15       NA       NA   NA 13.46667 75.12719
## 16       NA       NA   NA 13.19487 81.09818
## 17 8.138333 33.55379   NA 13.33149 71.94475
##             vars    n   mean     sd median trimmed   mad   min     max   range
## date_sample    1 2802    NaN     NA     NA     NaN    NA   Inf    -Inf    -Inf
## project*       2 2802   1.43   0.49   1.00    1.41  0.00  1.00    2.00    1.00
## CHLOROPHYLL    3 1967   3.89   3.68   2.71    3.19  2.09  0.33   36.05   35.72
## DENSITY        4 2000  24.73   0.47  24.76   24.75  0.44 22.71   25.98    3.27
## DO             5 2101   7.24   0.87   7.35    7.29  0.75  0.00   10.81   10.81
## ENTERO         6 2786 169.27 699.74   7.58   17.88  7.65  2.00 8668.00 8666.00
## FECAL          7 2786 233.75 815.20   9.45   42.01 10.37  2.00 7881.92 7879.92
## OG             8  351   0.24   0.23   0.20    0.20  0.00  0.20    2.65    2.45
## PH             9 2105   8.08   0.10   8.10    8.09  0.09  7.59    8.44    0.85
## SALINITY      10 2097  33.50   0.33  33.51   33.51  0.14 20.38   33.98   13.60
## SUSO          11  369   4.91   1.85   4.64    4.80  1.61  0.20   13.71   13.51
## TEMP          12 2616  15.22   1.83  15.01   15.11  1.77 10.96   22.97   12.01
## XMS           13 2606  77.43   8.03  79.29   78.55  5.84 18.11   90.68   72.57
##               skew kurtosis    se
## date_sample     NA       NA    NA
## project*      0.30    -1.91  0.01
## CHLOROPHYLL   2.63    10.24  0.08
## DENSITY      -0.47     0.46  0.01
## DO           -0.76     3.34  0.02
## ENTERO        6.11    42.36 13.26
## FECAL         5.43    33.41 15.44
## OG            7.92    70.11  0.01
## PH           -0.71     1.79  0.00
## SALINITY    -29.25  1137.46  0.01
## SUSO          0.79     1.80  0.10
## TEMP          0.61     0.27  0.04
## XMS          -1.91     5.85  0.16
##          date_sample project parameter        Avg
## Not NA n       48395   48395     48395 47222.0000
## NA n               0       0         0  1173.0000
## Not NA %           1       1         1     0.9758
## NA %               0       0         0     0.0242
```

```
owt_df02_gb09_wkly02 = ts_eda(ts_df = owt_df02_gb09,
                              form_lead = c("date_sample", "project"),
                              form_cast = "parameter",
                              param_lst = param_lst02,
                              l1_col = c("project"),
```

```
                                l1_param = c("PLOO", "SBOO"),
                                rtn_met = FALSE,
                                box = FALSE,
                                week_agg = TRUE,
                                out_rm = TRUE
                                )
```

```
## date_sample + project ~ parameter
## <environment: 0x000001f3b6324d20>
## CHLOROPHYLL

## Using Avg as value column: use value.var to override.

## [1] 1967    3
## [1] 1919    3
## [1] "L2 length = 0"

## DENSITY

## Using Avg as value column: use value.var to override.
```

```
## [1] 2000    3
## [1] 1990    3
## [1] "L2 length = 0"

## DO

## Using Avg as value column: use value.var to override.
```

```
## [1] 2101    3
```

```
## [1] 2082    3
## [1] "L2 length = 0"
```

```
## ENTERO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2786    3
## [1] 2713    3
## [1] "L2 length = 0"
```

```
## FECAL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2786    3
## [1] 2711    3
## [1] "L2 length = 0"
```

```
## OG
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 351   3
## [1] 345   3
## [1] "L2 length = 0"
```

```
## PH
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2105    3
## [1] 2079    3
## [1] "L2 length = 0"
```

```
## SALINITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2097    3
## [1] 2094    3
## [1] "L2 length = 0"
```

```
## SUSO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 369   3
## [1] 365   3
## [1] "L2 length = 0"
```

```
## TEMP
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2616    3
## [1] 2603    3
## [1] "L2 length = 0"
```

```
## XMS
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 2606    3
## [1] 2560    3
## [1] "L2 length = 0"
```

```
##    date_sample project CHLOROPHYLL DENSITY       DO      ENTERO     FECAL OG
## 1   1990-11-19    PLOO        0.87  23.855 6.550000          NA        NA NA
## 2   1990-11-19    SBOO        1.27  23.853 7.410000          NA        NA NA
## 3   1991-01-07    PLOO          NA      NA       NA   25.384615  88.46154 NA
## 4   1991-01-14    PLOO          NA      NA 5.445417   58.129735 137.21730 NA
## 5   1991-01-21    PLOO          NA      NA       NA   23.205128  59.61538 NA
## 6   1991-01-28    PLOO          NA      NA       NA   31.818910  69.78365 NA
## 7   1991-02-04    PLOO          NA      NA       NA  154.230769 428.58974 NA
## 8   1991-02-11    PLOO          NA      NA       NA   16.838141  14.63141 NA
## 9   1991-02-18    PLOO          NA      NA 5.597500   45.317879 112.33029 NA
## 10  1991-02-25    PLOO          NA      NA       NA    9.083333  16.10737 NA
## 11  1991-03-04    PLOO          NA      NA       NA   16.512821  15.05128 NA
## 12  1991-03-11    PLOO          NA      NA 4.808333   43.496041 247.95270 NA
## 13  1991-03-18    PLOO          NA      NA       NA   32.542347 179.98990 NA
## 14  1991-03-25    PLOO          NA      NA       NA 1370.111538 517.44812 NA
## 15  1991-04-01    PLOO          NA      NA       NA   15.025641  33.15385 NA
## 16  1991-04-08    PLOO          NA      NA       NA   38.837607 136.90598 NA
## 17  1991-04-15    PLOO          NA      NA 4.730833   43.944524 190.35018 NA
##          PH SALINITY SUSO     TEMP      XMS
## 1  8.080000 33.61700   NA 19.43000       NA
## 2  8.180000 33.57400   NA 19.31000 75.60000
## 3        NA       NA   NA 14.45000 81.96154
## 4  8.195000 33.50113   NA 14.07478 82.04876
```

```
## 5        NA       NA   NA 14.54487 70.19231
## 6        NA       NA   NA 14.28846 77.61167
## 7        NA       NA   NA 14.23462 81.83333
## 8        NA       NA   NA 14.46154 70.83333
## 9  8.173333 33.51717   NA 14.00639 79.30243
## 10       NA       NA   NA 14.05769 79.71518
## 11       NA       NA   NA 14.24231 82.44872
## 12 8.201667 33.48729   NA 13.93447 70.49667
## 13       NA       NA   NA 12.97995 68.95260
## 14       NA       NA   NA 13.11026 69.92308
## 15       NA       NA   NA 13.46667 75.12719
## 16       NA       NA   NA 13.19487 81.09818
## 17 8.138333 33.55379   NA 13.33149 71.94475
##             vars    n   mean     sd median trimmed  mad   min     max   range
## date_sample    1 2799    NaN     NA     NA     NaN   NA   Inf    -Inf    -Inf
## project*       2 2799   1.43   0.49   1.00    1.41 0.00  1.00    2.00    1.00
## CHLOROPHYLL    3 1919   3.51   2.75   2.63    3.06 1.98  0.33   14.72   14.38
## DENSITY        4 1990  24.74   0.46  24.76   24.76 0.44 23.34   25.98    2.64
## DO             5 2082   7.26   0.81   7.36    7.30 0.74  4.69    9.81    5.12
## ENTERO         6 2713  66.28 228.34   7.25   14.79 7.15  2.00 2266.55 2264.55
## FECAL          7 2711 115.89 335.46   8.89   33.22 9.50  2.00 2658.87 2656.87
## OG             8  345   0.22   0.07   0.20    0.20 0.00  0.20    0.90    0.70
## PH             9 2079   8.08   0.10   8.10    8.09 0.09  7.77    8.38    0.61
## SALINITY      10 2094  33.50   0.16  33.51   33.51 0.14 32.59   33.98    1.39
## SUSO          11  365   4.83   1.71   4.61    4.77 1.57  0.20   10.21   10.01
## TEMP          12 2603  15.19   1.78  15.00   15.10 1.76 10.96   20.68    9.72
## XMS           13 2560  78.03   6.67  79.43   78.77 5.69 53.63   90.68   37.05
##              skew kurtosis   se
## date_sample    NA       NA   NA
## project*     0.30    -1.91 0.01
## CHLOROPHYLL  1.53     2.20 0.06
## DENSITY     -0.34     0.08 0.01
## DO          -0.46     0.44 0.02
## ENTERO       5.78    37.71 4.38
## FECAL        4.74    24.82 6.44
## OG           5.74    40.06 0.00
## PH          -0.36     0.45 0.00
## SALINITY    -0.53     1.74 0.00
## SUSO         0.37     0.30 0.09
## TEMP         0.50    -0.07 0.03
## XMS         -1.07     1.10 0.13
##          date_sample project parameter        Avg
## Not NA n       48395   48395     48395 47222.0000
## NA n               0       0         0  1173.0000
## Not NA %           1       1         1     0.9758
## NA %               0       0         0     0.0242
```

```
owt_df02_gb09_wkly03 <- owt_df02_gb09_wkly
print(head(owt_df02_gb09_wkly03, 17))
```

```
##    date_sample project CHLOROPHYLL DENSITY       DO      ENTERO     FECAL OG
## 1   1990-11-19    PLOO        0.87  23.855 6.550000          NA        NA NA
## 2   1990-11-19    SBOO        1.27  23.853 7.410000          NA        NA NA
## 3   1991-01-07    PLOO          NA      NA       NA   25.384615  88.46154 NA
```

```
## 4   1991-01-14    PLOO          NA      NA 5.445417   58.129735 137.21730 NA
## 5   1991-01-21    PLOO          NA      NA       NA   23.205128  59.61538 NA
## 6   1991-01-28    PLOO          NA      NA       NA   31.818910  69.78365 NA
## 7   1991-02-04    PLOO          NA      NA       NA  154.230769 428.58974 NA
## 8   1991-02-11    PLOO          NA      NA       NA   16.838141  14.63141 NA
## 9   1991-02-18    PLOO          NA      NA 5.597500   45.317879 112.33029 NA
## 10  1991-02-25    PLOO          NA      NA       NA    9.083333  16.10737 NA
## 11  1991-03-04    PLOO          NA      NA       NA   16.512821  15.05128 NA
## 12  1991-03-11    PLOO          NA      NA 4.808333   43.496041 247.95270 NA
## 13  1991-03-18    PLOO          NA      NA       NA   32.542347 179.98990 NA
## 14  1991-03-25    PLOO          NA      NA       NA 1370.111538 517.44812 NA
## 15  1991-04-01    PLOO          NA      NA       NA   15.025641  33.15385 NA
## 16  1991-04-08    PLOO          NA      NA       NA   38.837607 136.90598 NA
## 17  1991-04-15    PLOO          NA      NA 4.730833   43.944524 190.35018 NA
##          PH SALINITY SUSO     TEMP      XMS
## 1  8.080000 33.61700   NA 19.43000 44.85000
## 2  8.180000 33.57400   NA 19.31000 75.60000
## 3        NA       NA   NA 14.45000 81.96154
## 4  8.195000 33.50113   NA 14.07478 82.04876
## 5        NA       NA   NA 14.54487 70.19231
## 6        NA       NA   NA 14.28846 77.61167
## 7        NA       NA   NA 14.23462 81.83333
## 8        NA       NA   NA 14.46154 70.83333
## 9  8.173333 33.51717   NA 14.00639 79.30243
## 10       NA       NA   NA 14.05769 79.71518
## 11       NA       NA   NA 14.24231 82.44872
## 12 8.201667 33.48729   NA 13.93447 70.49667
## 13       NA       NA   NA 12.97995 68.95260
## 14       NA       NA   NA 13.11026 69.92308
## 15       NA       NA   NA 13.46667 75.12719
## 16       NA       NA   NA 13.19487 81.09818
## 17 8.138333 33.55379   NA 13.33149 71.94475
```

Run custom function on data aggregated by `date_sample`, `project`, `depth_m_bin` and `parameter`

```
owt_df02_gb07_mrgd = ts_eda(ts_df = owt_df02_gb07,
                            form_lead = c("date_sample", "project", "depth_m_bin"),
                            form_cast = "parameter",
                            param_lst = param_lst02,
                            l1_col = c("project"),
                            l1_param = c("PLOO", "SBOO"),
                            l2_col = c("depth_m_bin"),
                            l2_param = depth_lvls01,
                            rtn_met = FALSE,
                            box = FALSE
                            )
```

```
## date_sample + project + depth_m_bin ~ parameter
## <environment: 0x000001f3b5a5c7e8>
## CHLOROPHYLL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 8386    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## DENSITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 8627    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## DO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 9842    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## ENTERO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 15533     4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
```

```
## FECAL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 14874     4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
```

```
## OG
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1115    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: [33,47)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [8,33)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [33,47)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [47,70)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
```

```
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## PH
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 9695    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## SALINITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 9844    4
## [1] "L2 length = 8"
```

```
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## SUSO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 3023    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## TEMP
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 12010     4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## XMS
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 11969     4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
```

```
##   replacement has 1 row, data has 0
```

```
##    date_sample project depth_m_bin CHLOROPHYLL DENSITY       DO    ENTERO
## 1   1990-11-15    PLOO      [8,33)        0.87  23.855 6.550000        NA
## 2   1990-11-15    SBOO       [0,8)        1.27  23.853 7.410000        NA
## 3   1991-01-02    PLOO       [0,8)          NA      NA       NA  34.07407
## 4   1991-01-02    PLOO      [8,33)          NA      NA       NA  27.50000
## 5   1991-01-03    PLOO       [0,8)          NA      NA       NA  17.40741
## 6   1991-01-03    PLOO      [8,33)          NA      NA       NA  21.66667
## 7   1991-01-07    PLOO       [0,8)          NA      NA       NA  77.40741
## 8   1991-01-07    PLOO      [8,33)          NA      NA       NA 170.83333
## 9   1991-01-08    PLOO       [0,8)          NA      NA       NA  36.25000
## 10  1991-01-08    PLOO     [33,47)          NA      NA       NA  10.00000
## 11  1991-01-08    PLOO     [47,70)          NA      NA       NA  16.66667
## 12  1991-01-08    PLOO      [8,33)          NA      NA       NA  57.50000
## 13  1991-01-09    PLOO       [0,8)          NA      NA 5.675000  11.81818
## 14  1991-01-09    PLOO     [33,47)          NA      NA 5.391667  32.50000
## 15  1991-01-09    PLOO     [47,70)          NA      NA 5.300000  10.00000
## 16  1991-01-09    PLOO     [70,90)          NA      NA 5.025000  10.00000
## 17  1991-01-09    PLOO      [8,33)          NA      NA 5.496154  30.00000
##        FECAL OG       PH SALINITY SUSO     TEMP      XMS
## 1         NA NA 8.080000 33.61700   NA 19.43000 44.85000
## 2         NA NA 8.180000 33.57400   NA 19.31000 75.60000
## 3  134.81481 NA       NA       NA   NA 14.56667 77.03704
## 4  105.00000 NA       NA       NA   NA 14.37500 86.75000
## 5   45.55556 NA       NA       NA   NA 14.48519 83.55556
## 6   64.16667 NA       NA       NA   NA 14.18333 84.66667
## 7   44.07407 NA       NA       NA   NA 14.61852 77.62963
## 8  163.33333 NA       NA       NA   NA 14.36667 82.00000
## 9   31.66667 NA       NA       NA   NA 13.36667 81.00000
## 10  12.50000 NA       NA       NA   NA       NA       NA
## 11  10.00000 NA       NA       NA   NA       NA       NA
## 12  66.00000 NA       NA       NA   NA 13.52500 79.00000
## 13  11.36364 NA 8.200000 33.51292   NA 14.59333 85.96667
## 14  10.00000 NA 8.200000 33.52583   NA 14.08333 86.25000
## 15  75.00000 NA 8.192857 33.52500   NA 13.70000 85.50000
## 16  10.00000 NA 8.150000 33.52500   NA 13.07500 85.00000
## 17  42.50000 NA 8.200000 33.51846   NA 14.44333 86.93333
##             vars     n   mean      sd median trimmed  mad    min      max
## date_sample     1 17003    NaN      NA     NA     NaN   NA    Inf     -Inf
## project*        2 17003   1.37    0.48   1.00    1.34 0.00   1.00     2.00
```

```
## depth_m_bin*    3 17003   4.49    2.61   5.00    4.48 2.97   1.00     8.00
## CHLOROPHYLL     4  8386   3.60    4.09   2.38    2.82 2.13   0.00    54.04
## DENSITY         5  8627  24.96    0.69  24.98   24.99 0.70  22.39    26.48
## DO              6  9842   6.70    1.69   7.10    6.80 1.58   0.00    12.83
## ENTERO          7 15533 150.11  925.42   2.80   10.66 1.19   0.00 18000.00
## FECAL           8 14874 269.82 1129.98   3.85   28.41 2.74   0.00 13000.00
## OG              9  1115   0.24    0.26   0.20    0.20 0.00   0.20     5.10
## PH             10  9695   8.01    0.18   8.05    8.02 0.18   7.33     8.59
## SALINITY       11  9844  33.52    0.86  33.54   33.54 0.17   0.00    34.36
## SUSO           12  3023   4.77    2.99   4.18    4.40 1.89   0.20    48.70
## TEMP           13 12010  14.27    2.80  14.14   14.11 2.90   0.00    25.34
## XMS            14 11969  80.22    9.07  82.04   81.41 7.25 -37.00    93.83
##                 range   skew kurtosis   se
## date_sample      -Inf     NA       NA   NA
## project*         1.00   0.54    -1.71 0.00
## depth_m_bin*     7.00  -0.11    -1.42 0.02
## CHLOROPHYLL     54.04   3.70    22.87 0.04
## DENSITY          4.09  -0.36    -0.15 0.01
## DO              12.83  -0.55    -0.16 0.02
## ENTERO       18000.00   9.88   111.40 7.43
## FECAL        13000.00   7.12    59.92 9.27
## OG               4.90  11.87   171.74 0.01
## PH               1.26  -0.50    -0.10 0.00
## SALINITY        34.36 -34.13  1283.78 0.01
## SUSO            48.50   3.91    33.72 0.05
## TEMP            25.34   0.42     0.06 0.03
## XMS            130.83  -2.14     9.79 0.08
##          date_sample project depth_m_bin parameter         Avg
## Not NA n      121286  121286      121286    121286 119635.0000
## NA n               0       0           0         0   1651.0000
## Not NA %           1       1           1         1      0.9864
## NA %               0       0           0         0      0.0136
```

```
owt_df02_gb07_wkly = ts_eda(ts_df = owt_df02_gb07,
                            form_lead = c("date_sample", "project", "depth_m_bin"),
                            form_cast = "parameter",
                            param_lst = param_lst02,
                            l1_col = c("project"),
                            l1_param = c("PLOO", "SBOO"),
                            l2_col = c("depth_m_bin"),
                            l2_param = depth_lvls01,
                            rtn_met = FALSE,
                            box = FALSE,
                            week_agg = TRUE
                            )
```

```
## date_sample + project + depth_m_bin ~ parameter
## <environment: 0x000001f3f8da2d60>
## CHLOROPHYLL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 5198    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
```

```
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## DENSITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 5282    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## DO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 5851    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## ENTERO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 9986    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
```

```
## FECAL
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 9842    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
```

```
## OG
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 458   4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: [33,47)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [8,33)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [33,47)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [47,70)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
```

```
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## PH
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 5856    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## SALINITY
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 5851    4
## [1] "L2 length = 8"
```

```
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## SUSO
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 1709    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## TEMP
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 6958    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
##   replacement has 1 row, data has 0
```

```
## XMS
```

```
## Using Avg as value column: use value.var to override.
```

```
## [1] 6937    4
## [1] "L2 length = 8"
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "PLOO: Unknown", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [70,90)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [90,112)", class =
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: [112,120]", class
##   replacement has 1 row, data has 0
## Error in `$<-.data.frame`(`*tmp*`, "Groups", value = structure(1L, levels = "SBOO: Unknown", class =
```

```
##   replacement has 1 row, data has 0
```

```
##    date_sample project depth_m_bin CHLOROPHYLL DENSITY       DO    ENTERO
## 1   1990-11-19    PLOO      [8,33)        0.87  23.855 6.550000        NA
## 2   1990-11-19    SBOO       [0,8)        1.27  23.853 7.410000        NA
## 3   1991-01-07    PLOO       [0,8)          NA      NA       NA  25.74074
## 4   1991-01-07    PLOO      [8,33)          NA      NA       NA  24.58333
## 5   1991-01-14    PLOO       [0,8)          NA      NA 5.550000  36.09512
## 6   1991-01-14    PLOO     [33,47)          NA      NA 5.347222  66.25000
## 7   1991-01-14    PLOO     [47,70)          NA      NA 5.300000  13.33333
## 8   1991-01-14    PLOO     [70,90)          NA      NA 5.025000  10.00000
## 9   1991-01-14    PLOO      [8,33)          NA      NA 5.448718  85.73333
## 10  1991-01-14    PLOO     Unknown          NA      NA       NA  18.88889
## 11  1991-01-21    PLOO       [0,8)          NA      NA       NA  11.11111
## 12  1991-01-21    PLOO      [8,33)          NA      NA       NA  50.41667
## 13  1991-01-28    PLOO       [0,8)          NA      NA       NA  39.62963
## 14  1991-01-28    PLOO      [8,33)          NA      NA       NA  26.66667
## 15  1991-01-28    PLOO     Unknown          NA      NA       NA  10.00000
## 16  1991-02-04    PLOO       [0,8)          NA      NA       NA 137.96296
## 17  1991-02-04    PLOO      [8,33)          NA      NA       NA 190.83333
##        FECAL OG       PH SALINITY SUSO     TEMP      XMS
## 1         NA NA 8.080000 33.61700   NA 19.43000 44.85000
## 2         NA NA 8.180000 33.57400   NA 19.31000 75.60000
## 3   90.18519 NA       NA       NA   NA 14.52593 80.29630
## 4   84.58333 NA       NA       NA   NA 14.27917 85.70833
## 5   33.47643 NA 8.200000 33.49806   NA 14.19729 82.40221
## 6  352.50000 NA 8.200000 33.50861   NA 14.15278 82.25000
## 7   31.66667 NA 8.192857 33.52500   NA 13.70000 85.50000
## 8   10.00000 NA 8.150000 33.52500   NA 13.07500 85.00000
## 9  200.06667 NA 8.200000 33.49907   NA 14.01900 82.28000
## 10 120.00000 NA       NA       NA   NA       NA       NA
## 11  17.22222 NA       NA       NA   NA 14.65926 70.83333
## 12 155.00000 NA       NA       NA   NA 14.28750 68.75000
## 13  77.96296 NA       NA       NA   NA 14.46296 76.07407
## 14  87.50000 NA       NA       NA   NA 13.89583 81.14015
## 15  12.22222 NA       NA       NA   NA       NA       NA
## 16 296.48148 NA       NA       NA   NA 14.37407 82.00000
## 17 725.83333 NA       NA       NA   NA 13.92083 81.45833
##              vars     n   mean     sd median trimmed  mad   min      max
## date_sample     1 10371    NaN     NA     NA     NaN   NA   Inf     -Inf
## project*        2 10371   1.36   0.48   1.00    1.33 0.00  1.00     2.00
```

```
## depth_m_bin*    3 10371   4.69   2.66   6.00    4.74 2.97  1.00     8.00
## CHLOROPHYLL     4  5198   3.50   3.91   2.34    2.76 1.97  0.00    49.89
## DENSITY         5  5282  24.93   0.69  24.92   24.95 0.68 22.39    26.48
## DO              6  5851   6.72   1.66   7.14    6.84 1.49  0.00    11.96
## ENTERO          7  9986  92.65 572.67   3.16    9.41 1.72  1.93 12000.00
## FECAL           8  9842 175.67 733.02   4.00   21.43 2.97  1.00 12000.00
## OG              9   458   0.24   0.20   0.20    0.20 0.00  0.20     2.65
## PH             10  5856   8.02   0.18   8.06    8.03 0.17  7.33     8.56
## SALINITY       11  5851  33.52   0.62  33.54   33.54 0.17  8.38    34.23
## SUSO           12  1709   4.54   2.80   4.02    4.19 1.74  0.20    39.40
## TEMP           13  6958  14.37   2.78  14.27   14.23 2.84  3.45    25.34
## XMS            14  6937  79.59   8.90  81.36   80.71 7.23 15.80    93.15
##                 range   skew kurtosis   se
## date_sample      -Inf     NA       NA   NA
## project*         1.00   0.56    -1.68 0.00
## depth_m_bin*     7.00  -0.21    -1.42 0.03
## CHLOROPHYLL     49.89   3.74    22.93 0.05
## DENSITY          4.09  -0.29    -0.15 0.01
## DO              11.96  -0.59    -0.20 0.02
## ENTERO       11998.07  10.78   141.08 5.73
## FECAL        11999.00   7.39    68.78 7.39
## OG               2.45   9.07    92.51 0.01
## PH               1.24  -0.62     0.11 0.00
## SALINITY        25.86 -26.02   816.01 0.01
## SUSO            39.20   3.44    24.87 0.07
## TEMP            21.89   0.42    -0.15 0.03
## XMS             77.35  -1.69     4.81 0.11
##          date_sample project depth_m_bin parameter         Avg
## Not NA n      121286  121286      121286    121286 119635.0000
## NA n               0       0           0         0   1651.0000
## Not NA %           1       1           1         1      0.9864
## NA %               0       0           0         0      0.0136
```

```r
# Define function that imputes the missing values to parameter dataframe using linear
↪  interpolation
impute_missing_values <- function(df_data) {

    params <- c("CHLOROPHYLL", "DENSITY", "DO", "ENTERO", "FECAL", "OG", "PH",
↪  "SALINITY", "SUSO", "TEMP", "XMS")

  for (param in params) {
    print(head(df_data, 17))
    print(param)
    print(date_sample)

    x <- zoo(df_data$param, df_data$date_sample)
    df_data$param <- na.interpolation(x, option = "linear")
    return(df_data)

  }
}

# remove NAs
# Linear Interpolation
```

```r
# owt_df02_gb04_mrgd
x <- zoo(owt_df02_gb04_mrgd$CHLOROPHYLL, owt_df02_gb04_mrgd$date_sample)
owt_df02_gb04_mrgd$CHLOROPHYLL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_mrgd$DENSITY, owt_df02_gb04_mrgd$date_sample)
owt_df02_gb04_mrgd$DENSITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_mrgd$DO, owt_df02_gb04_mrgd$date_sample)
owt_df02_gb04_mrgd$DO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_mrgd$ENTERO, owt_df02_gb04_mrgd$date_sample)
owt_df02_gb04_mrgd$ENTERO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_mrgd$FECAL, owt_df02_gb04_mrgd$date_sample)
owt_df02_gb04_mrgd$FECAL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_mrgd$OG, owt_df02_gb04_mrgd$date_sample)
owt_df02_gb04_mrgd$OG <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_mrgd$PH, owt_df02_gb04_mrgd$date_sample)
owt_df02_gb04_mrgd$PH <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_mrgd$SALINITY, owt_df02_gb04_mrgd$date_sample)
owt_df02_gb04_mrgd$SALINITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_mrgd$SUSO, owt_df02_gb04_mrgd$date_sample)
owt_df02_gb04_mrgd$SUSO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_mrgd$TEMP, owt_df02_gb04_mrgd$date_sample)
owt_df02_gb04_mrgd$TEMP <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_mrgd$XMS, owt_df02_gb04_mrgd$date_sample)
owt_df02_gb04_mrgd$XMS <- na.interpolation(x, option = "linear")


# owt_df02_gb04_wkly
x <- zoo(owt_df02_gb04_wkly$CHLOROPHYLL, owt_df02_gb04_wkly$date_sample)
owt_df02_gb04_wkly$CHLOROPHYLL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_wkly$DENSITY, owt_df02_gb04_wkly$date_sample)
owt_df02_gb04_wkly$DENSITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_wkly$DO, owt_df02_gb04_wkly$date_sample)
owt_df02_gb04_wkly$DO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_wkly$ENTERO, owt_df02_gb04_wkly$date_sample)
owt_df02_gb04_wkly$ENTERO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_wkly$FECAL, owt_df02_gb04_wkly$date_sample)
owt_df02_gb04_wkly$FECAL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_wkly$OG, owt_df02_gb04_wkly$date_sample)
```

```r
owt_df02_gb04_wkly$OG <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_wkly$PH, owt_df02_gb04_wkly$date_sample)
owt_df02_gb04_wkly$PH <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_wkly$SALINITY, owt_df02_gb04_wkly$date_sample)
owt_df02_gb04_wkly$SALINITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_wkly$SUSO, owt_df02_gb04_wkly$date_sample)
owt_df02_gb04_wkly$SUSO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_wkly$TEMP, owt_df02_gb04_wkly$date_sample)
owt_df02_gb04_wkly$TEMP <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb04_wkly$XMS, owt_df02_gb04_wkly$date_sample)
owt_df02_gb04_wkly$XMS <- na.interpolation(x, option = "linear")


# owt_df02_gb09_mrgd
x <- zoo(owt_df02_gb09_mrgd$CHLOROPHYLL, owt_df02_gb09_mrgd$date_sample)
owt_df02_gb09_mrgd$CHLOROPHYLL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_mrgd$DENSITY, owt_df02_gb09_mrgd$date_sample)
owt_df02_gb09_mrgd$DENSITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_mrgd$DO, owt_df02_gb09_mrgd$date_sample)
owt_df02_gb09_mrgd$DO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_mrgd$ENTERO, owt_df02_gb09_mrgd$date_sample)
owt_df02_gb09_mrgd$ENTERO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_mrgd$FECAL, owt_df02_gb09_mrgd$date_sample)
owt_df02_gb09_mrgd$FECAL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_mrgd$OG, owt_df02_gb09_mrgd$date_sample)
owt_df02_gb09_mrgd$OG <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_mrgd$PH, owt_df02_gb09_mrgd$date_sample)
owt_df02_gb09_mrgd$PH <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_mrgd$SALINITY, owt_df02_gb09_mrgd$date_sample)
owt_df02_gb09_mrgd$SALINITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_mrgd$SUSO, owt_df02_gb09_mrgd$date_sample)
owt_df02_gb09_mrgd$SUSO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_mrgd$TEMP, owt_df02_gb09_mrgd$date_sample)
owt_df02_gb09_mrgd$TEMP <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_mrgd$XMS, owt_df02_gb09_mrgd$date_sample)
owt_df02_gb09_mrgd$XMS <- na.interpolation(x, option = "linear")
```

```r
# owt_df02_gb09_wkly <- impute_missing_values(owt_df02_gb09_wkly)
x <- zoo(owt_df02_gb09_wkly$CHLOROPHYLL, owt_df02_gb09_wkly$date_sample)
owt_df02_gb09_wkly$CHLOROPHYLL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_wkly$DENSITY, owt_df02_gb09_wkly$date_sample)
owt_df02_gb09_wkly$DENSITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_wkly$DO, owt_df02_gb09_wkly$date_sample)
owt_df02_gb09_wkly$DO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_wkly$ENTERO, owt_df02_gb09_wkly$date_sample)
owt_df02_gb09_wkly$ENTERO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_wkly$FECAL, owt_df02_gb09_wkly$date_sample)
owt_df02_gb09_wkly$FECAL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_wkly$OG, owt_df02_gb09_wkly$date_sample)
owt_df02_gb09_wkly$OG <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_wkly$PH, owt_df02_gb09_wkly$date_sample)
owt_df02_gb09_wkly$PH <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_wkly$SALINITY, owt_df02_gb09_wkly$date_sample)
owt_df02_gb09_wkly$SALINITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_wkly$SUSO, owt_df02_gb09_wkly$date_sample)
owt_df02_gb09_wkly$SUSO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_wkly$TEMP, owt_df02_gb09_wkly$date_sample)
owt_df02_gb09_wkly$TEMP <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb09_wkly$XMS, owt_df02_gb09_wkly$date_sample)
owt_df02_gb09_wkly$XMS <- na.interpolation(x, option = "linear")


# owt_df02_gb07_mrgd
x <- zoo(owt_df02_gb07_mrgd$CHLOROPHYLL, owt_df02_gb07_mrgd$date_sample)
owt_df02_gb07_mrgd$CHLOROPHYLL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_mrgd$DENSITY, owt_df02_gb07_mrgd$date_sample)
owt_df02_gb07_mrgd$DENSITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_mrgd$DO, owt_df02_gb07_mrgd$date_sample)
owt_df02_gb07_mrgd$DO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_mrgd$ENTERO, owt_df02_gb07_mrgd$date_sample)
owt_df02_gb07_mrgd$ENTERO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_mrgd$FECAL, owt_df02_gb07_mrgd$date_sample)
owt_df02_gb07_mrgd$FECAL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_mrgd$OG, owt_df02_gb07_mrgd$date_sample)
owt_df02_gb07_mrgd$OG <- na.interpolation(x, option = "linear")
```

```r
x <- zoo(owt_df02_gb07_mrgd$PH, owt_df02_gb07_mrgd$date_sample)
owt_df02_gb07_mrgd$PH <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_mrgd$SALINITY, owt_df02_gb07_mrgd$date_sample)
owt_df02_gb07_mrgd$SALINITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_mrgd$SUSO, owt_df02_gb07_mrgd$date_sample)
owt_df02_gb07_mrgd$SUSO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_mrgd$TEMP, owt_df02_gb07_mrgd$date_sample)
owt_df02_gb07_mrgd$TEMP <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_mrgd$XMS, owt_df02_gb07_mrgd$date_sample)
owt_df02_gb07_mrgd$XMS <- na.interpolation(x, option = "linear")


# owt_df02_gb07_mrgd
x <- zoo(owt_df02_gb07_wkly$CHLOROPHYLL, owt_df02_gb07_wkly$date_sample)
owt_df02_gb07_wkly$CHLOROPHYLL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_wkly$DENSITY, owt_df02_gb07_wkly$date_sample)
owt_df02_gb07_wkly$DENSITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_wkly$DO, owt_df02_gb07_wkly$date_sample)
owt_df02_gb07_wkly$DO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_wkly$ENTERO, owt_df02_gb07_wkly$date_sample)
owt_df02_gb07_wkly$ENTERO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_wkly$FECAL, owt_df02_gb07_wkly$date_sample)
owt_df02_gb07_wkly$FECAL <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_wkly$OG, owt_df02_gb07_wkly$date_sample)
owt_df02_gb07_wkly$OG <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_wkly$PH, owt_df02_gb07_wkly$date_sample)
owt_df02_gb07_wkly$PH <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_wkly$SALINITY, owt_df02_gb07_wkly$date_sample)
owt_df02_gb07_wkly$SALINITY <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_wkly$SUSO, owt_df02_gb07_wkly$date_sample)
owt_df02_gb07_wkly$SUSO <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_wkly$TEMP, owt_df02_gb07_wkly$date_sample)
owt_df02_gb07_wkly$TEMP <- na.interpolation(x, option = "linear")

x <- zoo(owt_df02_gb07_wkly$XMS, owt_df02_gb07_wkly$date_sample)
owt_df02_gb07_wkly$XMS <- na.interpolation(x, option = "linear")
```

```r
# https://cran.r-project.org/web/packages/padr/vignettes/padr.html
library(padr)
```

```r
library(dplyr)

owt_df02_gb04_mrgd %>% pad()
```

```
## Warning in zoo(rval[i], index(x)[i]): some methods for "zoo" objects do not work
## if the index entries in 'order.by' are not unique

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## pad applied on the interval: day

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```

	date_sample	CHLOROPHYLL	DENSITY	DO	ENTERO	FECAL
1	1990-11-15	1.0700000	23.85400	6.9800000	32.051282	125.641026
2	1990-11-16	1.0690476	23.85410	6.6792500	32.051282	125.641026
3	1990-11-17	1.0680952	23.85420	6.3785000	18.717949	51.282051
4	1990-11-18	1.0671429	23.85431	6.0777500	106.153846	80.769231
5	1990-11-19	1.0661905	23.85441	5.7770000	40.000000	40.555556
6	1990-11-20	1.0652381	23.85451	5.4762500	20.338983	40.508475
7	1990-11-21	1.0642857	23.85461	5.5000000	40.227273	78.181818
8	1990-11-22	1.0633333	23.85471	5.3600000	83.928571	446.071429
9	1990-11-23	1.0623810	23.85482	5.3561364	33.846154	95.641026
10	1990-11-24	1.0614286	23.85492	5.3522727	12.564103	23.589744
11	1990-11-25	1.0604762	23.85502	5.3484091	20.512821	31.025641
12	1990-11-26	1.0595238	23.85512	5.3445455	43.125000	108.541667
13	1990-11-27	1.0585714	23.85522	5.3406818	183.076923	427.692308
14	1990-11-28	1.0576190	23.85533	5.3368182	125.384615	429.487179
15	1990-11-29	1.0566667	23.85543	5.3329545	16.291667	16.750000
16	1990-11-30	1.0557143	23.85553	5.3290909	17.384615	12.512821
17	1990-12-01	1.0547619	23.85563	5.3252273	51.897436	55.435897
18	1990-12-02	1.0538095	23.85573	5.3213636	45.666667	49.925926
19	1990-12-03	1.0528571	23.85584	5.3175000	6.700000	33.900000
20	1990-12-04	1.0519048	23.85594	5.8800000	36.204082	120.571429
21	1990-12-05	1.0509524	23.85604	5.5950000	86.121212	301.818182
22	1990-12-06	1.0500000	23.85614	5.4528571	15.500000	27.291667
23	1990-12-07	1.0490476	23.85624	5.3107143	2.666667	4.923077
24	1990-12-08	1.0480952	23.85635	5.1685714	26.666667	18.410256
25	1990-12-09	1.0471429	23.85645	5.0264286	6.358974	11.692308
26	1990-12-10	1.0461905	23.85655	4.8842857	122.923077	575.230769
27	1990-12-11	1.0452381	23.85665	4.7421429	7.746032	11.841270
28	1990-12-12	1.0442857	23.85676	4.6000000	49.240000	374.160000
29	1990-12-13	1.0433333	23.85686	4.8700000	3.692308	5.743590
30	1990-12-14	1.0423810	23.85696	4.9550000	33.878788	272.787879
31	1990-12-15	1.0414286	23.85706	4.9370313	72.717949	406.666667
32	1990-12-16	1.0404762	23.85716	4.9190625	18.242424	98.303030
33	1990-12-17	1.0395238	23.85727	4.9010938	6.666667	35.000000
34	1990-12-18	1.0385714	23.85737	4.8831250	6.974359	10.512821
35	1990-12-19	1.0376190	23.85747	4.8651563	173.333333	125.777778
36	1990-12-20	1.0366667	23.85757	4.8471875	138.000000	1650.000000
37	1990-12-21	1.0357143	23.85767	4.8292187	6500.000000	725.000000
38	1990-12-22	1.0347619	23.85778	4.8112500	32.250000	75.950000
39	1990-12-23	1.0338095	23.85788	4.7932813	7.333333	5.076923
40	1990-12-24	1.0328571	23.85798	4.7753125	22.717949	61.230769
41	1990-12-25	1.0319048	23.85808	4.7573438	48.923077	240.923077
42	1990-12-26	1.0309524	23.85818	4.7393750	2.000000	2.000000
43	1990-12-27	1.0300000	23.85829	4.7214063	65.589744	167.794872
44	1990-12-28	1.0290476	23.85839	4.7034375	17.897436	10.820513

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## 45    1990-12-29   1.0280952 23.85849  4.6854688    15.074074    21.407407
## 46    1990-12-30   1.0271429 23.85859  4.6675000   168.440000   856.560000
## 47    1990-12-31   1.0261905 23.85869  4.7400000     2.444444    16.518519
## 48    1991-01-01   1.0252381 23.85880  4.7850000    15.866667    46.444444
## 49    1991-01-02   1.0242857 23.85890  4.7770833    41.076923   127.076923
## 50    1991-01-03   1.0233333 23.85900  4.7691667     5.555556     3.555556
## 51    1991-01-04   1.0223810 23.85910  4.7612500    26.307692   101.692308
## 52    1991-01-05   1.0214286 23.85920  4.7533333     4.974359     6.051282
## 53    1991-01-06   1.0204762 23.85931  4.7454167    15.692308    15.230769
## 54    1991-01-07   1.0195238 23.85941  4.7375000    13.025641    42.358974
## 55    1991-01-08   1.0185714 23.85951  4.7295833     3.111111     4.222222
## 56    1991-01-09   1.0176190 23.85961  4.7216667     7.846154    35.435897
## 57    1991-01-10   1.0166667 23.85971  4.7137500     7.435897     7.333333
## 58    1991-01-11   1.0157143 23.85982  4.7058333    15.125000    28.208333
## 59    1991-01-12   1.0147619 23.85992  4.6979167    12.051282     0.000000
## 60    1991-01-13   1.0138095 23.86002  4.6900000    36.476190   152.571429
## 61    1991-01-14   1.0128571 23.86012  4.1200000    27.600000   162.520000
## 62    1991-01-15   1.0119048 23.86022  4.6400000    21.076923    39.589744
## 63    1991-01-16   1.0109524 23.86033  4.6750000   275.272727  1842.242424
## 64    1991-01-17   1.0100000 23.86043  4.7220000   101.179487   124.307692
## 65    1991-01-18   1.0090476 23.86053  4.7690000    52.250000   119.083333
## 66    1991-01-19   1.0080952 23.86063  4.8160000    46.051282   205.384615
## 67    1991-01-20   1.0071429 23.86073  4.8630000    45.250000   362.708333
## 68    1991-01-21   1.0061905 23.86084  4.9100000     6.205128     8.820513
## 69    1991-01-22   1.0052381 23.86094  4.9570000     2.444444     2.000000
## 70    1991-01-23   1.0042857 23.86104  5.0040000    13.179487    69.538462
## 71    1991-01-24   1.0033333 23.86114  5.0510000    16.512821    19.692308
## 72    1991-01-25   1.0023810 23.86124  5.0980000    34.380952   178.126984
## 73    1991-01-26   1.0014286 23.86135  5.1450000   103.800000   849.960000
## 74    1991-01-27   1.0004762 23.86145  6.0500000    27.948718   162.102564
## 75    1991-01-28   0.9995238 23.86155  6.5700000    21.575758   292.000000
## 76    1991-01-29   0.9985714 23.86165  6.5060648     4.666667    18.923077
## 77    1991-01-30   0.9976190 23.86176  6.4421296     3.333333     7.555556
## 78    1991-01-31   0.9966667 23.86186  6.3781944    11.641026    16.256410
## 79    1991-02-01   0.9957143 23.86196  6.3142593    61.076923   189.897436
## 80    1991-02-02   0.9947619 23.86206  6.2503241     8.222222    18.000000
## 81    1991-02-03   0.9938095 23.86216  6.1863889    12.256410    73.384615
## 82    1991-02-04   0.9928571 23.86227  6.1224537    18.564103    48.923077
## 83    1991-02-05   0.9919048 23.86237  6.0585185     2.666667     2.000000
## 84    1991-02-06   0.9909524 23.86247  5.9945833    13.230769    10.717949
## 85    1991-02-07   0.9900000 23.86257  5.9306481    73.743590  1348.564103
## 86    1991-02-08   0.9890476 23.86267  5.8667130   113.904762   798.190476
## 87    1991-02-09   0.9880952 23.86278  5.8027778    61.200000   424.080000
## 88    1991-02-10   0.9871429 23.86288  6.3300000    55.487179   530.051282
## 89    1991-02-11   0.9861905 23.86298  6.6700000   125.757576  1728.000000
## 90    1991-02-12   0.9852381 23.86308  6.6078824    16.102564    65.897436
## 91    1991-02-13   0.9842857 23.86318  6.5457647    24.888889    50.444444
## 92    1991-02-14   0.9833333 23.86329  6.4836471    35.076923   172.205128
## 93    1991-02-15   0.9823810 23.86339  6.4215294   157.897436  1172.666667
## 94    1991-02-16   0.9814286 23.86349  6.3594118   122.820513   925.333333
## 95    1991-02-17   0.9804762 23.86359  6.2972941    19.333333     5.777778
## 96    1991-02-18   0.9795238 23.86369  6.2351765     5.333333    14.222222
## 97    1991-02-19   0.9785714 23.86380  6.1730588    17.128205   298.615385
## 98    1991-02-20   0.9776190 23.86390  6.1109412    16.461538   367.384615
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## 99    1991-02-21   0.9766667 23.86400  6.0488235    24.615385    26.794872
## 100   1991-02-22   0.9757143 23.86410  5.9867059    16.444444     7.111111
## 101   1991-02-23   0.9747619 23.86420  5.9245882    38.820513   566.051282
## 102   1991-02-24   0.9738095 23.86431  5.8624706    12.820513    34.615385
## 103   1991-02-25   0.9728571 23.86441  5.8003529    32.444444   480.476190
## 104   1991-02-26   0.9719048 23.86451  5.7382353    11.160000   227.000000
## 105   1991-02-27   0.9709524 23.86461  5.8200000     5.025641   221.538462
## 106   1991-02-28   0.9700000 23.86471  5.8800000    97.515152  1627.818182
## 107   1991-03-01   0.9690476 23.86482  5.8840271     9.666667   172.875000
## 108   1991-03-02   0.9680952 23.86492  5.8880543    69.076923   725.846154
## 109   1991-03-03   0.9671429 23.86502  5.8920814   167.589744  1607.897436
## 110   1991-03-04   0.9661905 23.86512  5.8961086     5.166667    38.916667
## 111   1991-03-05   0.9652381 23.86522  5.9001357     6.666667    41.487179
## 112   1991-03-06   0.9642857 23.86533  5.9041629     6.444444     2.222222
## 113   1991-03-07   0.9633333 23.86543  5.9081900     9.743590     2.358974
## 114   1991-03-08   0.9623810 23.86553  5.9122172     4.410256    19.230769
## 115   1991-03-09   0.9614286 23.86563  5.9162443     8.444444     8.888889
## 116   1991-03-10   0.9604762 23.86573  5.9202715     6.871795    23.179487
## 117   1991-03-11   0.9595238 23.86584  5.9242986     3.897436     8.307692
## 118   1991-03-12   0.9585714 23.86594  5.9283258    19.592593   188.703704
## 119   1991-03-13   0.9576190 23.86604  5.9323529     3.830508     4.677966
## 120   1991-03-14   0.9566667 23.86614  6.3000000     7.076923     3.384615
## 121   1991-03-15   0.9557143 23.86624  6.7650000     2.484848    30.242424
## 122   1991-03-16   0.9547619 23.86635  6.6540196    16.666667    30.000000
## 123   1991-03-17   0.9538095 23.86645  6.5430392    41.128205   518.205128
## 124   1991-03-18   0.9528571 23.86655  6.4320588    12.358974    97.897436
## 125   1991-03-19   0.9519048 23.86665  6.3210784     3.025641    25.743590
## 126   1991-03-20   0.9509524 23.86676  6.2100980     4.000000     7.777778
## 127   1991-03-21   0.9500000 23.86686  6.0991176     2.512821    15.743590
## 128   1991-03-22   0.9490476 23.86696  5.9881373    14.615385    97.282051
## 129   1991-03-23   0.9480952 23.86706  5.8771569     9.619048    31.714286
## 130   1991-03-24   0.9471429 23.86716  5.7661765    15.322344   603.200000
## 131   1991-03-25   0.9461905 23.86727  5.8900000    21.025641  1116.461538
## 132   1991-03-26   0.9452381 23.86737  6.2100000     2.000000     4.424242
## 133   1991-03-27   0.9442857 23.86747  6.1741176    10.256410    23.641026
## 134   1991-03-28   0.9433333 23.86757  6.1382353     7.333333    95.555556
## 135   1991-03-29   0.9423810 23.86767  6.1023529     4.153846    14.923077
## 136   1991-03-30   0.9414286 23.86778  6.0664706     6.974359   139.076923
## 137   1991-03-31   0.9404762 23.86788  6.0305882    15.777778     8.888889
## 138   1991-04-01   0.9395238 23.86798  5.9947059    17.794872   300.358974
## 139   1991-04-02   0.9385714 23.86808  5.9588235    12.717949    11.538462
## 140   1991-04-03   0.9376190 23.86818  5.9229412   141.555556   380.888889
## 141   1991-04-04   0.9366667 23.86829  5.8870588    17.743590   124.000000
## 142   1991-04-05   0.9357143 23.86839  5.8511765    13.743590    79.333333
## 143   1991-04-06   0.9347619 23.86849  5.8152941    21.074074    15.629630
## 144   1991-04-07   0.9338095 23.86859  5.7794118    51.560000   196.920000
## 145   1991-04-08   0.9328571 23.86869  6.0066667     2.000000     3.638889
## 146   1991-04-09   0.9319048 23.86880  6.1711111    44.333333   179.625000
## 147   1991-04-10   0.9309524 23.86890  6.3355556     2.933333     9.066667
## 148   1991-04-11   0.9300000 23.86900  6.5000000    18.222222   142.888889
## 149   1991-04-12   0.9299043 23.86905  6.4151471    20.880000   127.520000
## 150   1991-04-13   0.9298086 23.86911  6.3302941    16.428571    14.285714
## 151   1991-04-14   0.9297129 23.86916  6.2454412    15.025641    71.948718
## 152   1991-04-15   0.9296172 23.86921  6.1605882    25.948718   217.743590
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## 153   1991-04-16   0.9295215 23.86926  6.0757353     6.416667    27.541667
## 154   1991-04-17   0.9294258 23.86932  5.9908824     6.615385    26.256410
## 155   1991-04-18   0.9293301 23.86937  5.9060294    24.923077   188.410256
## 156   1991-04-19   0.9292344 23.86942  5.8211765    27.529412   111.235294
## 157   1991-04-20   0.9291388 23.86947  5.7363235   123.904762  1099.238095
## 158   1991-04-21   0.9290431 23.86953  5.6514706    10.640000   280.080000
## 159   1991-04-22   0.9289474 23.86958  5.3600000     5.589744    40.102564
## 160   1991-04-23   0.9288517 23.86963  5.3300000    72.000000   791.142857
## 161   1991-04-24   0.9287560 23.86968  5.3730719     2.058824     6.823529
## 162   1991-04-25   0.9286603 23.86974  5.4161438     5.285714    13.647059
## 163   1991-04-26   0.9285646 23.86979  5.4592157    74.235294     8.352941
## 164   1991-04-27   0.9284689 23.86984  5.5022876    36.232558     6.093023
## 165   1991-04-28   0.9283732 23.86989  5.5453595    87.764706   258.000000
## 166   1991-04-29   0.9282775 23.86995  5.5884314    19.705882    15.823529
## 167   1991-04-30   0.9281818 23.87000  5.6315033   113.466667   623.133333
## 168   1991-05-01   0.9280861 23.87005  5.6745752    26.476190    16.222222
## 169   1991-05-02   0.9279904 23.87011  5.7176471    88.290909   317.864407
## 170   1991-05-03   0.9278947 23.87016  5.6766667    18.833333   172.055556
## 171   1991-05-04   0.9277990 23.87021  5.2036111   497.333333  1991.487179
## 172   1991-05-05   0.9277033 23.87026  4.7305556    33.230769    29.692308
## 173   1991-05-06   0.9276077 23.87032  4.2575000     9.435897    28.256410
## 174   1991-05-07   0.9275120 23.87037  3.7844444    16.153846    39.282051
## 175   1991-05-08   0.9274163 23.87042  3.3113889     3.111111    10.888889
## 176   1991-05-09   0.9273206 23.87047  2.8383333     7.948718    16.631579
## 177   1991-05-10   0.9272249 23.87053  2.3652778     6.717949    13.487179
## 178   1991-05-11   0.9271292 23.87058  1.8922222    68.000000   272.717949
## 179   1991-05-12   0.9270335 23.87063  1.4191667   231.538462  1394.871795
## 180   1991-05-13   0.9269378 23.87068  0.9461111    12.000000    13.272727
## 181   1991-05-14   0.9268421 23.87074  0.4730556    70.000000   427.916667
## 182   1991-05-15   0.9267464 23.87079  0.0000000    78.177215   793.478261
## 183   1991-05-16   0.9266507 23.87084  0.0000000   315.928571  2185.142857
## 184   1991-05-17   0.9265550 23.87089  0.0000000  1151.456790  3205.111111
## 185   1991-05-18   0.9264593 23.87095  0.2476716   504.222222   915.111111
## 186   1991-05-19   0.9263636 23.87100  0.4953431   179.555556   462.000000
## 187   1991-05-20   0.9262679 23.87105  0.7430147   674.604651  4376.000000
## 188   1991-05-21   0.9261722 23.87111  0.9906863   884.444444  2718.666667
## 189   1991-05-22   0.9260766 23.87116  1.2383578   351.125000  1597.208333
## 190   1991-05-23   0.9259809 23.87121  1.4860294   848.222222  3453.555556
## 191   1991-05-24   0.9258852 23.87126  1.7337010   415.625000  1085.291667
## 192   1991-05-25   0.9257895 23.87132  1.9813725   473.555556   732.888889
## 193   1991-05-26   0.9256938 23.87137  2.2290441   754.222222  2772.888889
## 194   1991-05-27   0.9255981 23.87142  2.4767157   241.111111  1648.000000
## 195   1991-05-28   0.9255024 23.87147  2.7243873   122.375000  1143.833333
## 196   1991-05-29   0.9254067 23.87153  2.9720588   413.333333  1564.625000
## 197   1991-05-30   0.9253110 23.87158  3.2197304    75.777778   382.222222
## 198   1991-05-31   0.9252153 23.87163  3.4674020   200.500000  1596.375000
## 199   1991-06-01   0.9251196 23.87168  3.7150735   352.666667  3126.000000
## 200   1991-06-02   0.9250239 23.87174  3.9627451   327.777778  1284.000000
## 201   1991-06-03   0.9249282 23.87179  4.2104167   700.416667  2808.833333
## 202   1991-06-04   0.9248325 23.87184  4.4580882   209.555556  1689.333333
## 203   1991-06-05   0.9247368 23.87189  4.7057598   483.000000  1747.458333
## 204   1991-06-06   0.9246411 23.87195  4.9534314   797.333333  4762.000000
## 205   1991-06-07   0.9245455 23.87200  5.2011029   435.500000  1515.583333
## 206   1991-06-08   0.9244498 23.87205  5.4487745   160.888889  1094.666667
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## 207   1991-06-09   0.9243541 23.87211  5.6964461  1650.000000  6506.888889
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## 214   1991-06-16   0.9236842 23.87247  5.8091820   391.555556  1769.777778
## 215   1991-06-17   0.9235885 23.87253  5.7822426   636.666667  1993.000000
## 216   1991-06-18   0.9234928 23.87258  5.7553033    34.888889    57.111111
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## 218   1991-06-20   0.9233014 23.87268  5.7014246   370.222222  3435.111111
## 219   1991-06-21   0.9232057 23.87274  5.6744853   674.291667  1548.083333
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## 221   1991-06-23   0.9230144 23.87284  5.6206066    39.333333   227.333333
## 222   1991-06-24   0.9229187 23.87289  5.5936673   264.041667  1163.791667
## 223   1991-06-25   0.9228230 23.87295  5.5667279   262.666667  1796.000000
## 224   1991-06-26   0.9227273 23.87300  5.5397886   582.958333  2253.333333
## 225   1991-06-27   0.9226316 23.87305  5.5128493   145.333333   352.000000
## 226   1991-06-28   0.9225359 23.87311  5.4859099   652.625000  2266.750000
## 227   1991-06-29   0.9224402 23.87316  5.4589706  2605.777778  6511.777778
## 228   1991-06-30   0.9223445 23.87321  5.4320313   775.777778  1118.000000
## 229   1991-07-01   0.9222488 23.87326  5.4050919  1166.500000  3512.916667
## 230   1991-07-02   0.9221531 23.87332  5.3781526    80.000000    98.888889
## 231   1991-07-03   0.9220574 23.87337  5.3512132    84.708333   598.166667
## 232   1991-07-04   0.9219617 23.87342  5.3242739   750.500000  2913.500000
## 233   1991-07-05   0.9218660 23.87347  5.2973346   256.888889  1587.333333
## 234   1991-07-06   0.9217703 23.87353  5.2703952   534.888889  2781.111111
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## 236   1991-07-08   0.9215789 23.87363  5.2165165   288.958333  2054.833333
## 237   1991-07-09   0.9214833 23.87368  5.1895772  1191.777778  5062.888889
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## 239   1991-07-11   0.9212919 23.87379  5.1356985   230.444444  3508.444444
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## 241   1991-07-13   0.9211005 23.87389  5.0818199   343.777778  3192.000000
## 242   1991-07-14   0.9210048 23.87395  5.0548805     8.222222    16.888889
## 243   1991-07-15   0.9209091 23.87400  5.0279412    51.536232   391.362319
## 244   1991-07-16   0.9208134 23.87405  5.1497386     6.875000     4.960000
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## 246   1991-07-18   0.9206220 23.87416  5.3933333    51.916667   141.805556
## 247   1991-07-19   0.9205263 23.87421  5.3425408    18.888889     2.851852
## 248   1991-07-20   0.9204306 23.87426  5.2917484    25.897436    86.564103
## 249   1991-07-21   0.9203349 23.87432  5.2409559    50.461538   129.076923
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## 253   1991-07-25   0.9199522 23.87453  5.0377859     3.435897     2.871795
## 254   1991-07-26   0.9198565 23.87458  4.9869935     2.102564     3.641026
## 255   1991-07-27   0.9197608 23.87463  4.9362010     2.000000     6.358974
## 256   1991-07-28   0.9196651 23.87468  4.8854085    21.794872   303.102564
## 257   1991-07-29   0.9195694 23.87474  4.8346160    14.539683    95.142857
## 258   1991-07-30   0.9194737 23.87479  4.7838235    51.345455   486.036364
## 259   1991-07-31   0.9193780 23.87484  4.8685784     4.666667    13.555556
## 260   1991-08-01   0.9192823 23.87489  4.9533333    70.296296   306.740741
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## 261   1991-08-02   0.9191866 23.87495  4.9768441     2.666667    33.692308
## 262   1991-08-03   0.9190909 23.87500  5.0003548    11.777778     4.222222
## 263   1991-08-04   0.9189952 23.87505  5.0238655     2.051282     2.153846
## 264   1991-08-05   0.9188995 23.87511  5.0473763    44.820513   335.641026
## 265   1991-08-06   0.9188038 23.87516  5.0708870    74.717949   404.512821
## 266   1991-08-07   0.9187081 23.87521  5.0943978     4.888889    10.666667
## 267   1991-08-08   0.9186124 23.87526  5.1179085   167.948718  1503.692308
## 268   1991-08-09   0.9185167 23.87532  5.1414192     9.333333    16.461538
## 269   1991-08-10   0.9184211 23.87537  5.1649300     8.307692     7.538462
## 270   1991-08-11   0.9183254 23.87542  5.1884407     4.000000     7.777778
## 271   1991-08-12   0.9182297 23.87547  5.2119514    36.358974   162.512821
## 272   1991-08-13   0.9181340 23.87553  5.2354622   123.948718  1446.615385
## 273   1991-08-14   0.9180383 23.87558  5.2589729    58.000000    27.333333
## 274   1991-08-15   0.9179426 23.87563  5.2824837   173.076923   972.153846
## 275   1991-08-16   0.9178469 23.87568  5.3059944    22.307692   261.692308
## 276   1991-08-17   0.9177512 23.87574  5.3295051    44.102564   203.384615
## 277   1991-08-18   0.9176555 23.87579  5.3530159    16.000000     4.666667
## 278   1991-08-19   0.9175598 23.87584  5.3765266    10.307692    64.923077
## 279   1991-08-20   0.9174641 23.87589  5.4000373    17.487179    11.025641
## 280   1991-08-21   0.9173684 23.87595  5.4235481     2.380952    26.031746
## 281   1991-08-22   0.9172727 23.87600  5.4470588    57.520000   427.280000
## 282   1991-08-23   0.9171770 23.87605  5.6500000     5.846154    14.307692
## 283   1991-08-24   0.9170813 23.87611  5.7300000    47.636364   306.969697
## 284   1991-08-25   0.9169856 23.87616  5.7832773    44.051282   185.948718
## 285   1991-08-26   0.9168900 23.87621  5.8365546    31.333333   108.500000
## 286   1991-08-27   0.9167943 23.87626  5.8898319    91.589744   796.256410
## 287   1991-08-28   0.9166986 23.87632  5.9431092    53.875000   202.166667
## 288   1991-08-29   0.9166029 23.87637  5.9963866   115.897436  1366.051282
## 289   1991-08-30   0.9165072 23.87642  6.0496639    55.460317   208.126984
## 290   1991-08-31   0.9164115 23.87647  6.1029412   131.280000  1031.920000
## 291   1991-09-01   0.9163158 23.87653  6.7900000    19.128205   553.230769
## 292   1991-09-02   0.9162201 23.87658  6.9800000     4.727273    20.848485
## 293   1991-09-03   0.9161244 23.87663  6.9014916    13.538462   145.641026
## 294   1991-09-04   0.9160287 23.87668  6.8229832     4.222222     9.333333
## 295   1991-09-05   0.9159330 23.87674  6.7444748    22.512821   123.487179
## 296   1991-09-06   0.9158373 23.87679  6.6659664    84.615385   809.743590
## 297   1991-09-07   0.9157416 23.87684  6.5874580    25.025641   165.538462
## 298   1991-09-08   0.9156459 23.87689  6.5089496     2.666667    10.222222
## 299   1991-09-09   0.9155502 23.87695  6.4304412     9.794872    77.179487
## 300   1991-09-10   0.9154545 23.87700  6.3519328    12.512821   109.948718
## 301   1991-09-11   0.9153589 23.87705  6.2734244   140.888889    73.777778
## 302   1991-09-12   0.9152632 23.87711  6.1949160    61.897436   965.230769
## 303   1991-09-13   0.9151675 23.87716  6.1164076    35.894737   363.105263
## 304   1991-09-14   0.9150718 23.87721  6.0378992   161.487179   860.512821
## 305   1991-09-15   0.9149761 23.87726  5.9593908    18.031746   196.222222
## 306   1991-09-16   0.9148804 23.87732  5.8808824    87.680000   816.200000
## 307   1991-09-17   0.9147847 23.87737  6.0900000    23.333333   191.384615
## 308   1991-09-18   0.9146890 23.87742  6.2050000    50.242424   200.909091
## 309   1991-09-19   0.9145933 23.87747  6.1626316    10.358974   106.820513
## 310   1991-09-20   0.9144976 23.87753  6.1202632    23.555556  1227.555556
## 311   1991-09-21   0.9144019 23.87758  6.0778947    81.743590   617.538462
## 312   1991-09-22   0.9143062 23.87763  6.0355263     8.615385    26.051282
## 313   1991-09-23   0.9142105 23.87768  5.9931579    20.820513   114.153846
## 314   1991-09-24   0.9141148 23.87774  5.9507895     4.222222    76.666667
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## 315   1991-09-25   0.9140191 23.87779  5.9084211     6.205128    25.846154
## 316   1991-09-26   0.9139234 23.87784  5.8660526     2.958333    20.833333
## 317   1991-09-27   0.9138278 23.87789  5.8236842    13.333333   178.256410
## 318   1991-09-28   0.9137321 23.87795  5.7813158     7.487179    13.179487
## 319   1991-09-29   0.9136364 23.87800  5.7389474     5.777778    36.444444
## 320   1991-09-30   0.9135407 23.87805  5.6965789    44.769231   564.871795
## 321   1991-10-01   0.9134450 23.87811  5.6542105    69.230769   469.384615
## 322   1991-10-02   0.9133493 23.87816  5.6118421     4.205128    21.025641
## 323   1991-10-03   0.9132536 23.87821  5.5694737     7.777778   228.666667
## 324   1991-10-04   0.9131579 23.87826  5.5271053    39.128205   396.153846
## 325   1991-10-05   0.9130622 23.87832  5.4847368    40.769231   271.846154
## 326   1991-10-06   0.9129665 23.87837  5.4423684    23.301587   506.666667
## 327   1991-10-07   0.9128708 23.87842  5.4000000    18.560000   351.240000
## 328   1991-10-08   0.9127751 23.87847  5.8366667    24.138889   353.305556
## 329   1991-10-09   0.9126794 23.87853  5.8085730     5.794872     3.333333
## 330   1991-10-10   0.9125837 23.87858  5.7804793    17.333333    78.888889
## 331   1991-10-11   0.9124880 23.87863  5.7523856     3.384615     6.717949
## 332   1991-10-12   0.9123923 23.87868  5.7242919     8.564103    19.897436
## 333   1991-10-13   0.9122967 23.87874  5.6961983     7.555556    19.333333
## 334   1991-10-14   0.9122010 23.87879  5.6681046     7.641026     3.692308
## 335   1991-10-15   0.9121053 23.87884  5.6400109    54.153846   348.358974
## 336   1991-10-16   0.9120096 23.87889  5.6119172    16.476190    46.539683
## 337   1991-10-17   0.9119139 23.87895  5.5838235    29.640000   371.640000
## 338   1991-10-18   0.9118182 23.87900  5.9700000    56.769231   466.205128
## 339   1991-10-19   0.9117225 23.87905  5.7450000   102.363636   625.212121
## 340   1991-10-20   0.9116268 23.87911  5.7212896     2.717949    17.692308
## 341   1991-10-21   0.9115311 23.87916  5.6975792     6.222222    16.222222
## 342   1991-10-22   0.9114354 23.87921  5.6738688    13.384615   110.666667
## 343   1991-10-23   0.9113397 23.87926  5.6501584     4.512821    35.230769
## 344   1991-10-24   0.9112440 23.87932  5.6264480     2.541667    27.958333
## 345   1991-10-25   0.9111483 23.87937  5.6027376     3.692308     8.358974
## 346   1991-10-26   0.9110526 23.87942  5.5790271     3.589744    21.384615
## 347   1991-10-27   0.9109569 23.87947  5.5553167     4.444444    13.111111
## 348   1991-10-28   0.9108612 23.87953  5.5316063    31.025641   316.461538
## 349   1991-10-29   0.9107656 23.87958  5.5078959    28.256410   253.076923
## 350   1991-10-30   0.9106699 23.87963  5.4841855    97.435897    47.333333
## 351   1991-10-31   0.9105742 23.87968  5.4604751     8.571429     6.793651
## 352   1991-11-01   0.9104785 23.87974  5.4367647   100.000000   153.520000
## 353   1991-11-02   0.9103828 23.87979  5.6833333    29.555556   570.388889
## 354   1991-11-03   0.9102871 23.87984  5.8850000     2.051282     2.256410
## 355   1991-11-04   0.9101914 23.87989  6.0866667     8.871795    41.897436
## 356   1991-11-05   0.9100957 23.87995  6.2883333     7.282051     3.333333
## 357   1991-11-06   0.9100000 23.88000  6.4900000     5.666667     3.794872
## 358   1991-11-07   0.9098333 23.88002  6.4202451     4.051282     4.256410
## 359   1991-11-08   0.9096667 23.88004  6.3504902     3.333333   120.222222
## 360   1991-11-09   0.9095000 23.88007  6.2807353     6.358974    55.692308
## 361   1991-11-10   0.9093333 23.88009  6.2109804     7.794872    17.589744
## 362   1991-11-11   0.9091667 23.88011  6.1412255    26.000000   132.615385
## 363   1991-11-12   0.9090000 23.88013  6.0714706    33.487179   110.000000
## 364   1991-11-13   0.9088333 23.88016  6.0017157     2.222222    16.666667
## 365   1991-11-14   0.9086667 23.88018  5.9319608    73.897436   336.923077
## 366   1991-11-15   0.9085000 23.88020  5.8622059     9.538462   100.307692
## 367   1991-11-16   0.9083333 23.88022  5.7924510    10.333333     2.000000
## 368   1991-11-17   0.9081667 23.88024  5.7226961    29.222222    73.407407
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## 369   1991-11-18   0.9080000 23.88027  5.6529412    16.960000   101.160000
## 370   1991-11-19   0.9078333 23.88029  5.7600000     5.384615    35.384615
## 371   1991-11-20   0.9076667 23.88031  5.5250000    41.212121   396.484848
## 372   1991-11-21   0.9075000 23.88033  5.5273529     2.000000     2.421053
## 373   1991-11-22   0.9073333 23.88036  5.5297059     3.333333     6.444444
## 374   1991-11-23   0.9071667 23.88038  5.5320588    25.794872   182.666667
## 375   1991-11-24   0.9070000 23.88040  5.5344118    18.307692    18.102564
## 376   1991-11-25   0.9068333 23.88042  5.5367647    78.153846   409.025641
## 377   1991-11-26   0.9066667 23.88044  5.5391176    85.250000    86.041667
## 378   1991-11-27   0.9065000 23.88047  5.5414706     8.871795    15.692308
## 379   1991-11-28   0.9063333 23.88049  5.5438235     2.000000     2.205128
## 380   1991-11-29   0.9061667 23.88051  5.5461765     2.000000     2.037037
## 381   1991-11-30   0.9060000 23.88053  5.5485294     6.840000    19.440000
## 382   1991-12-01   0.9058333 23.88056  5.5933333    34.333333   157.777778
## 383   1991-12-02   0.9056667 23.88058  5.6251120    62.307692    24.205128
## 384   1991-12-03   0.9055000 23.88060  5.6568908   290.000000   163.333333
## 385   1991-12-04   0.9053333 23.88062  5.6886695    24.153846     8.769231
## 386   1991-12-05   0.9051667 23.88064  5.7204482   348.564103   893.333333
## 387   1991-12-06   0.9050000 23.88067  5.7522269   590.000000   956.733333
## 388   1991-12-07   0.9048333 23.88069  5.7840056   101.555556   159.111111
## 389   1991-12-08   0.9046667 23.88071  5.8157843    37.846154    20.717949
## 390   1991-12-09   0.9045000 23.88073  5.8475630    59.897436   174.974359
## 391   1991-12-10   0.9043333 23.88076  5.8793417    16.222222    26.444444
## 392   1991-12-11   0.9041667 23.88078  5.9111204     8.358974    16.102564
## 393   1991-12-12   0.9040000 23.88080  5.9428992    12.205128    16.102564
## 394   1991-12-13   0.9038333 23.88082  5.9746779    18.000000    17.076923
## 395   1991-12-14   0.9036667 23.88084  6.0064566    18.451613   111.015873
## 396   1991-12-15   0.9035000 23.88087  6.0382353   154.720000   273.660714
## 397   1991-12-16   0.9033333 23.88089  6.1266667   121.888889   436.305556
## 398   1991-12-17   0.9031667 23.88091  6.0608734    35.179487   240.820513
## 399   1991-12-18   0.9030000 23.88093  5.9950802    60.717949   103.538462
## 400   1991-12-19   0.9028333 23.88096  5.9292870    20.974359    27.076923
## 401   1991-12-20   0.9026667 23.88098  5.8634938    57.384615    99.435897
## 402   1991-12-21   0.9025000 23.88100  5.7977005    27.375000   187.875000
## 403   1991-12-22   0.9023333 23.88102  5.7319073    41.333333    46.205128
## 404   1991-12-23   0.9021667 23.88104  5.6661141    74.000000   278.051282
## 405   1991-12-24   0.9020000 23.88107  5.6003209   110.615385   328.102564
## 406   1991-12-25   0.9018333 23.88109  5.5345276    28.820513    39.846154
## 407   1991-12-26   0.9016667 23.88111  5.4687344    69.111111   111.873016
## 408   1991-12-27   0.9015000 23.88113  5.4029412    81.080000   160.440000
## 409   1991-12-28   0.9013333 23.88116  5.7200000    18.194444    32.972222
## 410   1991-12-29   0.9011667 23.88118  5.6653922    12.461538     6.410256
## 411   1991-12-30   0.9010000 23.88120  5.6107843    11.384615    47.435897
## 412   1991-12-31   0.9008333 23.88122  5.5561765    25.333333    97.487179
## 413   1992-01-01   0.9006667 23.88124  5.5015686     2.222222     3.777778
## 414   1992-01-02   0.9005000 23.88127  5.4469608     3.025641     4.256410
## 415   1992-01-03   0.9003333 23.88129  5.3923529    63.333333   130.410256
## 416   1992-01-04   0.9001667 23.88131  5.3377451   152.256410   917.025641
## 417   1992-01-05   0.9000000 23.88133  5.2831373    14.769231    40.871795
## 418   1992-01-06   0.8998333 23.88136  5.2285294     5.166667     4.291667
## 419   1992-01-07   0.8996667 23.88138  5.1739216    39.641026    56.564103
## 420   1992-01-08   0.8995000 23.88140  5.1193137    46.296296   108.481481
## 421   1992-01-09   0.8993333 23.88142  5.0647059    67.320000   238.440000
## 422   1992-01-10   0.8991667 23.88144  5.6933333    73.361111   348.416667
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## 423   1992-01-11   0.8990000 23.88147  5.6214480     5.076923     6.769231
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## 425   1992-01-13   0.8986667 23.88151  5.4776772    21.846154    74.615385
## 426   1992-01-14   0.8985000 23.88153  5.4057919     5.794872    14.871795
## 427   1992-01-15   0.8983333 23.88156  5.3339065    50.256410   288.717949
## 428   1992-01-16   0.8981667 23.88158  5.2620211     7.641026    17.794872
## 429   1992-01-17   0.8980000 23.88160  5.1901357     2.923077     5.384615
## 430   1992-01-18   0.8978333 23.88162  5.1182504     2.222222    10.000000
## 431   1992-01-19   0.8976667 23.88164  5.0463650     8.358974    45.384615
## 432   1992-01-20   0.8975000 23.88167  4.9744796     6.205128    12.871795
## 433   1992-01-21   0.8973333 23.88169  4.9025943    24.769231     6.564103
## 434   1992-01-22   0.8971667 23.88171  4.8307089    51.384615   256.307051
## 435   1992-01-23   0.8970000 23.88173  4.7588235    78.000000   506.050000
## 436   1992-01-24   0.8968333 23.88176  4.7669853   103.965517   546.655172
## 437   1992-01-25   0.8966667 23.88178  4.7751471    70.769231   541.435897
## 438   1992-01-26   0.8965000 23.88180  4.7833088   891.333333   300.435897
## 439   1992-01-27   0.8963333 23.88182  4.7914706    22.410256    59.435897
## 440   1992-01-28   0.8961667 23.88184  4.7996324    96.512821   121.487179
## 441   1992-01-29   0.8960000 23.88187  4.8077941     8.717949    59.948718
## 442   1992-01-30   0.8958333 23.88189  4.8159559     7.111111    61.777778
## 443   1992-01-31   0.8956667 23.88191  4.8241176     2.000000     2.000000
## 444   1992-02-01   0.8955000 23.88193  4.8322794    27.897436   148.717949
## 445   1992-02-02   0.8953333 23.88196  4.8404412   604.666667     8.000000
## 446   1992-02-03   0.8951667 23.88198  4.8486029    45.846154   221.487179
## 447   1992-02-04   0.8950000 23.88200  4.8567647     3.555556   101.777778
## 448   1992-02-05   0.8948333 23.88202  4.8649265    50.564103   192.974359
## 449   1992-02-06   0.8946667 23.88204  4.8730882    28.564103   147.282051
## 450   1992-02-07   0.8945000 23.88207  4.8812500   141.948718   476.307692
## 451   1992-02-08   0.8943333 23.88209  4.8894118    12.444444     4.666667
## 452   1992-02-09   0.8941667 23.88211  4.8975735    11.076923    84.205128
## 453   1992-02-10   0.8940000 23.88213  4.9057353   106.153846   769.435897
## 454   1992-02-11   0.8938333 23.88216  4.9138971    12.465116   118.511628
## 455   1992-02-12   0.8936667 23.88218  4.9220588    72.150000   725.850000
## 456   1992-02-13   0.8935000 23.88220  5.0800000    45.137931   502.482759
## 457   1992-02-14   0.8933333 23.88222  5.1016544     2.000000     2.000000
## 458   1992-02-15   0.8931667 23.88224  5.1233088    37.125000   257.583333
## 459   1992-02-16   0.8930000 23.88227  5.1449632     2.000000     4.000000
## 460   1992-02-17   0.8928333 23.88229  5.1666176     2.102564     2.717949
## 461   1992-02-18   0.8926667 23.88231  5.1882721    83.791667   625.208333
## 462   1992-02-19   0.8925000 23.88233  5.2099265    22.000000    20.000000
## 463   1992-02-20   0.8923333 23.88236  5.2315809    30.000000   398.923077
## 464   1992-02-21   0.8921667 23.88238  5.2532353     2.102564     2.666667
## 465   1992-02-22   0.8920000 23.88240  5.2748897     3.777778    27.333333
## 466   1992-02-23   0.8918333 23.88242  5.2965441    27.076923    64.051282
## 467   1992-02-24   0.8916667 23.88244  5.3181985     3.435897     9.641026
## 468   1992-02-25   0.8915000 23.88247  5.3398529     8.888889    17.111111
## 469   1992-02-26   0.8913333 23.88249  5.3615074     4.450000     3.450000
## 470   1992-02-27   0.8911667 23.88251  5.3831618     2.512821     2.871795
## 471   1992-02-28   0.8910000 23.88253  5.4048162    42.634921    96.920635
## 472   1992-02-29   0.8908333 23.88256  5.4264706     7.098039    96.392157
## 473   1992-03-01   0.8906667 23.88258  5.4333333     8.166667     3.222222
## 474   1992-03-02   0.8905000 23.88260  5.4197415     3.589744     8.871795
## 475   1992-03-03   0.8903333 23.88262  5.4061497    23.333333   180.222222
## 476   1992-03-04   0.8901667 23.88264  5.3925579    19.300000   180.100000
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## 477   1992-03-05   0.8900000 23.88267  5.3789661    42.923077   271.230769
## 478   1992-03-06   0.8898333 23.88269  5.3653743     4.153846     5.589744
## 479   1992-03-07   0.8896667 23.88271  5.3517825     2.222222    12.888889
## 480   1992-03-08   0.8895000 23.88273  5.3381907     3.750000     8.250000
## 481   1992-03-09   0.8893333 23.88276  5.3245989     8.461538    30.974359
## 482   1992-03-10   0.8891667 23.88278  5.3110071    14.051282    17.025641
## 483   1992-03-11   0.8890000 23.88280  5.2974153    29.396825   222.857143
## 484   1992-03-12   0.8888333 23.88282  5.2838235     8.392157   123.568627
## 485   1992-03-13   0.8886667 23.88284  5.9233333    28.916667   182.231884
## 486   1992-03-14   0.8885000 23.88287  5.9471919     9.897436    33.435897
## 487   1992-03-15   0.8883333 23.88289  5.9710504     4.666667    12.666667
## 488   1992-03-16   0.8881667 23.88291  5.9949090    26.358974    72.923077
## 489   1992-03-17   0.8880000 23.88293  6.0187675     0.000000    44.820513
## 490   1992-03-18   0.8878333 23.88296  6.0426261    26.666667   616.888889
## 491   1992-03-19   0.8876667 23.88298  6.0664846    49.000000   237.050000
## 492   1992-03-20   0.8875000 23.88300  6.0903431   110.051282   915.333333
## 493   1992-03-21   0.8873333 23.88302  6.1142017    80.708333   732.458333
## 494   1992-03-22   0.8871667 23.88304  6.1380602    34.153846   394.769231
## 495   1992-03-23   0.8870000 23.88307  6.1619188     4.871795    69.743590
## 496   1992-03-24   0.8868333 23.88309  6.1857773     3.282051    13.897436
## 497   1992-03-25   0.8866667 23.88311  6.2096359    16.000000     6.222222
## 498   1992-03-26   0.8865000 23.88313  6.2334944     6.592593    23.333333
## 499   1992-03-27   0.8863333 23.88316  6.2573529   139.160000   931.320000
## 500   1992-03-28   0.8861667 23.88318  6.3666667     2.138889     2.222222
## 501   1992-03-29   0.8860000 23.88320  6.3727839    20.083333     5.541667
## 502   1992-03-30   0.8858333 23.88322  6.3789011     6.000000    12.000000
## 503   1992-03-31   0.8856667 23.88324  6.3850183    13.076923    58.820513
## 504   1992-04-01   0.8855000 23.88327  6.3911355     3.487179    12.307692
## 505   1992-04-02   0.8853333 23.88329  6.3972527    90.000000   108.666667
## 506   1992-04-03   0.8851667 23.88331  6.4033700     2.100000     4.800000
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## 508   1992-04-05   0.8848333 23.88336  6.4156044     4.410256    12.615385
## 509   1992-04-06   0.8846667 23.88338  6.4217216     6.444444    23.111111
## 510   1992-04-07   0.8845000 23.88340  6.4278388     9.550000    31.450000
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## 513   1992-04-10   0.8840000 23.88347  6.4461905     8.727273   154.109091
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## 516   1992-04-13   0.8835000 23.88353  0.0000000    11.642857    14.181818
## 517   1992-04-14   0.8833333 23.88356  0.3625000    21.000000    26.000000
## 518   1992-04-15   0.8831667 23.88358  0.7250000     2.051282     2.000000
## 519   1992-04-16   0.8830000 23.88360  1.0875000   146.000000   177.555556
## 520   1992-04-17   0.8828333 23.88362  1.4500000     7.047619    23.428571
## 521   1992-04-18   0.8826667 23.88364  1.8125000    28.000000    56.000000
## 522   1992-04-19   0.8825000 23.88367  2.1750000    24.769231   180.615385
## 523   1992-04-20   0.8823333 23.88369  2.5375000     8.666667    77.538462
## 524   1992-04-21   0.8821667 23.88371  2.9000000     7.833333    74.333333
## 525   1992-04-22   0.8820000 23.88373  3.2625000    16.000000     8.000000
## 526   1992-04-23   0.8818333 23.88376  3.6250000    19.230769    58.820513
## 527   1992-04-24   0.8816667 23.88378  3.9875000    18.564103    67.897436
## 528   1992-04-25   0.8815000 23.88380  4.3500000    16.583333    63.875000
## 529   1992-04-26   0.8813333 23.88382  4.7125000    10.000000    54.000000
## 530   1992-04-27   0.8811667 23.88384  5.0750000     7.384615    53.230769
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## 531   1992-04-28   0.8810000 23.88387  5.4375000     5.074074    12.777778
## 532   1992-04-29   0.8808333 23.88389  5.8000000    10.000000   106.392157
## 533   1992-04-30   0.8806667 23.88391  5.2433333     5.722222    35.805556
## 534   1992-05-01   0.8805000 23.88393  5.5550000     7.555556     2.888889
## 535   1992-05-02   0.8803333 23.88396  5.8666667    46.871795   273.743590
## 536   1992-05-03   0.8801667 23.88398  6.1783333    16.256410    62.410256
## 537   1992-05-04   0.8800000 23.88400  6.4900000    28.512821   202.564103
## 538   1992-05-05   0.8798830 23.88402  6.4663284    36.153846   134.410256
## 539   1992-05-06   0.8797661 23.88405  6.4426568     6.000000    12.888889
## 540   1992-05-07   0.8796491 23.88407  6.4189853     6.358974     6.358974
## 541   1992-05-08   0.8795322 23.88409  6.3953137    21.435897    14.820513
## 542   1992-05-09   0.8794152 23.88412  6.3716421     2.000000     2.615385
## 543   1992-05-10   0.8792982 23.88414  6.3479705     2.102564     2.102564
## 544   1992-05-11   0.8791813 23.88416  6.3242990     6.153846    21.076923
## 545   1992-05-12   0.8790643 23.88419  6.3006274   108.000000     7.555556
## 546   1992-05-13   0.8789474 23.88421  6.2769558     3.384615     2.307692
## 547   1992-05-14   0.8788304 23.88423  6.2532842    11.631083    27.153846
## 548   1992-05-15   0.8787135 23.88426  7.4965367    19.877551    52.000000
## 549   1992-05-16   0.8785965 23.88428  6.6097509     9.784615    12.800000
## 550   1992-05-17   0.8784795 23.88430  6.8048389     4.769231     3.076923
## 551   1992-05-18   0.8783626 23.88433  6.9999269     4.051282     3.179487
## 552   1992-05-19   0.8782456 23.88435  7.1239043     3.333333     3.282051
## 553   1992-05-20   0.8781287 23.88437  7.2261491     2.615385     3.384615
## 554   1992-05-21   0.8780117 23.88440  7.3283940     2.068966     3.218391
## 555   1992-05-22   0.8778947 23.88442  7.4306388     3.230769     3.230769
## 556   1992-05-23   0.8777778 23.88444  7.5328836     5.897436     2.461538
## 557   1992-05-24   0.8776608 23.88447  7.6351284     2.512821     3.128205
## 558   1992-05-25   0.8775439 23.88449  7.7373732     3.692308     5.333333
## 559   1992-05-26   0.8774269 23.88451  7.8396180     2.444444     3.555556
## 560   1992-05-27   0.8773099 23.88454  7.9418629     2.512821     2.871795
## 561   1992-05-28   0.8771930 23.88456  8.0441077     2.000000     2.871795
## 562   1992-05-29   0.8770760 23.88458  8.1463525     5.272727     4.545455
## 563   1992-05-30   0.8769591 23.88461  7.7147970     4.032915     8.858934
## 564   1992-05-31   0.8768421 23.88463  7.9296952     2.793103    13.172414
## 565   1992-06-01   0.8767251 23.88465  7.6750258     2.000000     7.282051
## 566   1992-06-02   0.8766082 23.88468  7.4203564     7.777778     9.333333
## 567   1992-06-03   0.8764912 23.88470  7.4175935     2.000000     3.230769
## 568   1992-06-04   0.8763743 23.88473  7.4148306     2.000000     2.641026
## 569   1992-06-05   0.8762573 23.88475  7.4831195     2.000000     2.051282
## 570   1992-06-06   0.8761404 23.88477  7.5514083     2.051282     9.692308
## 571   1992-06-07   0.8760234 23.88480  7.6196971     3.538462     2.461538
## 572   1992-06-08   0.8759064 23.88482  7.6879860    16.717949     6.410256
## 573   1992-06-09   0.8757895 23.88484  7.7562748     2.000000     2.000000
## 574   1992-06-10   0.8756725 23.88487  7.8245637     7.375000     3.708333
## 575   1992-06-11   0.8755556 23.88489  7.8928525     6.767241     6.702107
## 576   1992-06-12   0.8754386 23.88491  7.8851421     6.159483     9.695881
## 577   1992-06-13   0.8753216 23.88494  7.9787590     5.551724    12.689655
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## 579   1992-06-15   0.8750877 23.88498  7.3849631     7.076923     3.589744
## 580   1992-06-16   0.8749708 23.88501  7.0880651     5.256410     2.794872
## 581   1992-06-17   0.8748538 23.88503  5.9766136     3.435897     2.000000
## 582   1992-06-18   0.8747368 23.88505  4.8651622    10.606838    10.333333
## 583   1992-06-19   0.8746199 23.88508  6.9143915    17.777778    18.666667
## 584   1992-06-20   0.8745029 23.88510  7.1184833    16.000000    22.000000
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## 585   1992-06-21   0.8743860 23.88512  7.3225752     2.051282     4.512821
## 586   1992-06-22   0.8742690 23.88515  7.5266670     2.256410     2.410256
## 587   1992-06-23   0.8741520 23.88517  7.7307589     2.102564     3.333333
## 588   1992-06-24   0.8740351 23.88519  7.9348507     2.102564     2.051282
## 589   1992-06-25   0.8739181 23.88522  8.1389426     2.000000     2.205128
## 590   1992-06-26   0.8738012 23.88524  8.3430344     2.102564     2.307692
## 591   1992-06-27   0.8736842 23.88526  8.5471263     3.333333    16.666667
## 592   1992-06-28   0.8735673 23.88529  8.7512181     3.550000    14.650000
## 593   1992-06-29   0.8734503 23.88531  8.9553100   103.090909     3.045455
## 594   1992-06-30   0.8733333 23.88533  8.2420666    65.045455     5.591693
## 595   1992-07-01   0.8732164 23.88536  8.0308553    27.000000     8.137931
## 596   1992-07-02   0.8730994 23.88538  7.8346420     7.333333     9.641026
## 597   1992-07-03   0.8729825 23.88540  7.6384287     3.846154     2.102564
## 598   1992-07-04   0.8728655 23.88543  7.4422154   170.888889  1066.222222
## 599   1992-07-05   0.8727485 23.88545  7.2460021     2.093023     2.093023
## 600   1992-07-06   0.8726316 23.88547  7.0497888     8.379845     4.841383
## 601   1992-07-07   0.8725146 23.88550  6.8615583    14.666667     7.589744
## 602   1992-07-08   0.8723977 23.88552  6.6733278     9.358974     6.153846
## 603   1992-07-09   0.8722807 23.88554  6.8996152     4.051282     4.717949
## 604   1992-07-10   0.8721637 23.88557  7.1259026     7.230769     4.000000
## 605   1992-07-11   0.8720468 23.88559  7.3521899     3.500000     6.458333
## 606   1992-07-12   0.8719298 23.88561  7.5784773     2.863636     2.363636
## 607   1992-07-13   0.8718129 23.88564  6.9972805     7.880094     3.612853
## 608   1992-07-14   0.8716959 23.88566  8.3055789    12.896552     4.862069
## 609   1992-07-15   0.8715789 23.88568  7.8916610     3.230769     4.000000
## 610   1992-07-16   0.8714620 23.88571  7.4777430     2.820513     3.692308
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## 615   1992-07-21   0.8708772 23.88582  5.8432930     2.230769     2.589744
## 616   1992-07-22   0.8707602 23.88585  6.0974162     2.461538     2.769231
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## 618   1992-07-24   0.8705263 23.88589  6.6056626     2.102564     3.025641
## 619   1992-07-25   0.8704094 23.88592  6.8597859     2.000000     3.282051
## 620   1992-07-26   0.8702924 23.88594  7.1139091     6.045455     4.227273
## 621   1992-07-27   0.8701754 23.88596  6.5139756     4.022727     3.217085
## 622   1992-07-28   0.8700585 23.88599  7.7331207     2.000000     2.206897
## 623   1992-07-29   0.8699415 23.88601  7.6034085     4.461538     2.102564
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## 625   1992-07-31   0.8697076 23.88606  7.3439843    17.777778   118.444444
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## 627   1992-08-02   0.8694737 23.88611  7.0845600     5.692308     2.307692
## 628   1992-08-03   0.8693567 23.88613  6.9548478     3.846154     2.153846
## 629   1992-08-04   0.8692398 23.88615  6.8915440     2.000000     2.000000
## 630   1992-08-05   0.8691228 23.88618  6.8282401     6.333333     2.222222
## 631   1992-08-06   0.8690058 23.88620  6.9021026    10.666667     2.444444
## 632   1992-08-07   0.8688889 23.88622  6.9759651    10.256410     5.384615
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## 639   1992-08-14   0.8680702 23.88639  7.4930025     2.153846     5.435897
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## 647   1992-08-22   0.8671345 23.88657  7.0367289     2.102564     2.461538
## 648   1992-08-23   0.8670175 23.88660  6.9398829     2.666667     4.102564
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## 652   1992-08-27   0.8665497 23.88669  7.9129756     3.344406     3.886364
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## 683   1992-09-27   0.8629240 23.88742  8.4205921    18.888889    11.111111
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## 686   1992-09-30   0.8625731 23.88749  7.9074699     9.726496     2.914530
## 687   1992-10-01   0.8624561 23.88751  7.8810145    15.897436     2.051282
## 688   1992-10-02   0.8623392 23.88753  7.8545590    11.118529     5.742622
## 689   1992-10-03   0.8622222 23.88756  8.4362727     6.339623     9.433962
## 690   1992-10-04   0.8621053 23.88758  8.2676071     3.714286     3.714286
## 691   1992-10-05   0.8619883 23.88760  8.5352222     4.457143     3.990476
## 692   1992-10-06   0.8618713 23.88763  8.6629667     5.200000     4.266667
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## 696   1992-10-10   0.8614035 23.88772  7.8057921     2.000000     2.256410
## 697   1992-10-11   0.8612865 23.88774  7.9588258    23.333333     2.222222
## 698   1992-10-12   0.8611696 23.88777  8.1118596    13.333333     2.393162
## 699   1992-10-13   0.8610526 23.88779  8.0879876     3.333333     2.564103
## 700   1992-10-14   0.8609357 23.88781  8.0641157     3.333333     2.222222
## 701   1992-10-15   0.8608187 23.88784  8.0402438     3.282051     4.512821
## 702   1992-10-16   0.8607018 23.88786  8.0163719     6.000000     8.000000
## 703   1992-10-17   0.8605848 23.88788  7.9925000     7.681818    16.545455
## 704   1992-10-18   0.8604678 23.88791  7.7699444     3.888889    59.222222
## 705   1992-10-19   0.8603509 23.88793  7.8848171     3.276353    40.216524
## 706   1992-10-20   0.8602339 23.88795  7.9091935     2.663818    21.210826
## 707   1992-10-21   0.8601170 23.88798  7.5769019     2.051282     2.205128
## 708   1992-10-22   0.8600000 23.88800  7.2446102     3.515670    50.507123
## 709   1992-10-23   0.8602098 23.88803  7.6376099     4.980057    98.809117
## 710   1992-10-24   0.8604196 23.88806  7.6771246     6.444444   147.111111
## 711   1992-10-25   0.8606294 23.88808  7.7166392     3.024390     6.439024
## 712   1992-10-26   0.8608392 23.88811  7.7561539     3.794872     2.205128
## 713   1992-10-27   0.8610490 23.88814  7.7956686     2.974359    10.923077
## 714   1992-10-28   0.8612587 23.88817  7.8351833    15.333333    67.777778
## 715   1992-10-29   0.8614685 23.88820  7.8746979     9.666667    34.888889
## 716   1992-10-30   0.8616783 23.88822  7.9142126     4.000000     2.000000
## 717   1992-10-31   0.8618881 23.88825  7.9537273     6.636364     3.272727
## 718   1992-11-01   0.8620979 23.88828  7.1947561     5.518182     4.003030
## 719   1992-11-02   0.8623077 23.88831  7.7671333     4.400000     4.733333
## 720   1992-11-03   0.8625175 23.88834  7.9194615     3.714286     2.214286
## 721   1992-11-04   0.8627273 23.88836  6.7083880     3.549451     2.132784
## 722   1992-11-05   0.8629371 23.88839  6.5872258     3.384615     2.051282
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## 724   1992-11-07   0.8633566 23.88845  6.3449014     2.025641     2.384615
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## 726   1992-11-09   0.8637762 23.88850  6.7441278    19.777778     7.333333
## 727   1992-11-10   0.8639860 23.88853  6.9437410    14.452991     7.743590
## 728   1992-11-11   0.8641958 23.88856  7.1433542     9.128205     8.153846
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## 730   1992-11-13   0.8646154 23.88862  7.5181136    70.090909    93.545455
## 731   1992-11-14   0.8648252 23.88864  5.8326104    40.183386    48.945141
## 732   1992-11-15   0.8650350 23.88867  6.3540862    10.275862     4.344828
## 733   1992-11-16   0.8652448 23.88870  5.7453821     8.371942     4.298261
## 734   1992-11-17   0.8654545 23.88873  5.9861944     6.468022     4.251695
## 735   1992-11-18   0.8656643 23.88876  6.2270067     4.564103     4.205128
## 736   1992-11-19   0.8658741 23.88878  6.4678190     8.871795     3.025641
## 737   1992-11-20   0.8660839 23.88881  6.7086313     6.461538     6.102564
## 738   1992-11-21   0.8662937 23.88884  6.9494436    37.555556    19.333333
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## 741   1992-11-24   0.8669231 23.88892  7.5278281    10.086991     3.430251
## 742   1992-11-25   0.8671329 23.88895  8.2166533    16.310345     2.724138
## 743   1992-11-26   0.8673427 23.88898  7.7391229     9.538462     2.102564
## 744   1992-11-27   0.8675524 23.88901  7.2615924    81.766382    64.364672
## 745   1992-11-28   0.8677622 23.88903  7.1009775   153.994302   126.626781
## 746   1992-11-29   0.8679720 23.88906  7.3202780   226.222222   188.888889
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## 747   1992-11-30   0.8681818 23.88909  7.5395785    38.000000    30.000000
## 748   1992-12-01   0.8683916 23.88912  7.7588790    10.800000     2.600000
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## 750   1992-12-03   0.8688112 23.88917  8.1974799     9.846154     5.897436
## 751   1992-12-04   0.8690210 23.88920  8.4167804     4.461538     2.102564
## 752   1992-12-05   0.8692308 23.88923  8.6360809     7.555556    17.111111
## 753   1992-12-06   0.8694406 23.88926  8.8553813 12000.000000 12000.000000
## 754   1992-12-07   0.8696503 23.88929  9.0746818    42.954545    38.818182
## 755   1992-12-08   0.8698601 23.88931  8.5992317    27.063480    23.840125
## 756   1992-12-09   0.8700699 23.88934  8.8388448    11.172414     8.862069
## 757   1992-12-10   0.8702797 23.88937  7.7121010     9.333333     9.333333
## 758   1992-12-11   0.8704895 23.88940  6.5853571     9.358974     8.538462
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## 760   1992-12-13   0.8709091 23.88945  6.0491417    22.666667    15.555556
## 761   1992-12-14   0.8711189 23.88948  5.7810339    94.000000    52.000000
## 762   1992-12-15   0.8713287 23.88951  5.5129262    71.435897    39.897436
## 763   1992-12-16   0.8715385 23.88954  6.3039715    48.871795    27.794872
## 764   1992-12-17   0.8717483 23.88957  5.9234444    26.307692    15.692308
## 765   1992-12-18   0.8719580 23.88959  5.6949821     3.743590     3.589744
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## 767   1992-12-20   0.8723776 23.88965  5.5149025    16.888889     5.333333
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## 769   1992-12-22   0.8727972 23.88971  5.3348229    18.531746   109.087302
## 770   1992-12-23   0.8730070 23.88973  5.2447831    34.980159    91.257937
## 771   1992-12-24   0.8732168 23.88976  5.5375800    51.428571    73.428571
## 772   1992-12-25   0.8734266 23.88979  5.1796905    86.727273   522.545455
## 773   1992-12-26   0.8736364 23.88982  5.7654972    49.113636   263.314394
## 774   1992-12-27   0.8738462 23.88985  6.4830588    11.500000     4.083333
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## 776   1992-12-29   0.8742657 23.88990  6.0954033     6.888889    36.222222
## 777   1992-12-30   0.8744755 23.88993  5.9015755    49.333333    18.666667
## 778   1992-12-31   0.8746853 23.88996  5.7077478     9.916667    23.583333
## 779   1993-01-01   0.8748951 23.88999  5.5139200     7.000000    36.142857
## 780   1993-01-02   0.8751049 23.89001  8.5644545     2.666667     2.909091
## 781   1993-01-03   0.8753147 23.89004  6.7272683     2.000000     2.200000
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## 785   1993-01-07   0.8761538 23.89015  5.1428104    12.000000    14.000000
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## 787   1993-01-09   0.8765734 23.89021  5.8103203     7.212121     4.181818
## 788   1993-01-10   0.8767832 23.89024  6.1440752     4.606061     6.424242
## 789   1993-01-11   0.8769930 23.89027  6.4778301    86.000000   250.000000
## 790   1993-01-12   0.8772028 23.89029  6.8115851     2.606061     5.757576
## 791   1993-01-13   0.8774126 23.89032  7.1453400    10.000000    28.714286
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## 793   1993-01-15   0.8778322 23.89038  7.9042059    10.500000    10.333333
## 794   1993-01-16   0.8780420 23.89041  6.6786328     5.636364     8.969697
## 795   1993-01-17   0.8782517 23.89043  5.4530598     6.212121     7.969697
## 796   1993-01-18   0.8784615 23.89046  5.4685327     6.787879     6.969697
## 797   1993-01-19   0.8786713 23.89049  5.4840056     7.424242     8.090909
## 798   1993-01-20   0.8788811 23.89052  5.4976554     8.060606     9.212121
## 799   1993-01-21   0.8790909 23.89055  5.5113052     3.454545     4.484848
## 800   1993-01-22   0.8793007 23.89057  5.5249549    13.996503   446.953963
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## 801   1993-01-23   0.8795105 23.89060  5.0785294    24.538462   889.423077
## 802   1993-01-24   0.8797203 23.89063  5.7174076    40.606061     4.727273
## 803   1993-01-25   0.8799301 23.89066  6.3562857     6.000000    15.000000
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## 805   1993-01-27   0.8803497 23.89071  7.2800417    23.666667     2.333333
## 806   1993-01-28   0.8805594 23.89074  7.1822465     3.757576    28.363636
## 807   1993-01-29   0.8807692 23.89077  7.0844512     2.000000     4.000000
## 808   1993-01-30   0.8809790 23.89080  6.9866560    10.000000     2.181818
## 809   1993-01-31   0.8811888 23.89083  6.8888608     4.000000    12.000000
## 810   1993-02-01   0.8813986 23.89085  6.7910656     2.000000    24.000000
## 811   1993-02-02   0.8816084 23.89088  6.6932704     2.000000     2.000000
## 812   1993-02-03   0.8818182 23.89091  6.5954752     6.181818     3.757576
## 813   1993-02-04   0.8820280 23.89094  6.4976800    60.538462   502.500000
## 814   1993-02-05   0.8822378 23.89097  6.0728627    35.435897   252.333333
## 815   1993-02-06   0.8824476 23.89099  6.9507696    10.333333     2.166667
## 816   1993-02-07   0.8826573 23.89102  7.8286765    25.555556     8.888889
## 817   1993-02-08   0.8828671 23.89105  8.7065833     2.000000     2.000000
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## 819   1993-02-10   0.8832867 23.89110  8.2450000     2.000000     3.600000
## 820   1993-02-11   0.8834965 23.89113  8.1750238    13.555556     2.222222
## 821   1993-02-12   0.8837063 23.89116  8.1050476     3.000000     3.666667
## 822   1993-02-13   0.8839161 23.89119  8.0350714    68.909091   366.000000
## 823   1993-02-14   0.8841259 23.89122  7.9650952     2.000000    12.000000
## 824   1993-02-15   0.8843357 23.89124  7.8951190     3.575758     6.060606
## 825   1993-02-16   0.8845455 23.89127  7.8251429    25.142857   124.571429
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## 827   1993-02-18   0.8849650 23.89133  7.4667000    29.200000   231.000000
## 828   1993-02-19   0.8851748 23.89136  6.3657127     8.121212     2.545455
## 829   1993-02-20   0.8853846 23.89138  5.2647255     6.080808     2.272727
## 830   1993-02-21   0.8855944 23.89141  5.5433846     4.040404     2.000000
## 831   1993-02-22   0.8858042 23.89144  5.5791019     2.000000     2.166667
## 832   1993-02-23   0.8860140 23.89147  5.6148193     8.000000     2.000000
## 833   1993-02-24   0.8862238 23.89150  5.6505366     3.636364     2.303030
## 834   1993-02-25   0.8864336 23.89152  5.6862539     2.000000     2.000000
## 835   1993-02-26   0.8866434 23.89155  5.7219713   133.111111    33.777778
## 836   1993-02-27   0.8868531 23.89158  5.7576886     2.000000     3.000000
## 837   1993-02-28   0.8870629 23.89161  5.7934059    92.096154   324.865385
## 838   1993-03-01   0.8872727 23.89164  5.2955577   182.192308   646.730769
## 839   1993-03-02   0.8874825 23.89166  6.0889931     2.121212     2.303030
## 840   1993-03-03   0.8876923 23.89169  6.8824286     9.000000    18.142857
## 841   1993-03-04   0.8879021 23.89172  5.9310000    14.000000    84.800000
## 842   1993-03-05   0.8881119 23.89175  7.3413750     4.060606     4.424242
## 843   1993-03-06   0.8883217 23.89178  7.1245937   589.333333    94.888889
## 844   1993-03-07   0.8885315 23.89180  6.9078125     2.000000     2.083333
## 845   1993-03-08   0.8887413 23.89183  6.6910312    44.000000    26.000000
## 846   1993-03-09   0.8889510 23.89186  6.4742500     2.750000    18.750000
## 847   1993-03-10   0.8891608 23.89189  7.0094103     7.000000     4.900000
## 848   1993-03-11   0.8893706 23.89192  6.5236061     2.000000     2.000000
## 849   1993-03-12   0.8895804 23.89194  6.0378020    11.961538   222.115385
## 850   1993-03-13   0.8897902 23.89197  6.1336863    21.923077   442.230769
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## 852   1993-03-15   0.8687211 23.89202  6.4004388     4.000000     2.000000
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## 854   1993-03-17   0.8261634 23.89207  6.6013163     6.000000     2.083333
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## 855   1993-03-18   0.8048846 23.89209  6.7017551    10.416667     2.583333
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## 864   1993-03-27   0.6133749 23.89228  5.8748150     2.083333     2.666667
## 865   1993-03-28   0.5920960 23.89231  6.0565147     2.166667     3.000000
## 866   1993-03-29   0.5708171 23.89233  6.2382143     7.652174    29.043478
## 867   1993-03-30   0.5495383 23.89235  7.0215833    18.583333     4.333333
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## 870   1993-04-02   0.4857017 23.89242  6.1226471   144.307692  1073.807692
## 871   1993-04-03   0.4644228 23.89244  6.0051244    20.000000    36.888889
## 872   1993-04-04   0.4431440 23.89246  5.8876018     5.416667     4.583333
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## 875   1993-04-07   0.4062829 23.89253  6.5289940     3.000000     3.833333
## 876   1993-04-08   0.4119795 23.89255  6.6323998     3.833333     6.833333
## 877   1993-04-09   0.4176761 23.89257  6.7358055    65.777778   136.444444
## 878   1993-04-10   0.4233727 23.89259  6.8392113   878.000000  1922.000000
## 879   1993-04-11   0.4290693 23.89261  6.9426170     4.000000     3.250000
## 880   1993-04-12   0.4347659 23.89264  7.0460228     2.000000     4.416667
## 881   1993-04-13   0.4404626 23.89266  7.1494286     6.142857     5.142857
## 882   1993-04-14   0.4461592 23.89268  6.9820000     2.000000     2.000000
## 883   1993-04-15   0.4518558 23.89270  8.4575833     2.000000     2.416667
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## 885   1993-04-17   0.4632490 23.89274  6.0258900    57.519231   264.038462
## 886   1993-04-18   0.4689456 23.89277  5.7824706   103.038462   520.076923
## 887   1993-04-19   0.4746422 23.89279  5.9162850     2.500000     3.833333
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## 889   1993-04-21   0.4860354 23.89283  6.1839139     2.888889    11.555556
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## 892   1993-04-24   0.5031253 23.89290  6.5853571     6.000000     3.428571
## 893   1993-04-25   0.5088219 23.89292  7.6523043     2.083333     3.083333
## 894   1993-04-26   0.5145185 23.89294  7.2853333     2.000000    22.600000
## 895   1993-04-27   0.5202151 23.89296  5.5194038   189.076923   593.500000
## 896   1993-04-28   0.5259117 23.89299  5.1077451   102.316239   308.416667
## 897   1993-04-29   0.5316083 23.89301  5.1134338    15.555556    23.333333
## 898   1993-04-30   0.5373050 23.89303  5.1191225     2.916667     4.333333
## 899   1993-05-01   0.5430016 23.89305  5.1248113    11.333333    91.833333
## 900   1993-05-02   0.5486982 23.89307  5.1305000    35.000000     2.000000
## 901   1993-05-03   0.5543948 23.89309  5.1361887   108.000000    10.000000
## 902   1993-05-04   0.5600914 23.89312  5.1418775     4.083333     6.333333
## 903   1993-05-05   0.5657880 23.89314  5.1475662     2.416667     9.750000
## 904   1993-05-06   0.5714846 23.89316  5.1532549    85.615385  1203.423077
## 905   1993-05-07   0.5771812 23.89318  5.0955000    48.029915   611.267094
## 906   1993-05-08   0.5828778 23.89320  6.3639375    10.444444    19.111111
## 907   1993-05-09   0.5885745 23.89323  7.6323750     3.666667    10.916667
## 908   1993-05-10   0.5942711 23.89325  6.0377917    39.500000    12.416667
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## 909   1993-05-11   0.5999677 23.89327  5.9931097     6.416667     2.000000
## 910   1993-05-12   0.6056643 23.89329  5.9484278     2.000000     5.000000
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## 912   1993-05-14   0.6170575 23.89334  5.8590639    10.250000     5.416667
## 913   1993-05-15   0.6227541 23.89336  5.8143819     2.484848     4.727273
## 914   1993-05-16   0.6284507 23.89338  5.7697000    26.200000    45.400000
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## 916   1993-05-18   0.6398440 23.89342  9.0058750     2.000000     2.250000
## 917   1993-05-19   0.6455406 23.89345  5.1739314    34.229508    93.534836
## 918   1993-05-20   0.6512372 23.89347  5.5310385    66.459016   184.819672
## 919   1993-05-21   0.6569338 23.89349  5.7481736     4.083333     2.000000
## 920   1993-05-22   0.6626304 23.89351  5.9653088     2.888889     2.444444
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## 922   1993-05-24   0.6740236 23.89355  6.3995791     3.555556     7.111111
## 923   1993-05-25   0.6797202 23.89358  6.6167143    15.428571     2.000000
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## 927   1993-05-29   0.7025067 23.89366  5.7142083     2.000000     2.000000
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## 930   1993-06-01   0.7195965 23.89373  4.9939208    45.034188    83.636752
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## 932   1993-06-03   0.7309897 23.89377  5.3531653     4.000000     2.083333
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## 1130  1993-12-18   1.8074957 24.58471  4.9187974     2.166667     2.666667
## 1131  1993-12-19   2.0796218 24.59504  2.4593987    26.833333     2.083333
## 1132  1993-12-20   2.3517478 24.60538  0.0000000    41.246855   190.475629
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## 1134  1993-12-22   3.3651542 24.60319  7.7145958     5.000000    25.250000
## 1135  1993-12-23   2.9234974 24.71686  7.1853669    14.333333    10.416667
## 1136  1993-12-24   2.4818406 24.83053  6.6561379     8.333333     8.750000
## 1137  1993-12-25   2.6741000 24.78975  6.8565614     2.333333     7.083333
## 1138  1993-12-26   2.8663594 24.74896  7.0569849    58.000000    29.555556
## 1139  1993-12-27   3.0586187 24.70818  7.2574084    49.805556    25.870370
## 1140  1993-12-28   3.2508781 24.66739  7.4578319    41.611111    22.185185
## 1141  1993-12-29   3.4431375 24.62661  7.6582554    33.416667    18.500000
## 1142  1993-12-30   2.9389255 24.78953  6.7645022    17.730769    61.538462
## 1143  1993-12-31   2.9916750 24.59386  7.3774221    41.636364    12.969697
## 1144  1994-01-01   3.0444246 24.75041  6.9168219   250.000000    40.000000
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## 1178  1994-02-04   3.8602299 25.50674  4.9268279     6.363636     7.814394
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## 1197  1994-02-23   7.2718979 25.34558  6.7451398    27.692308   331.115385
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## 1277  1994-05-14   4.2300353 25.37420  7.8884325   277.454545   282.454545
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## 1286  1994-05-23   7.9819103 25.79384  5.5531154    15.416667    22.666667
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## 1337  1994-07-13   6.0764117 25.38875  7.6793059    20.181818    84.181818
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## 1340  1994-07-16   8.7278792 25.36476  8.1624397     4.571429    44.095238
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## 1560  1995-02-21   6.8663599 24.40284  6.6652271    18.500000    95.600000
## 1561  1995-02-22   6.9304375 24.32408  6.5438713     2.444444     6.000000
## 1562  1995-02-23   3.8501226 24.80383  6.4225155     3.225806    21.935484
## 1563  1995-02-24   3.9483123 25.28946  5.2191891    53.377778   765.200000
## 1564  1995-02-25   4.0465019 24.98819  5.2804075     2.055556     4.555556
## 1565  1995-02-26   4.1446916 24.68692  5.3416259     6.181818     3.818182
## 1566  1995-02-27   4.2428813 24.38564  5.4028444     2.000000     2.222222
## 1567  1995-02-28   4.3410710 24.08437  5.4640628     2.388889     4.972222
## 1568  1995-03-01   4.4392606 24.26161  5.7658371     2.777778     7.722222
## 1569  1995-03-02   4.5374503 24.43885  6.0676114     4.909091     6.727273
## 1570  1995-03-03   4.6356400 24.61609  6.3693857    12.177778    50.088889
## 1571  1995-03-04   4.7338297 24.79333  6.6711600     2.000000     6.000000
## 1572  1995-03-05   4.8320194 24.97057  6.9729344    39.875000    19.937500
## 1573  1995-03-06   4.9302090 24.77238  7.2747087    17.155556   318.133333
## 1574  1995-03-07   5.0283987 24.72854  7.1060683    14.000000    62.111111
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## 1577  1995-03-10   5.3229677 25.07945  6.6001471     3.806452    52.451613
## 1578  1995-03-11   5.2611964 25.25367  7.4962856    13.714286   381.607143
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## 1597  1995-03-30   3.9014667 24.65720  8.1429038    10.333333    32.055556
## 1598  1995-03-31   4.2820102 24.65933  8.0903151     6.297872    17.063830
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## 1637  1995-05-09   3.7434375 24.94779  7.5647333    17.703704    18.962963
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## 1641  1995-05-13   7.3031653 25.54920  7.7443091    49.148936   201.106383
## 1642  1995-05-14   8.1930972 25.50229  7.7892030    60.400000  1970.000000
## 1643  1995-05-15   9.0830291 25.45539  7.8340969     2.000000     6.000000
## 1644  1995-05-16   9.9729611 25.40848  7.8789909    81.611111    94.333333
## 1645  1995-05-17  10.8628930 25.36157  7.9238848   482.727273  1731.090909
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## 1664  1995-06-05   5.5626928 25.13181  7.7352117    17.555556     5.555556
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## 1671  1995-06-12   4.3981573 25.46131  5.8848994  2400.000000  9600.000000
## 1672  1995-06-13   3.2970921 25.68598  5.0598081  1202.833333  4806.000000
## 1673  1995-06-14   4.0988990 25.61543  5.2793937     5.666667    12.000000
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## 1679  1995-06-20   9.4855141 25.36514  6.2927966     4.166667     9.944444
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## 1700  1995-07-11   8.7119868 25.15136  7.1072628     2.000000     7.944444
## 1701  1995-07-12   8.5580075 25.10859  7.1751221     8.488889   152.666667
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## 1703  1995-07-14   7.1903438 25.26353  6.8641203     2.095238     2.000000
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## 1707  1995-07-18   4.8684364 25.56157  5.4061150    25.785714   446.964286
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## 1718  1995-07-29   5.6161614 25.15140  6.5022630     2.133333     3.688889
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## 1735  1995-08-15   5.1422511 25.55815  5.6331520    11.071429   399.678571
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## 1770  1995-09-19   5.5026290 25.07151  6.2993842    23.548387   268.064516
## 1771  1995-09-20  10.6365375 24.64760  7.7240521    12.052632    45.473684
## 1772  1995-09-21   4.8968200 25.35855  5.8611524    52.000000   771.911111
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## 1773  1995-09-22   5.1802605 25.44145  5.6224550     2.666667     2.888889
## 1774  1995-09-23   5.4637010 25.52434  5.3837575     2.787879     2.717172
## 1775  1995-09-24   6.1733394 25.35363  6.0139714     2.909091     2.545455
## 1776  1995-09-25   6.8829778 25.18291  6.6441853     2.000000     2.333333
## 1777  1995-09-26   7.5926162 25.01219  7.2743992     3.333333     2.055556
## 1778  1995-09-27   8.3022545 24.84148  7.9046130     8.645833     4.486111
## 1779  1995-09-28   8.0128386 24.64807  8.0163166    13.958333     6.916667
## 1780  1995-09-29   7.2518000 24.66479  7.8346402    20.533333    59.533333
## 1781  1995-09-30   6.7231008 24.73861  7.5079305     9.111111    93.611111
## 1782  1995-10-01   6.1944016 24.81244  7.1812208     6.400000    28.600000
## 1783  1995-10-02   5.6657024 24.88626  6.8545110     2.944444    11.166667
## 1784  1995-10-03   5.1370032 24.96008  6.5278013     5.354839    39.290323
## 1785  1995-10-04   9.1804542 24.56856  7.2445917    15.052632    26.736842
## 1786  1995-10-05   8.6567762 24.72505  6.4755823     4.888889    15.555556
## 1787  1995-10-06   8.1330982 24.88153  5.7065729    25.466667   419.911111
## 1788  1995-10-07   7.6094203 25.03802  5.6474687     2.000000     2.000000
## 1789  1995-10-08   7.0857423 25.19451  5.5883644     5.636364   129.636364
## 1790  1995-10-09   6.5620644 25.35100  5.5292602     2.000000     2.444444
## 1791  1995-10-10   7.6497012 25.26249  5.9919335     8.545455     8.545455
## 1792  1995-10-11   8.7373380 25.17399  6.4546068     2.277778    11.055556
## 1793  1995-10-12   9.8249748 25.08548  6.9172801     3.388889     7.722222
## 1794  1995-10-13  10.9126117 24.99698  7.3799534     2.611111     5.333333
## 1795  1995-10-14  12.0002485 24.90848  7.8426267    81.724138   359.448276
## 1796  1995-10-15  10.1886727 24.90749  7.8490673    30.789474   613.105263
## 1797  1995-10-16   7.3018119 24.91360  7.7922048     2.266667    13.933333
## 1798  1995-10-17   7.3324141 25.37398  5.7781821     2.666667    11.555556
## 1799  1995-10-18   5.3034129 25.06903  6.8719584    27.619048    45.571429
## 1800  1995-10-19   6.7189708 24.83469  7.2020325     5.629630     6.518519
## 1801  1995-10-20   0.7200000 23.88100  6.7900000    19.348148   268.459259
## 1802  1995-10-21   4.9806956 25.34418  5.8001376    33.066667   530.400000
## 1803  1995-10-22   5.3204780 25.31808  5.9962685     6.833333    27.166667
## 1804  1995-10-23   5.6602605 25.29199  6.1923995    26.000000    31.272727
## 1805  1995-10-24   6.0000430 25.26590  6.3885305    11.555556     2.888889
## 1806  1995-10-25   6.3398255 25.23980  6.5846614    15.276596   128.893617
## 1807  1995-10-26   6.6796080 25.21371  6.7807924    36.000000    36.000000
## 1808  1995-10-27   7.0193905 25.18762  6.9769234   871.272727    84.000000
## 1809  1995-10-28   7.3591730 25.16152  7.1730544     3.055556     9.444444
## 1810  1995-10-29   7.6989555 25.13543  7.3691853     2.888889     6.444444
## 1811  1995-10-30   8.0387380 25.10934  7.5653163     9.957447     6.510638
## 1812  1995-10-31   8.3785205 25.08324  7.7614473    22.944444   148.444444
## 1813  1995-11-01  11.6486303 25.08554  7.7497815     2.111111    10.000000
## 1814  1995-11-02   8.4714667 25.07515  7.7971452     8.333333     7.733333
## 1815  1995-11-03   6.1791645 25.25078  6.7051381    48.193548   269.612903
## 1816  1995-11-04   5.7560614 25.38723  6.3294814    28.750000   543.500000
## 1817  1995-11-05   7.0688417 25.09216  7.6022063     3.777778     2.592593
## 1818  1995-11-06   4.9637980 25.49981  5.5610288     3.000000     2.962963
## 1819  1995-11-07   4.7792498 25.45023  5.8894517     2.222222     3.333333
## 1820  1995-11-08   4.5947016 25.40064  6.2178745     7.272727    11.090909
## 1821  1995-11-09   4.4101534 25.35106  6.5462974   211.111111    14.000000
## 1822  1995-11-10   4.2256052 25.30147  6.8747202    10.333333    12.500000
## 1823  1995-11-11   4.0410570 25.25188  7.2031431     8.085106     7.063830
## 1824  1995-11-12   3.8565088 25.20230  7.5315659     5.777778    19.444444
## 1825  1995-11-13   3.6719606 25.15271  7.8599888     2.666667     4.666667
## 1826  1995-11-14   3.5954517 25.14323  7.6857456    17.100000     9.500000
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## 1827  1995-11-15   3.5189429 25.13375  7.5115024     2.733333     3.600000
## 1828  1995-11-16   3.5760250 25.14012  7.7129750     5.055556   203.055556
## 1829  1995-11-17   1.7246419 25.28593  6.7967187    22.193548    88.516129
## 1830  1995-11-18   1.5363743 25.33453  6.6288966    17.454545   104.000000
## 1831  1995-11-19   1.3481067 25.38312  6.4610744    70.800000   593.288889
## 1832  1995-11-20   6.4727458 25.06673  7.2018183     2.222222     6.518519
## 1833  1995-11-21   4.7838216 25.45663  5.8856703    60.020202    81.895623
## 1834  1995-11-22   4.5891738 25.45330  6.0146669   117.818182   157.272727
## 1835  1995-11-23   4.3945260 25.44997  6.1436636     2.444444     5.111111
## 1836  1995-11-24   4.1998783 25.44664  6.2726602     3.000000     9.055556
## 1837  1995-11-25   4.0052305 25.44331  6.4016568     2.611111     3.388889
## 1838  1995-11-26   3.8105827 25.43998  6.5306534    73.818182   182.727273
## 1839  1995-11-27   3.6159349 25.43665  6.6596501   775.000000  2425.000000
## 1840  1995-11-28   3.4212872 25.43332  6.7886467     6.500000    34.444444
## 1841  1995-11-29   3.2266394 25.42999  6.9176433     2.555556     4.444444
## 1842  1995-11-30   3.2617068 25.46185  6.8409927    66.444444   585.000000
## 1843  1995-12-01   4.2056786 25.31258  7.3360805     4.878049     4.487805
## 1844  1995-12-02   3.5739416 25.34235  7.2355177     2.444444     3.555556
## 1845  1995-12-03   2.9422047 25.37211  7.1349550     4.444444    16.333333
## 1846  1995-12-04   2.3104677 25.40187  7.0343923     4.709677    10.064516
## 1847  1995-12-05   3.1143333 25.20095  7.7791617     8.789474    28.315789
## 1848  1995-12-06   1.7916489 25.50995  6.0520818   101.777778   915.688889
## 1849  1995-12-07   1.2790500 25.64343  5.5810273  1114.909091  1226.545455
## 1850  1995-12-08   1.2824643 25.61923  5.6796633     5.052632    20.578947
## 1851  1995-12-09   1.2858786 25.59503  5.7782993     2.666667     3.555556
## 1852  1995-12-10   1.2892929 25.57084  5.8769353     3.555556    10.500000
## 1853  1995-12-11   1.2927073 25.54664  5.9755714    22.181818    13.818182
## 1854  1995-12-12   1.2961216 25.52244  6.0742074     6.944444    40.444444
## 1855  1995-12-13   1.2995359 25.49825  6.1728434     3.574468     6.042553
## 1856  1995-12-14   1.3029502 25.47405  6.2714795     3.555556     6.222222
## 1857  1995-12-15   1.3063645 25.44985  6.3701155    18.645161    53.870968
## 1858  1995-12-16   1.0657467 25.69097  5.3654713    10.507766    28.713262
## 1859  1995-12-17   3.1278167 25.14899  7.7300675     2.370370     3.555556
## 1860  1995-12-18   2.6215212 25.67150  6.2218348     2.000000     3.888889
## 1861  1995-12-19   1.9239488 25.71547  5.7180205   324.682927   571.121951
## 1862  1995-12-20   3.4126409 25.71515  5.7940066    25.794872   678.923077
## 1863  1995-12-21   2.9651677 25.74232  5.7688012     2.500000     4.111111
## 1864  1995-12-22   2.5176945 25.76948  5.7435959     3.822222    12.311111
## 1865  1995-12-23   2.0702212 25.79665  5.7183905     8.545455     4.000000
## 1866  1995-12-24   1.6227480 25.82382  5.6931852     6.376176     4.689655
## 1867  1995-12-25   5.5469515 25.47401  7.0189215     4.206897     5.379310
## 1868  1995-12-26   6.1911023 25.38974  7.4713058     2.888889    16.611111
## 1869  1995-12-27   4.5899643 25.36739  6.9578824     2.533333    43.266667
## 1870  1995-12-28   3.8833128 25.43867  6.6471883     2.055556     2.555556
## 1871  1995-12-29   3.1766612 25.50994  6.3364942     3.333333    16.222222
## 1872  1995-12-30   2.4700097 25.58122  6.0258002    13.833333     2.333333
## 1873  1995-12-31   1.7633582 25.65250  5.7151061     2.777778     5.111111
## 1874  1996-01-01   1.0567067 25.72378  5.4044120    49.071429   411.107143
## 1875  1996-01-02   2.4843167 24.89156  8.4580829     4.740741    10.888889
## 1876  1996-01-03   1.5195161 25.48392  6.1329374     5.354839    16.000000
## 1877  1996-01-04   1.3241161 25.63533  5.5732592     6.888889    28.000000
## 1878  1996-01-05   1.1287160 25.78674  5.0135809     3.200000     6.000000
## 1879  1996-01-06   1.7530088 25.76497  5.2456286    10.638298    89.872340
## 1880  1996-01-07   2.3773015 25.74321  5.4776763     6.545455    13.636364
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## 1881  1996-01-08   3.0015943 25.72145  5.7097239     3.277778     4.111111
## 1882  1996-01-09   3.6258871 25.69968  5.9417716     5.419355     5.548387
## 1883  1996-01-10   1.4285644 25.88729  4.6927264   230.285714  1847.928571
## 1884  1996-01-11   7.9166500 25.15400  7.7259408     2.000000     2.000000
## 1885  1996-01-12   7.2152624 25.16677  7.6329183     4.666667     2.222222
## 1886  1996-01-13   6.5138749 25.17954  7.5398957     5.166667    22.777778
## 1887  1996-01-14   5.8124873 25.19231  7.4468732    10.545455     9.818182
## 1888  1996-01-15   5.1110998 25.20507  7.3538506     2.000000     4.222222
## 1889  1996-01-16   4.4097122 25.21784  7.2608280    35.066667   264.400000
## 1890  1996-01-17   5.0494606 25.47282  6.5712185     2.551724     2.551724
## 1891  1996-01-18   4.0834773 25.58643  5.0139050     2.055556     2.722222
## 1892  1996-01-19   3.3034105 25.63987  4.6462681     4.888889     6.833333
## 1893  1996-01-20   2.5233438 25.69331  4.2786313     5.777778     9.111111
## 1894  1996-01-21   1.7432771 25.74675  3.9109944    27.454545    18.181818
## 1895  1996-01-22   1.7943890 25.61614  4.7161845     2.055556     2.000000
## 1896  1996-01-23   1.8455010 25.48552  5.5213747     3.333333     2.000000
## 1897  1996-01-24   1.8966129 25.35490  6.3265648    11.096774    74.709677
## 1898  1996-01-25   0.8946227 25.66776  5.3938293   442.714286  2088.357143
## 1899  1996-01-26   4.8811500 25.02583  6.7894017     3.333333     6.148148
## 1900  1996-01-27   5.0955735 24.92591  7.1054633     2.444444     3.555556
## 1901  1996-01-28   5.3099970 24.82600  7.4215249     5.191489     6.553191
## 1902  1996-01-29   5.5244205 24.72608  7.7375866   485.555556  1011.500000
## 1903  1996-01-30   6.2826545 24.76301  7.7645036     2.333333    11.555556
## 1904  1996-01-31   3.9083119 25.19494  6.9350707     3.133333    11.933333
## 1905  1996-02-01   3.1381663 25.30211  6.4432093     3.900000     2.800000
## 1906  1996-02-02   2.3680207 25.40928  5.9513479     2.000000     2.888889
## 1907  1996-02-03   1.5978750 25.51645  5.4594865     7.944444    27.000000
## 1908  1996-02-04   0.8277294 25.62362  4.9676251     3.818182     4.909091
## 1909  1996-02-05   4.2451630 25.45298  5.9828578     4.666667     3.777778
## 1910  1996-02-06   7.6625967 25.28235  6.9980906     4.444444    11.500000
## 1911  1996-02-07  11.0800303 25.11171  8.0133233     3.000000     6.555556
## 1912  1996-02-08   5.5216341 25.05562  8.0644880     3.712121     4.459596
## 1913  1996-02-09   5.7474222 25.03123  8.0971022     4.424242     2.363636
## 1914  1996-02-10   4.6688022 25.05850  7.6430012     3.111111     2.000000
## 1915  1996-02-11   3.5901821 25.08577  7.1889001     2.277778     3.222222
## 1916  1996-02-12   2.5115620 25.11304  6.7347991     2.444444     4.000000
## 1917  1996-02-13   1.4329419 25.14031  6.2806981    12.064516    51.806452
## 1918  1996-02-14   3.6301875 24.48828  8.2288783    54.321147   423.903226
## 1919  1996-02-15   1.2695289 25.44432  5.5280916    96.577778   796.000000
## 1920  1996-02-16   1.4426317 25.45465  5.4607079     3.000000    16.333333
## 1921  1996-02-17   1.6157345 25.46497  5.3933242     4.444444     6.000000
## 1922  1996-02-18   1.7888373 25.47530  5.3259405     2.388889     3.055556
## 1923  1996-02-19   1.9619401 25.48563  5.2585568     4.222222     3.555556
## 1924  1996-02-20   2.1350429 25.49596  5.1911732     6.888889    17.388889
## 1925  1996-02-21   3.8376352 25.45052  5.9121773     9.555556    31.222222
## 1926  1996-02-22   5.5402275 25.40508  6.6331814    23.555556    11.000000
## 1927  1996-02-23   7.2428198 25.35964  7.3541856     4.000000     5.888889
## 1928  1996-02-24   8.9454121 25.31420  8.0751897     5.851852    15.407407
## 1929  1996-02-25   9.1820818 25.25016  8.4336055     3.992593     8.837037
## 1930  1996-02-26   5.6060488 25.22334  7.6419759     2.133333     2.266667
## 1931  1996-02-27   1.8960387 25.09677  5.9103542     4.709677    10.967742
## 1932  1996-02-28   4.6301042 24.75904  7.7266350    29.361702    73.319149
## 1933  1996-02-29   0.6109489 25.45027  5.0562411   204.311111  1773.244444
## 1934  1996-03-01   0.6622955 25.46259  4.9786535    14.181818     4.181818
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## 1935  1996-03-02   0.7136421 25.47490  4.9010659     3.022222     3.022222
## 1936  1996-03-03   0.7649887 25.48721  4.8234783     6.722222     6.000000
## 1937  1996-03-04   0.8163353 25.49952  4.7458908    17.636364    12.727273
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## 1939  1996-03-06   0.9190284 25.52415  4.5907156     4.076628     2.727969
## 1940  1996-03-07   5.7122667 24.77158  7.7469752     5.931034     2.344828
## 1941  1996-03-08   4.2474684 24.65737  7.4699066     4.133333     9.266667
## 1942  1996-03-09   8.1299867 24.58123  7.6669324   257.444444   594.722222
## 1943  1996-03-10   4.8356272 24.78624  6.8519464     5.422222     5.733333
## 1944  1996-03-11   1.5412677 24.99124  6.0369603    13.666667    82.333333
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## 1952  1996-03-19   1.1257657 25.34231  5.0912948     7.818182     6.181818
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## 1955  1996-03-22   6.4764042 24.74717  7.4135750     4.275862     4.827586
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## 1960  1996-03-27   2.1795290 25.06676  6.5415645     5.225806    18.129032
## 1961  1996-03-28   1.4904791 25.29897  5.9745467    55.642857   958.071429
## 1962  1996-03-29   3.2715292 24.81784  6.8795725     3.611111     5.333333
## 1963  1996-03-30   2.6299184 24.94968  6.4364640    18.181818     8.909091
## 1964  1996-03-31   1.9883077 25.08153  5.9933555     4.800000     6.711111
## 1965  1996-04-01   1.3466969 25.21337  5.5502469     2.765957    20.893617
## 1966  1996-04-02   0.7050861 25.34521  5.1071384     5.160757    16.891253
## 1967  1996-04-03   1.2982479 25.21452  5.6170481     7.555556    12.888889
## 1968  1996-04-04   1.8914097 25.08383  6.1269578     2.000000     2.555556
## 1969  1996-04-05   2.4845715 24.95314  6.6368675     2.000000     5.277778
## 1970  1996-04-06   3.0777333 24.82245  7.1467771   103.317073    31.219512
## 1971  1996-04-07   3.6141133 24.83610  7.3292331   266.166667   672.777778
## 1972  1996-04-08   4.0425879 24.91302  7.2398809     2.222222     2.777778
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## 1974  1996-04-10   1.5182292 24.68932  6.5024054     3.407407     9.333333
## 1975  1996-04-11   1.2131727 25.24272  5.4875270   135.733333  1403.244444
## 1976  1996-04-12   0.8600000 23.88500  6.7500000    72.088889   707.733333
## 1977  1996-04-13   0.8539257 24.20299  6.4031708     8.444444    12.222222
## 1978  1996-04-14   0.8478515 24.52097  6.0563416    42.363636    22.545455
## 1979  1996-04-15   0.8417772 24.83896  5.7095124     2.000000     2.000000
## 1980  1996-04-16   0.8357029 25.15694  5.3626832     2.106383     2.425532
## 1981  1996-04-17   1.1952444 25.01048  5.7350608     2.212766     2.851064
## 1982  1996-04-18   1.5547859 24.86403  6.1074384     3.555556     6.666667
## 1983  1996-04-19   1.9143274 24.71757  6.4798160     2.777778     4.111111
## 1984  1996-04-20   2.2738689 24.57111  6.8521936    83.574468   342.893617
## 1985  1996-04-21   2.9156545 24.61064  6.9584142     2.000000     2.000000
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## 1987  1996-04-23   1.2444871 24.90545  5.9882945     9.225806    42.193548
## 1988  1996-04-24   3.0939208 24.55917  6.5750400     3.473684     5.315789
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## 1989  1996-04-25   1.0343200 25.16714  5.2348420    46.311111   512.133333
## 1990  1996-04-26   1.0524251 25.17748  5.2305709    56.444444    12.222222
## 1991  1996-04-27   1.0705302 25.18783  5.2262998   280.181818   483.272727
## 1992  1996-04-28   1.0886353 25.19817  5.2220288  6000.000000 12000.000000
## 1993  1996-04-29   1.1067404 25.20852  5.2177577  3020.833333  6035.305556
## 1994  1996-04-30   1.4710573 25.16868  5.4456832    41.666667    70.611111
## 1995  1996-05-01   1.8353742 25.12885  5.6736086    50.000000   160.800000
## 1996  1996-05-02   2.1996912 25.08901  5.9015341  3016.500000  3069.500000
## 1997  1996-05-03   2.5640081 25.04918  6.1294596     2.444444     7.722222
## 1998  1996-05-04   2.9283250 25.00934  6.3573851    61.882353   351.647059
## 1999  1996-05-05   3.2926419 24.96951  6.5853106   270.000000  3100.000000
## 2000  1996-05-06   3.6569588 24.92967  6.8132360     3.666667     6.888889
## 2001  1996-05-07   4.0212758 24.88984  7.0411615     6.111111    49.666667
## 2002  1996-05-08   3.6786391 24.84925  7.0738331    58.545455    45.818182
## 2003  1996-05-09   3.3360024 24.80867  7.1065048    17.866667    58.066667
## 2004  1996-05-10   3.5297000 24.76806  7.2612862    23.944444    87.666667
## 2005  1996-05-11   2.4902323 24.90791  6.7571820     2.666667     4.500000
## 2006  1996-05-12   1.4507645 25.04775  6.2530777     9.047619    44.904762
## 2007  1996-05-13   1.1270659 25.22805  5.7042439    19.407407   561.000000
## 2008  1996-05-14   1.4415542 24.90697  6.8948179     8.074074    57.555556
## 2009  1996-05-15   1.3162890 24.97387  6.6178287   296.545455    66.727273
## 2010  1996-05-16   1.1910239 25.04076  6.3408395     2.944444     6.388889
## 2011  1996-05-17   1.0657587 25.10765  6.0638503     4.833333    13.777778
## 2012  1996-05-18   0.9404936 25.17454  5.7868612     6.545455     7.090909
## 2013  1996-05-19   0.8152284 25.24143  5.5098720     5.828283     4.878788
## 2014  1996-05-20   1.4800691 25.12079  6.0502717     5.111111     2.666667
## 2015  1996-05-21   2.1449097 25.00014  6.5906714     2.000000     2.000000
## 2016  1996-05-22   2.8097503 24.87950  7.1310712    13.702128    36.851064
## 2017  1996-05-23   3.4745909 24.75885  7.6714709     2.000000     2.000000
## 2018  1996-05-24   4.0393432 24.76099  7.8783402    79.000000   432.500000
## 2019  1996-05-25   2.3875500 24.76115  7.7204505     2.533333     3.400000
## 2020  1996-05-26   1.5748619 25.13593  6.3254143   648.424242  1146.000000
## 2021  1996-05-27   1.4558895 24.91192  6.9230316   296.695652  1219.217391
## 2022  1996-05-28   1.6094250 24.60423  7.6801128     4.615385    12.923077
## 2023  1996-05-29   1.6336955 24.80289  7.1106441   824.500000   735.812500
## 2024  1996-05-30   1.3817802 24.92678  6.7818457   230.500000   122.000000
## 2025  1996-05-31   1.1298649 25.05068  6.4530473    74.341463   346.731707
## 2026  1996-06-01   0.8779496 25.17458  6.1242490    36.000000     3.000000
## 2027  1996-06-02   0.6260343 25.29848  5.7954506    20.611111     4.444444
## 2028  1996-06-03   1.0428406 25.26973  5.9034182     5.222222     5.888889
## 2029  1996-06-04   1.4596468 25.24098  6.0113858  8400.000000  8520.000000
## 2030  1996-06-05   1.8764531 25.21222  6.1193534    50.133333    48.000000
## 2031  1996-06-06   2.2932594 25.18347  6.2273210    22.000000    14.000000
## 2032  1996-06-07   2.7100656 25.15472  6.3352886   107.090909   557.090909
## 2033  1996-06-08   3.1268719 25.12597  6.4432562   315.200000  2047.200000
## 2034  1996-06-09   3.5436782 25.09721  6.5512238    20.333333    31.833333
## 2035  1996-06-10   3.9604844 25.06846  6.6591915   500.000000  3000.000000
## 2036  1996-06-11   4.3772907 25.03971  6.7671591     5.277778     6.222222
## 2037  1996-06-12   4.7940970 25.01096  6.8751267     2.666667     2.222222
## 2038  1996-06-13   3.2872881 25.09920  6.5688729   298.243902   341.414634
## 2039  1996-06-14   5.0990273 24.97055  7.2934991   366.307692  1577.743590
## 2040  1996-06-15   0.6048882 25.59211  4.0651052  1034.376068  1766.316239
## 2041  1996-06-16   0.7395193 25.48902  4.2960522  1702.444444  1954.888889
## 2042  1996-06-17   0.8741504 25.38593  4.5269993   658.666667   550.000000
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## 2043  1996-06-18   1.0087814 25.28284  4.7579463   439.272727   407.090909
## 2044  1996-06-19   1.1434125 25.17975  4.9888933    28.785714    96.071429
## 2045  1996-06-20   1.9112710 25.50793  5.1544826    13.096774    64.129032
## 2046  1996-06-21   1.6531187 25.78419  4.1924359   129.000000   805.625000
## 2047  1996-06-22   1.4125923 25.74264  3.6646469    47.866667   232.933333
## 2048  1996-06-23   3.1031653 25.57977  4.5734311   808.666667  4017.333333
## 2049  1996-06-24   4.7937384 25.41691  5.4822154     2.000000     2.222222
## 2050  1996-06-25   6.4843114 25.25405  6.3909996     3.872340     9.787234
## 2051  1996-06-26   8.1748844 25.09118  7.2997838    31.722222    99.166667
## 2052  1996-06-27   7.3612667 25.24249  7.2210206     7.111111    78.222222
## 2053  1996-06-28   4.8538571 25.35696  6.5550140    33.800000   165.666667
## 2054  1996-06-29   2.8080516 25.62383  5.0709365    25.419355   134.064516
## 2055  1996-06-30   1.8441488 25.80588  4.2682244    65.250000   601.214286
## 2056  1996-07-01   4.7600583 25.24538  6.0778967     5.703704    29.185185
## 2057  1996-07-02   4.3584197 25.31845  5.7577225  2241.300000  2762.500000
## 2058  1996-07-03   3.9567810 25.39151  5.4375484   619.000000  3050.000000
## 2059  1996-07-04   3.5551423 25.46458  5.1173743    16.944444   344.222222
## 2060  1996-07-05   3.1535036 25.53764  4.7972002     2.000000     2.500000
## 2061  1996-07-06   2.7518650 25.61070  4.4770260   383.636364  1593.454545
## 2062  1996-07-07   2.3502263 25.68377  4.1568519   414.666667  4002.666667
## 2063  1996-07-08   1.9485876 25.75683  3.8366778     8.500000    38.333333
## 2064  1996-07-09   1.5469489 25.82990  3.5165036     5.111111    15.166667
## 2065  1996-07-10   1.1453102 25.90296  3.1963295    12.000000     4.909091
## 2066  1996-07-11   0.7436716 25.97602  2.8761554     7.138889     6.204545
## 2067  1996-07-12   4.6440507 25.72643  4.5187476     2.277778     7.500000
## 2068  1996-07-13   8.5444299 25.47683  6.1613399     3.000000    15.722222
## 2069  1996-07-14  12.4448091 25.22723  7.8039321     5.000000    22.333333
## 2070  1996-07-15   8.3862841 25.15373  7.6324493    64.085106   648.000000
## 2071  1996-07-16   4.1722976 25.27272  6.7648986   345.111111   832.833333
## 2072  1996-07-17   2.6409488 25.82653  4.4502465   176.974910   439.287634
## 2073  1996-07-18   2.2674839 25.51925  4.7955177     8.838710    45.741935
## 2074  1996-07-19   3.3873375 25.58895  6.7818688    10.578947    39.105263
## 2075  1996-07-20   2.7812019 25.65865  6.1036013     2.000000     2.888889
## 2076  1996-07-21   2.1750663 25.72835  5.4253339     2.555556     8.888889
## 2077  1996-07-22   1.5689307 25.79804  4.7470665    11.090909     6.000000
## 2078  1996-07-23   0.9627951 25.86774  4.0687990     7.545455     4.111111
## 2079  1996-07-24   2.1656794 25.72548  4.5899338     4.000000     2.222222
## 2080  1996-07-25   3.3685637 25.58323  5.1110686    50.909091   103.272727
## 2081  1996-07-26   4.5714480 25.44097  5.6322035     3.611111    58.944444
## 2082  1996-07-27   5.7743324 25.29871  6.1533383     2.222222     2.000000
## 2083  1996-07-28   6.9772167 25.15645  6.6744731     5.000000    10.933333
## 2084  1996-07-29   8.5528311 24.87624  7.3234669   258.553191   616.170213
## 2085  1996-07-30   7.3449640 24.82280  7.3498230     2.444444    11.000000
## 2086  1996-07-31   6.1370970 24.76935  7.3761791     2.111111     3.222222
## 2087  1996-08-01   2.1166645 25.44336  5.1442284    60.950000     4.600000
## 2088  1996-08-02   3.6122458 24.93738  7.4237325    42.105263    32.473684
## 2089  1996-08-03   1.5580333 25.68291  4.4570267    85.466667  1257.288889
## 2090  1996-08-04   1.2638851 25.67552  4.5347787    80.400000    43.600000
## 2091  1996-08-05   0.9697370 25.66814  4.6125308     4.000000     8.944444
## 2092  1996-08-06   0.6755888 25.66075  4.6902829     3.363636     9.472222
## 2093  1996-08-07   1.2118279 25.59496  4.6642679     2.727273    10.000000
## 2094  1996-08-08   1.7480670 25.52916  4.6382530     2.355556    18.933333
## 2095  1996-08-09   2.2843061 25.46337  4.6122381     4.388889     7.500000
## 2096  1996-08-10   2.8205452 25.39757  4.5862232     9.904762    30.238095
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## 2097  1996-08-11   6.2854042 24.86923  7.7266233     2.000000     2.000000
## 2098  1996-08-12   0.9103562 25.58816  4.4065175    12.080000   883.680000
## 2099  1996-08-13   2.8168088 25.18438  4.9878348     2.000000     5.611111
## 2100  1996-08-14   4.7232613 24.78061  5.5691521    73.568966   766.137931
## 2101  1996-08-15   4.3611956 24.42179  7.5181556   263.444444   338.000000
## 2102  1996-08-16   3.3692929 24.67388  7.5542133     2.533333     2.000000
## 2103  1996-08-17   3.4083866 24.67100  7.5450189     2.000000    13.111111
## 2104  1996-08-18   3.4474803 24.66813  7.5358245    12.545455    22.000000
## 2105  1996-08-19   3.4865741 24.66525  7.5266301     4.666667    25.777778
## 2106  1996-08-20   3.5256678 24.66237  7.5174356     9.555556    14.000000
## 2107  1996-08-21   3.5647616 24.65949  7.5082412    18.000000    37.454545
## 2108  1996-08-22   3.6038553 24.65662  7.4990468     2.000000     2.000000
## 2109  1996-08-23   3.6429491 24.65374  7.4898524     4.444444     6.444444
## 2110  1996-08-24   3.6820428 24.65086  7.4806579    26.727273    27.454545
## 2111  1996-08-25   3.7211366 24.64798  7.4714635     3.333333     5.333333
## 2112  1996-08-26   3.7602303 24.64511  7.4622691     2.611111    38.555556
## 2113  1996-08-27   7.0344182 25.00007  7.7085703     2.307692     6.538462
## 2114  1996-08-28   7.8448556 25.00405  8.0517880    11.021277    23.617021
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## 2117  1996-08-31   5.9251879 24.91151  7.4813230    22.036364    11.018182
## 2118  1996-09-01   5.2535394 24.44853  8.5205909     2.000000     2.722222
## 2119  1996-09-02   4.7989341 24.51978  8.1169773     4.727273     2.909091
## 2120  1996-09-03   4.3443288 24.59102  7.7133638     2.250000     6.500000
## 2121  1996-09-04   3.8897235 24.66227  7.3097502     9.818182    11.454545
## 2122  1996-09-05   3.4351182 24.73351  6.9061367     2.000000     2.111111
## 2123  1996-09-06   6.2235455 24.71051  7.5154323     8.500000     5.500000
## 2124  1996-09-07   9.0119727 24.68750  8.1247279    75.862069    18.896552
## 2125  1996-09-08   7.7924956 24.70444  8.0891071   343.000000   376.500000
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## 2132  1996-09-15   8.8416417 24.20649  7.3898294    27.818182     9.636364
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## 2134  1996-09-17   8.6540765 24.48809  7.0077918     5.636364     3.636364
## 2135  1996-09-18   8.5602939 24.62889  6.8167730     5.111111    11.111111
## 2136  1996-09-19  15.6675485 24.58576  7.2255682     5.750000     8.250000
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## 2138  1996-09-21  14.5271848 24.51010  8.4167048     2.222222     3.333333
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## 2140  1996-09-23   8.1641714 24.64903  8.3776643    19.333333    13.666667
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## 2142  1996-09-25  30.3534917 24.31519  7.0476246    44.347826    49.347826
## 2143  1996-09-26   4.8975778 24.84229  6.5085084    18.177778   102.444444
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## 2145  1996-09-28   5.4746521 24.82331  7.0030279    11.000000    90.791667
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## 2147  1996-09-30  10.9712295 24.23150  7.5501047    59.000000    98.500000
## 2148  1996-10-01  13.7195182 23.93560  7.8236430     5.333333     3.500000
## 2149  1996-10-02   7.0386273 24.05128  6.6505967     5.787234    16.425532
## 2150  1996-10-03   4.5161348 24.13626  6.9275230    17.750000    80.250000
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## 2151  1996-10-04   1.9936424 24.22124  7.2044494     4.055556     3.500000
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## 2155  1996-10-08   3.8908370 24.33590  7.6737485     3.466667     2.000000
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## 2160  1996-10-13   0.9100000 23.88600  6.8700000     6.250000     8.250000
## 2161  1996-10-14   3.4217042 24.46771  6.7995437     4.842105     3.736842
## 2162  1996-10-15   3.5131309 24.53185  6.9247063     6.250000    12.250000
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## 2164  1996-10-17   3.5820140 24.57165  7.1336651    18.000000    18.210526
## 2165  1996-10-18   3.5594705 24.54731  7.2174615     4.500000    10.000000
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## 2167  1996-10-20   3.5143833 24.49862  7.3850542     5.111111    61.333333
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## 2175  1996-10-28   1.6557212 24.68679  7.1703936     2.444444     4.000000
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## 2177  1996-10-30   3.3241545 24.74011  7.0501039    14.127660    10.340426
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## 2181  1996-11-03   3.2286970 24.89738  7.0837974    19.000000    36.000000
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## 2183  1996-11-05   5.4084727 24.90402  8.1090355     3.153846     3.846154
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## 2185  1996-11-07   2.4293833 24.85360  7.5274212     2.074074     3.111111
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## 2189  1996-11-11   3.1576542 25.11218  6.7231142    98.576271   569.389831
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## 2201  1996-11-23   5.3231659 24.94141  7.7671320     8.000000     7.454545
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## 2203  1996-11-25   5.3818667 25.02815  7.6797206     2.666667    11.538462
## 2204  1996-11-26   5.6525810 25.03124  7.7896521     4.000000    19.866667
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## 2205  1996-11-27   2.7703250 25.00773  7.2177700     5.185185    10.888889
## 2206  1996-11-28   3.0647049 24.86593  7.7763555   151.250000    68.750000
## 2207  1996-11-29   3.3590848 24.72413  8.3349409   404.829268   252.487805
## 2208  1996-11-30   5.2336909 24.87018  7.8292603    18.230769     4.692308
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## 2216  1996-12-08   2.9129970 24.55943  7.9876646    22.000000    79.090909
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## 2218  1996-12-10   2.8864530 24.76270  7.6447197     6.000000    13.000000
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## 2224  1996-12-16   3.2238583 24.64644  8.3221146     2.666667     9.629630
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## 2226  1996-12-18   6.6076533 24.62869  7.6114982   132.297872  1299.446809
## 2227  1996-12-19   4.7568905 24.75011  6.9999193    45.513514   788.702703
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## 2258  1997-01-19   7.1364818 24.23315  7.7163800     2.555556     2.777778
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## 2397  1997-06-07  12.7855208 25.29370  7.1384650     3.214286    14.000000
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## 2420  1997-06-30   6.4602212 24.67948  7.4464609     2.162162     2.702703
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## 2423  1997-07-03   7.6187045 24.99871  7.0365130     9.272727    52.181818
## 2424  1997-07-04   8.5228424 24.83891  7.6990748     4.777778    39.888889
## 2425  1997-07-05   7.8657189 24.72207  7.6373241     4.750000    14.000000
## 2426  1997-07-06   7.2085955 24.60523  7.5755733     3.454545     5.272727
## 2427  1997-07-07   6.5514720 24.48840  7.5138226     4.250000     6.000000
## 2428  1997-07-08   5.8943485 24.37156  7.4520718     3.833333     8.388889
## 2429  1997-07-09   5.6538717 24.43687  7.0531065    12.545455   387.090909
## 2430  1997-07-10   5.4133949 24.50219  6.6541411     2.000000     7.000000
## 2431  1997-07-11   5.1729182 24.56751  6.2551758    34.444444    13.277778
## 2432  1997-07-12   6.0391439 24.60933  6.5910227     2.000000     2.000000
## 2433  1997-07-13   6.9053697 24.65115  6.9268697    18.555556   160.666667
## 2434  1997-07-14   6.1980778 24.70514  6.2989504   228.363636   661.272727
## 2435  1997-07-15   7.0496833 24.47049  6.1826321     2.148148     3.259259
## 2436  1997-07-16   6.4403286 24.83249  6.9998586     2.666667     9.666667
## 2437  1997-07-17   4.4026788 25.01971  5.3725300     4.272727    21.500000
## 2438  1997-07-18   7.6932838 25.04152  5.8950216     5.454545     4.545455
## 2439  1997-07-19  10.9838889 25.06332  6.4175132     3.250000   254.500000
## 2440  1997-07-20  14.2744939 25.08513  6.9400048     8.978723     9.361702
## 2441  1997-07-21  13.9654939 25.30114  5.8365473     3.777778     6.722222
## 2442  1997-07-22   9.6259059 25.33262  5.7574933     2.000000     2.750000
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## 2474  1997-08-23   8.4939622 25.00743  6.8666929    76.944444   362.722222
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## 2517  1997-10-05   4.7525381 25.06758  7.0897026     3.600000    15.000000
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## 2526  1997-10-14   3.1927562 24.88659  7.1430056     5.500000    97.250000
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## 2560  1997-11-17   7.5641250 25.58617  5.9831183     2.000000     2.000000
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## 2564  1997-11-21   7.7990242 25.60209  7.4152118   317.894737   321.578947
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## 2575  1997-12-02   5.6119697 25.38913  6.1596006     2.333333     4.777778
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## 2578  1997-12-05   1.2046396 25.81116  4.9834231    61.720000   526.080000
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## 2580  1997-12-07   1.8485333 25.82150  5.2416231    10.750000    31.000000
## 2581  1997-12-08   3.7303220 25.67179  5.7125089     6.250000    13.500000
## 2582  1997-12-09   5.6121106 25.52208  6.1833946    20.000000  1211.636364
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## 2586  1997-12-13   9.1923889 25.32450  6.6496499    11.454545   135.272727
## 2587  1997-12-14   9.1007394 25.37542  6.4118918     8.594595   101.027027
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## 2590  1997-12-17  10.7469192 25.19782  6.5003171  1134.909091  1398.545455
## 2591  1997-12-18  11.1875414 25.12607  6.9267957  6170.000000  9600.000000
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## 2606  1998-01-02   5.6690970 24.59139  7.0569739     7.111111    15.222222
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## 2609  1998-01-05   6.1845500 24.38122  6.7997587     2.074074     4.592593
## 2610  1998-01-06   7.7332214 24.75496  7.9914900    18.466667   143.666667
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## 2616  1998-01-12   4.3933646 24.75121  6.1137635    24.500000     9.250000
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## 2619  1998-01-15   4.3271027 25.02579  5.8807080     2.000000     4.500000
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## 2621  1998-01-17   3.7153813 25.06971  5.7214350    73.916667   917.000000
## 2622  1998-01-18   2.3675187 25.10061  5.5774690     6.083333     9.458333
## 2623  1998-01-19   4.2502442 24.86408  6.5409201    16.750000     7.750000
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## 2625  1998-01-21   4.7555689 24.63457  7.2707616   126.944444   421.444444
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## 2634  1998-01-30   2.6220970 24.02212  7.5128992    25.636364   247.272727
## 2635  1998-01-31   2.7952515 23.72152  7.3670785     2.055556     3.888889
## 2636  1998-02-01   2.5028061 23.79269  7.5787424     5.500000    32.000000
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## 2638  1998-02-03   2.1753717 23.83783  7.6400722     6.909091    56.545455
## 2639  1998-02-04   2.1403828 23.81179  7.4897381    21.000000    11.500000
## 2640  1998-02-05   2.1053939 23.78575  7.3394039     2.055556     2.722222
## 2641  1998-02-06   3.2891444 24.65491  7.3280604    18.611111    70.277778
## 2642  1998-02-07   2.9460544 24.74283  7.2752227     3.578947     3.684211
## 2643  1998-02-08   2.6029643 24.83075  7.2223850     7.333333     7.800000
## 2644  1998-02-09   2.5094042 24.45502  7.6506367     4.000000     7.333333
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## 2646  1998-02-11   4.5647152 24.67931  7.6874900     3.750000     5.250000
## 2647  1998-02-12   4.3665303 24.63563  7.9052673    23.636364    78.909091
## 2648  1998-02-13   4.1683455 24.59195  8.1230445     2.777778     6.833333
## 2649  1998-02-14   5.3269758 24.75973  8.2343815     2.545455     4.636364
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## 2651  1998-02-16   7.8783374 24.83427  8.3800803     2.000000     9.000000
## 2652  1998-02-17   9.1540182 24.87154  8.4529297     4.255319    28.765957
## 2653  1998-02-18   4.4720424 24.66487  8.4102618     2.090909     4.363636
## 2654  1998-02-19   4.1484455 24.56972  8.3223756     6.181818    16.000000
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## 2656  1998-02-21   6.1054378 24.36485  8.2420798    30.500000   134.222222
## 2657  1998-02-22   2.1473167 24.53807  7.3814146     2.894737    11.684211
## 2658  1998-02-23   5.2077788 24.72340  7.4320082     2.076923     3.000000
## 2659  1998-02-24   3.5560810 24.69821  7.4938336     3.800000     6.333333
## 2660  1998-02-25   2.7555152 24.52311  7.8129979     5.833333    85.333333
## 2661  1998-02-26   2.6440242 24.29412  7.8938395     7.473684    19.789474
## 2662  1998-02-27   2.5325333 24.06513  7.9746812     7.277778     2.000000
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## 2664  1998-03-01   2.4128142 24.43662  7.3784453     5.272727     7.818182
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## 2669  1998-03-06   2.3285146 24.99635  6.6005008     2.000000     2.000000
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## 2690  1998-03-27   2.5005660 24.41144  7.5211736    41.250000    75.750000
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## 2707  1998-04-13   2.7289515 24.83450  7.5641379    13.166667     3.277778
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## 2720  1998-04-26   1.7768178 25.14403  6.7379980    18.177778    73.466667
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## 2740  1998-05-16   4.7888576 25.58735  5.6623177     3.250000     3.000000
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## 2742  1998-05-18  13.1349711 25.60560  7.1388833    12.085106    87.234043
## 2743  1998-05-19   6.9200500 25.39445  7.0866254     3.210526     5.315789
## 2744  1998-05-20   9.3059500 25.47481  7.2949683     3.200000     4.200000
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## 2751  1998-05-27   3.5594948 25.44913  5.9767469     2.750000     3.000000
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## 2764  1998-06-09  10.0004970 25.54303  6.0874361    22.833333   388.000000
## 2765  1998-06-10   9.5010015 25.43659  6.4605264     5.473684   162.315789
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## 2770  1998-06-15   4.5623581 25.34822  6.1387742     5.000000     6.250000
## 2771  1998-06-16   2.9131738 25.52276  5.4871660     5.170732    26.048780
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## 2785  1998-06-30   5.0339956 25.40156  5.7553518    22.000000    89.745455
## 2786  1998-07-01   3.9101857 25.35018  6.5073710    16.000000    48.333333
## 2787  1998-07-02   8.9114542 25.29326  6.1895350     6.148148    14.962963
## 2788  1998-07-03   7.5239121 25.32816  6.3439242     2.000000     2.888889
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## 2808  1998-07-23   5.5066364 24.65992  8.1293073     2.777778     2.000000
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## 2810  1998-07-25   5.2617354 24.38419  8.1608556    10.545455     7.090909
## 2811  1998-07-26   5.1392848 24.24632  8.1766297     2.055556     2.555556
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## 2813  1998-07-28   6.5590545 23.99097  8.2363476     2.765957     3.489362
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## 2816  1998-07-31   6.1278333 24.06613  8.2362358     2.000000     2.000000
## 2817  1998-08-01   5.0498292 23.97883  7.9573533    11.000000    29.736842
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## 2819  1998-08-03   2.6029643 24.83075  7.2223850     9.200000    14.600000
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## 2835  1998-08-19   4.4433133 25.04955  7.8339474     2.545455     4.363636
## 2836  1998-08-20   3.5157600 25.16729  7.5305427     2.277778     2.388889
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## 2838  1998-08-22   4.0000214 25.20685  7.5582521    10.789474     6.736842
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## 2849  1998-09-02   1.9116711 25.09123  6.8233538     5.622642     4.528302
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## 2852  1998-09-05   3.3168727 24.84138  7.2086315     2.388889     3.333333
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## 2854  1998-09-07   3.8686929 24.85475  7.1137832     2.000000     3.454545
## 2855  1998-09-08   4.1446030 24.86144  7.0663591     2.944444    10.888889
## 2856  1998-09-09   3.7246720 24.78861  7.2436023     2.500000     4.250000
## 2857  1998-09-10   3.3047409 24.71578  7.4208456     6.545455     2.727273
## 2858  1998-09-11   2.8848098 24.64295  7.5980889    30.250000    38.500000
## 2859  1998-09-12   2.4648788 24.57012  7.7753321     2.055556     2.777778
## 2860  1998-09-13   2.9694242 24.66269  7.6594212     3.148936     2.382979
## 2861  1998-09-14   3.1005106 24.73441  7.4462542     5.000000     4.750000
## 2862  1998-09-15   3.2315970 24.80613  7.2330873     7.111111     2.777778
## 2863  1998-09-16   4.3918689 25.15891  7.0441191     5.319149     5.191489
## 2864  1998-09-17   3.0721405 25.13366  7.0679381     5.789474     6.578947
## 2865  1998-09-18   2.8544750 25.10130  6.4232392     4.296296     3.777778
## 2866  1998-09-19   7.5216788 25.14190  7.2830936     2.111111     2.000000
## 2867  1998-09-20   6.1091621 25.09646  7.2139802    54.000000    17.578947
## 2868  1998-09-21   4.6966455 25.05102  7.1448667     2.722222     5.444444
## 2869  1998-09-22   0.8600000 23.89900  6.7600000     4.861111     6.222222
## 2870  1998-09-23   2.5301348 24.44724  6.9500906     7.000000     7.000000
## 2871  1998-09-24   4.2002697 24.99547  7.1401812     3.063830     3.063830
## 2872  1998-09-25   3.7805924 24.94556  7.3670689    21.250000    40.500000
## 2873  1998-09-26   3.3609152 24.89565  7.5939567     2.388889     7.555556
## 2874  1998-09-27   3.3702606 24.84700  7.6292008     2.727273     5.090909
## 2875  1998-09-28   3.3796061 24.79835  7.6644449   922.500000  1494.750000
## 2876  1998-09-29   3.3889515 24.74970  7.6996891     2.700000     7.800000
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## 2878  1998-10-01   3.5429283 24.80540  7.5847203    97.333333   220.000000
## 2879  1998-10-02   4.3018389 24.74506  7.6633850    49.666667   111.000000
## 2880  1998-10-03   3.6093683 24.84660  7.6451143     2.000000     2.000000
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## 2882  1998-10-05   1.9046394 24.92628  7.3436145     2.318182     6.000000
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## 2884  1998-10-07   3.6024182 24.95294  7.6563358    33.684211    18.947368
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## 2887  1998-10-10   3.4301667 25.12849  7.2581571    13.090909    63.636364
## 2888  1998-10-11   3.5489091 25.20953  7.1282448     8.250000     5.250000
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## 2890  1998-10-13   3.3580345 25.26038  7.3871896     5.000000     4.000000
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## 2893  1998-10-16   2.4291836 25.27048  7.1890289   196.000000    36.000000
## 2894  1998-10-17   2.1195667 25.34095  6.2131538   445.928571   328.857143
## 2895  1998-10-18   2.1972208 25.36324  6.2505500    87.423077   455.153846
## 2896  1998-10-19   2.0295979 25.44888  5.8806025    10.107143    39.964286
## 2897  1998-10-20   2.9304727 25.12073  7.3101742     7.055556    28.611111
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## 2901  1998-10-24   3.0215917 25.21184  7.1570733     4.000000     5.185185
## 2902  1998-10-25   4.9154091 25.17458  7.6968133    12.510638     9.106383
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## 2905  1998-10-28   5.6601939 25.02531  7.9447778  1613.368421  1686.947368
## 2906  1998-10-29   4.8882818 25.04233  7.8827062  4233.333333  4140.000000
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## 2907  1998-10-30   4.1163697 25.05935  7.8206345     5.166667    16.555556
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## 2913  1998-11-05   6.6376697 25.22964  7.4179527     3.263158     2.000000
## 2914  1998-11-06   6.9649606 25.15363  7.7275824    58.000000  1145.090909
## 2915  1998-11-07   7.2922515 25.07761  8.0372121    13.863636   127.500000
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## 2918  1998-11-10   3.3914152 25.19508  7.6062779    32.566038   220.377358
## 2919  1998-11-11   4.7606121 25.15004  7.6487692  6558.000000  8120.000000
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## 2922  1998-11-14   6.9817265 25.05659  7.7153198  1113.454545  1258.181818
## 2923  1998-11-15   6.4644470 25.05321  7.6968877 12000.000000 12000.000000
## 2924  1998-11-16   5.9471674 25.04984  7.6784557     2.000000     2.750000
## 2925  1998-11-17   5.4298879 25.04647  7.6600236     8.238095    30.380952
## 2926  1998-11-18   5.5518924 25.06279  7.7374012     2.000000     2.000000
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## 2930  1998-11-22   5.5343323 25.07303  7.8024926    95.894737   153.684211
## 2931  1998-11-23   5.1507586 25.03431  7.6354513     8.000000     2.000000
## 2932  1998-11-24   4.7671848 24.99559  7.4684100     2.095238     2.190476
## 2933  1998-11-25   4.7716485 25.38699  6.3664667     2.615385     2.769231
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## 2942  1998-12-04   4.8647048 25.66268  5.7011683     2.000000     2.200000
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## 2951  1998-12-13   7.3249000 25.48117  6.1260671     4.105263     3.157895
## 2952  1998-12-14   8.8604091 25.51569  5.9843142     2.880000     2.800000
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## 2954  1998-12-16  11.9314273 25.15168  7.5753155     2.000000     2.238095
## 2955  1998-12-17  10.1862727 25.20870  7.1215280     2.500000     2.250000
## 2956  1998-12-18   8.4411182 25.26572  6.6677405    50.181818    62.545455
## 2957  1998-12-19   6.6959636 25.32274  6.2139530     2.380952     5.714286
## 2958  1998-12-20   8.6934697 25.34615  6.3785742     3.750000     3.750000
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## 2961  1998-12-23  12.2930182 25.22880  7.5815452     2.000000     2.444444
## 2962  1998-12-24   5.6870417 25.11083  6.8292250     2.000000     2.787879
## 2963  1998-12-25   7.9934048 25.24552  6.8459557     2.421053     2.052632
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## 2965  1998-12-27   3.6790242 24.82213  6.6780891     4.640000     5.040000
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## 2967  1998-12-29   7.0557258 25.32044  5.8590239     2.000000     3.750000
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## 2969  1998-12-31  13.0603111 25.54488  6.1063110    31.894737    55.789474
## 2970  1999-01-01  16.4766222 25.43089  6.8204313     2.388889     2.277778
## 2971  1999-01-02   7.5988143 25.53510  5.9417345     2.200000     3.133333
## 2972  1999-01-03  15.9182250 25.30776  6.8813433     2.181818     7.757576
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## 2975  1999-01-06   7.0712879 24.73818  7.4112030     2.000000     2.333333
## 2976  1999-01-07   6.3807505 24.84534  7.1197218     2.000000     2.000000
## 2977  1999-01-08   5.6902131 24.95250  6.8282406    10.363636    20.909091
## 2978  1999-01-09   4.9996758 25.05965  6.5367594     2.000000     2.428571
## 2979  1999-01-10   7.4699773 24.63529  7.4934030     5.000000     5.750000
## 2980  1999-01-11   9.9402788 24.21092  8.4500467     2.142857     2.952381
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## 2984  1999-01-15   6.0321061 24.70213  6.2550918     2.909091     4.000000
## 2985  1999-01-16   3.2799545 24.87112  5.5302352     2.666667     4.523810
## 2986  1999-01-17   3.0575551 25.04010  5.9739572     9.250000    10.250000
## 2987  1999-01-18   2.8351556 25.20909  6.4176793    26.750000   212.321429
## 2988  1999-01-19   1.7776042 25.23973  6.3031917    93.178571   572.857143
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## 2990  1999-01-21   4.8314424 24.45518  7.6473897     2.142857     3.000000
## 2991  1999-01-22   5.9559939 24.81915  8.2286815     2.000000     2.111111
## 2992  1999-01-23   8.5819444 24.94814  7.0606033    11.636364    29.309091
## 2993  1999-01-24   4.5044119 25.06967  7.1625243     2.000000     2.266667
## 2994  1999-01-25   2.8121125 24.76048  6.8111250     2.000000     2.000000
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## 2996  1999-01-27   5.1548941 24.55540  7.4852259     2.000000     4.363636
## 2997  1999-01-28   6.3262848 24.45286  7.8222764     2.380952     6.714286
## 2998  1999-01-29   6.6972000 24.48822  7.4351432     5.250000     7.250000
## 2999  1999-01-30   7.0681152 24.52359  7.0480100     2.226415     2.981132
## 3000  1999-01-31   4.4689939 24.27497  7.7990042     4.560000     5.880000
## 3001  1999-02-01   4.8554357 24.59875  8.1081095     4.731707     3.804878
## 3002  1999-02-02   8.5573911 24.46105  8.6357696     2.000000     2.000000
## 3003  1999-02-03   3.7548333 24.23202  7.5886283     2.606061     3.636364
## 3004  1999-02-04   7.7677424 24.62415  8.5813288     3.384615     3.384615
## 3005  1999-02-05   6.7868152 24.59366  8.2159276     2.363636     3.090909
## 3006  1999-02-06   5.8058879 24.56316  7.8505264     2.809524    12.904762
## 3007  1999-02-07   5.3809591 24.55354  7.5816814     2.000000     2.000000
## 3008  1999-02-08   4.9560303 24.54392  7.3128364     4.188679     7.132075
## 3009  1999-02-09   4.4941152 24.48688  7.4155726    36.500000    64.000000
## 3010  1999-02-10   4.0322000 24.42983  7.5183088     2.476190     3.095238
## 3011  1999-02-11   4.3280939 24.37364  7.7892187     2.736842    11.789474
## 3012  1999-02-12   4.6239879 24.31746  8.0601286     6.000000    12.750000
## 3013  1999-02-13   4.9198818 24.26128  8.3310386    10.727273     5.090909
## 3014  1999-02-14   5.2157758 24.20509  8.6019485     2.190476     2.857143
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## 3018  1999-02-18   5.7798310 24.56898  8.5351667    39.066667     6.933333
## 3019  1999-02-19  11.6577545 24.48495  8.4584670     2.555556     2.111111
## 3020  1999-02-20   8.1039106 24.51530  8.1503973     8.750000    19.750000
## 3021  1999-02-21   4.5500667 24.54566  7.8423276     2.285714     5.238095
## 3022  1999-02-22   4.2316667 24.46139  7.6859728    68.000000    20.181818
## 3023  1999-02-23   3.9132667 24.37712  7.5296181    14.750000    19.000000
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## 3025  1999-02-25   3.7420222 24.36917  7.2354776     8.181818     5.636364
## 3026  1999-02-26   3.8891778 24.44548  7.0976918     3.000000    10.000000
## 3027  1999-02-27   4.0363333 24.52179  6.9599061     5.095238     9.047619
## 3028  1999-02-28   3.7211258 24.50595  7.1964088    10.000000     4.631579
## 3029  1999-03-01   3.4059182 24.49010  7.4329115     2.190476     2.095238
## 3030  1999-03-02   2.2346867 24.71136  7.5647764    17.155556   164.088889
## 3031  1999-03-03   2.1627208 24.79057  7.4697775     8.298507   106.567164
## 3032  1999-03-04   2.3237125 24.85481  7.2445417     2.000000     2.000000
## 3033  1999-03-05   2.2342909 23.94426  6.8044406     2.047619     2.190476
## 3034  1999-03-06   4.6454758 24.59134  7.8762533     4.538462     3.076923
## 3035  1999-03-07   5.0218089 24.72591  7.8272658   186.170213   290.425532
## 3036  1999-03-08   4.8209214 24.66895  8.4035588    16.733333    59.866667
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## 3038  1999-03-10   2.6730293 24.53651  7.1836704    47.000000     8.000000
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## 3044  1999-03-16   3.3221303 24.29155  7.5089388     2.000000     2.619048
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## 3046  1999-03-18   3.5643955 24.44155  7.9873213   152.909091    93.454545
## 3047  1999-03-19   2.3919310 24.59208  7.7758386   518.774194    75.483871
## 3048  1999-03-20   2.9885208 24.41137  7.0987042     2.146341     3.121951
## 3049  1999-03-21   3.7462576 24.66188  7.3814279     2.333333     2.000000
## 3050  1999-03-22   2.6455970 24.59381  6.4852518    11.147541    12.360656
## 3051  1999-03-23   0.7700000 23.91900  6.6400000     6.645199     7.466042
## 3052  1999-03-24   3.4989152 24.66768  6.5626379     2.142857     2.571429
## 3053  1999-03-25   3.0751409 24.58607  6.7124065     3.052632     2.421053
## 3054  1999-03-26   2.6513667 24.50445  6.8621752     2.680000     3.280000
## 3055  1999-03-27   3.3684566 24.50849  7.1314489     9.818182    15.636364
## 3056  1999-03-28   4.0855465 24.51254  7.4007226    36.750000    25.500000
## 3057  1999-03-29   4.8026364 24.51658  7.6699964    29.111111    15.111111
## 3058  1999-03-30   4.6700089 24.58846  7.6299062    78.425532   521.234043
## 3059  1999-03-31   3.3642956 24.66464  7.6307887     7.090909    52.666667
## 3060  1999-04-01   2.1221958 24.46667  6.5815658     2.060606     3.151515
## 3061  1999-04-02   2.3765376 24.50169  6.7194296    10.000000    10.000000
## 3062  1999-04-03   2.6308794 24.53670  6.8572935    10.909091    36.727273
## 3063  1999-04-04   2.8852212 24.57171  6.9951573     3.047619     2.285714
## 3064  1999-04-05   2.7654394 24.63176  6.9933647    26.000000    25.500000
## 3065  1999-04-06   2.6456576 24.69180  6.9915721  1137.471698   498.754717
## 3066  1999-04-07   2.5130505 24.65883  7.0198678  8266.666667  5186.666667
## 3067  1999-04-08   2.3804434 24.62585  7.0481634   750.500000   130.750000
## 3068  1999-04-09   2.2478364 24.59288  7.0764591   248.142857   159.809524
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## 3069  1999-04-10   2.5048833 24.64645  6.8416573   290.000000    58.000000
## 3070  1999-04-11   2.7619303 24.70001  6.6068555   107.047619    24.571429
## 3071  1999-04-12   2.9810056 24.73754  6.7941951  5070.000000  4900.000000
## 3072  1999-04-13   3.2000810 24.77506  6.9815347  2722.181818  3294.181818
## 3073  1999-04-14   3.4191563 24.81259  7.1688743    19.750000    11.000000
## 3074  1999-04-15   3.6382316 24.85011  7.3562139   139.090909   434.727273
## 3075  1999-04-16   3.8573069 24.88764  7.5435535   370.000000  5600.000000
## 3076  1999-04-17   4.0763823 24.92517  7.7308931     3.750000    21.000000
## 3077  1999-04-18   4.2954576 24.96269  7.9182327   448.068966   610.413793
## 3078  1999-04-19   3.4610089 24.96529  7.7982338    84.550000   690.300000
## 3079  1999-04-20   2.9724500 25.02584  7.3823621    21.066667    53.200000
## 3080  1999-04-21   2.2499909 25.02087  6.7698748     5.523810    17.095238
## 3081  1999-04-22   3.3141172 25.00113  6.9376865     7.000000     2.750000
## 3082  1999-04-23   4.3782434 24.98140  7.1054981    69.090909  1064.545455
## 3083  1999-04-24   5.4423697 24.96166  7.2733097    26.511628   249.209302
## 3084  1999-04-25   4.8661583 24.93160  7.3090424    16.666667   303.333333
## 3085  1999-04-26   4.2899468 24.90154  7.3447752     8.500000     4.750000
## 3086  1999-04-27   3.7137354 24.87147  7.3805079   548.545455  1661.636364
## 3087  1999-04-28   3.1375239 24.84141  7.4162406  1211.000000  6013.000000
## 3088  1999-04-29   2.5613125 24.81135  7.4519733     2.363636     3.333333
## 3089  1999-04-30   2.4999381 24.78550  7.2688197    52.500000    26.000000
## 3090  1999-05-01   2.4385636 24.75965  7.0856661     2.285714     2.476190
## 3091  1999-05-02   2.6152384 24.83425  7.0639174   104.727273   750.181818
## 3092  1999-05-03   2.7919131 24.90884  7.0421687     8.000000    10.000000
## 3093  1999-05-04   2.9685879 24.98344  7.0204200     2.714286     4.761905
## 3094  1999-05-05   9.4389244 25.00475  7.5124624   109.888889   475.944444
## 3095  1999-05-06   5.8184810 25.06534  7.2096798    95.073171   296.000000
## 3096  1999-05-07   6.8338000 25.00222  7.4441807    37.500000    64.125000
## 3097  1999-05-08   4.9701917 24.92189  7.6530316    30.500000     7.750000
## 3098  1999-05-09   3.1065833 24.84155  7.8618825     8.242424     2.424242
## 3099  1999-05-10   1.6677208 25.20554  6.0918944   274.881356   238.237288
## 3100  1999-05-11   2.2692364 24.91271  6.9000455   244.078431   240.470588
## 3101  1999-05-12   1.7851583 25.28541  5.9592365     6.750000    56.500000
## 3102  1999-05-13   1.9980844 25.27846  5.8634913     2.622222     2.133333
## 3103  1999-05-14   3.7650697 24.92806  7.3982164  1074.918033   849.049180
## 3104  1999-05-15   3.5445167 24.94199  7.3526782   254.727273  1016.545455
## 3105  1999-05-16   3.3239636 24.95592  7.3071400     8.720000    26.400000
## 3106  1999-05-17   3.4270273 24.98417  7.1791968  1768.000000  1250.000000
## 3107  1999-05-18   3.5300909 25.01243  7.0512535 12000.000000 12000.000000
## 3108  1999-05-19   3.6331545 25.04068  6.9233103     3.428571     4.809524
## 3109  1999-05-20   4.4299039 25.16869  6.4333884     2.000000     8.750000
## 3110  1999-05-21   5.2266533 25.29669  5.9434664    34.388889   505.055556
## 3111  1999-05-22   5.1019481 25.32374  5.9125223  1138.363636  2624.363636
## 3112  1999-05-23   4.9772429 25.35079  5.8815781   248.727273   538.969697
## 3113  1999-05-24   3.5747667 25.17833  6.1149550     2.424242     2.303030
## 3114  1999-05-25   7.5056030 25.41339  5.7879912     6.000000     9.222222
## 3115  1999-05-26   7.1761674 25.36542  6.0573344     6.000000     5.250000
## 3116  1999-05-27   6.8467318 25.31744  6.3266776    22.727273    47.818182
## 3117  1999-05-28   6.5172962 25.26947  6.5960208     2.500000     4.250000
## 3118  1999-05-29   6.1878606 25.22149  6.8653639     2.761905     9.761905
## 3119  1999-05-30   5.6528788 25.27391  6.5843688     3.698113     5.018868
## 3120  1999-05-31   7.9246636 25.09554  7.2676195     7.250000     3.750000
## 3121  1999-06-01  10.1964485 24.91716  7.9508703     2.285714     2.047619
## 3122  1999-06-02  10.5489374 24.99008  7.7997749    21.636364    18.545455
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## 3123  1999-06-03  10.9014263 25.06299  7.6486796     4.750000     3.500000
## 3124  1999-06-04  11.2539152 25.13591  7.4975842     2.190476     2.571429
## 3125  1999-06-05   8.5842576 25.02115  7.9289803     9.500000    28.500000
## 3126  1999-06-06   5.9146000 24.90640  8.3603764     3.358491     4.792453
## 3127  1999-06-07   5.9060788 25.03061  6.7217997     2.000000     3.076923
## 3128  1999-06-08   5.3525786 25.12154  6.4208505     4.780488    10.926829
## 3129  1999-06-09   5.6045956 25.03193  6.4250362    89.111111   285.722222
## 3130  1999-06-10   2.9519583 25.13137  6.5708279     2.666667     3.272727
## 3131  1999-06-11   2.8182998 25.19743  6.4449375     2.500000     4.500000
## 3132  1999-06-12   2.6846413 25.26350  6.3190470  1288.363636  2480.727273
## 3133  1999-06-13   2.5509828 25.32956  6.1931565    10.666667    41.333333
## 3134  1999-06-14   2.4173242 25.39563  6.0672661     2.761905     4.285714
## 3135  1999-06-15   5.7414924 25.37340  6.5567109     2.000000     2.000000
## 3136  1999-06-16   9.0656606 25.35118  7.0461558     2.226415     8.000000
## 3137  1999-06-17   8.2174758 25.15516  7.6483395     3.750000     5.000000
## 3138  1999-06-18   7.3692909 24.95914  8.2505233     2.047619     2.142857
## 3139  1999-06-19   6.2706646 25.06993  7.1589788    30.909091    46.181818
## 3140  1999-06-20   5.1720384 25.18073  6.0674342     4.750000    12.000000
## 3141  1999-06-21   4.0734121 25.29152  4.9758897     2.571429     2.619048
## 3142  1999-06-22   2.7591133 25.57372  4.7789031     2.088889     2.711111
## 3143  1999-06-23   2.2644083 25.66112  4.5325800    50.125000   672.041667
## 3144  1999-06-24   2.1869042 25.69094  4.2888258     9.552239    92.238806
## 3145  1999-06-25  11.7470182 25.28675  5.6097824     3.523810     4.190476
## 3146  1999-06-26  17.9609422 24.91884  7.6552380     2.055556     2.444444
## 3147  1999-06-27  13.6748842 24.99476  7.1186452    10.105263     6.315789
## 3148  1999-06-28   9.3888262 25.07067  6.5820524     2.266667     2.733333
## 3149  1999-06-29   9.9177722 24.71375  7.0511779     4.121212    33.090909
## 3150  1999-06-30  10.4467182 24.63418  7.5203033     2.000000     2.333333
## 3151  1999-07-01   8.5435162 24.75805  6.8194831     2.000000     2.750000
## 3152  1999-07-02   6.6403141 24.88192  6.1186629     2.909091     8.363636
## 3153  1999-07-03   4.7371121 25.00579  5.4178427    70.809524     7.380952
## 3154  1999-07-04   4.7242909 25.02148  5.3654815     4.000000     6.000000
## 3155  1999-07-05   4.7114697 25.03718  5.3131203    18.716981     4.566038
## 3156  1999-07-06   3.9821970 25.03138  5.5117431     2.000000     2.500000
## 3157  1999-07-07   3.2529242 25.02559  5.7103660     2.181818     4.545455
## 3158  1999-07-08   2.5236515 25.01979  5.9089888     2.095238     4.142857
## 3159  1999-07-09   6.2039846 25.08661  6.1334578     6.750000     9.250000
## 3160  1999-07-10   9.8843178 25.15343  6.3579269    17.333333    65.055556
## 3161  1999-07-11   6.9848881 24.98139  6.6383428    10.181818     7.272727
## 3162  1999-07-12   4.0854583 24.80935  6.9187588    12.545455     2.121212
## 3163  1999-07-13   5.5427429 25.06275  6.6828681     5.052632    19.789474
## 3164  1999-07-14  11.1702273 25.06460  6.6894206     2.000000     2.000000
## 3165  1999-07-15   3.8425182 24.60757  6.7412561     5.433962    10.301887
## 3166  1999-07-16   6.3456212 24.61830  6.6966356     2.250000     2.000000
## 3167  1999-07-17   8.8487242 24.62902  6.6520152   862.190476     5.000000
## 3168  1999-07-18   6.4938439 24.72553  6.2486130    42.526316     5.157895
## 3169  1999-07-19   4.1389636 24.82203  5.8452109    48.428571     5.095238
## 3170  1999-07-20   4.6145313 24.91699  5.7413545     2.500000     3.000000
## 3171  1999-07-21   5.0900990 25.01195  5.6374982     2.000000     2.181818
## 3172  1999-07-22   5.5656667 25.10690  5.5336418    17.571429     2.761905
## 3173  1999-07-23   8.8610356 25.18849  6.0222605     2.750000     2.750000
## 3174  1999-07-24  12.1564044 25.27007  6.5108791    28.222222    56.444444
## 3175  1999-07-25  12.1197367 25.15372  6.7551079     3.545455     2.500000
## 3176  1999-07-26  12.0830690 25.03736  6.9993367     2.000000     2.933333
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## 3177  1999-07-27  14.3809939 24.88410  7.8139461     2.444444     5.666667
## 3178  1999-07-28  11.5623747 24.76936  7.7470507     8.500000     6.750000
## 3179  1999-07-29   8.7437556 24.65462  7.6801554    18.000000    76.727273
## 3180  1999-07-30   5.9251364 24.53988  7.6132600     2.857143     2.333333
## 3181  1999-07-31   4.9972197 24.47863  7.5651779     5.000000     2.000000
## 3182  1999-08-01   4.0693030 24.41738  7.5170958     2.000000     2.000000
## 3183  1999-08-02   4.9732048 24.32697  7.4509712    36.727273    16.545455
## 3184  1999-08-03   5.8771067 24.23656  7.3848465     9.250000     5.500000
## 3185  1999-08-04   6.7810085 24.14615  7.3187219    15.090909     4.363636
## 3186  1999-08-05   7.6849103 24.05574  7.2525973   177.250000     3.500000
## 3187  1999-08-06   8.5888121 23.96533  7.1864727     4.000000     9.190476
## 3188  1999-08-07   1.7749622 24.91661  6.0104562     6.755556    39.200000
## 3189  1999-08-08   1.7952051 25.02593  5.8486901     4.842105     9.368421
## 3190  1999-08-09   1.8154479 25.13526  5.6869240    11.333333    53.875000
## 3191  1999-08-10   2.2702604 25.11809  5.8274950    10.875000   121.000000
## 3192  1999-08-11   4.7365515 24.65564  6.4622567    13.761905     2.428571
## 3193  1999-08-12   9.3571978 24.70142  7.4099982    43.045455   180.272727
## 3194  1999-08-13   9.6707810 24.68170  7.5098417     4.390244     3.853659
## 3195  1999-08-14   9.0899000 24.63511  7.3910233     2.111111     2.000000
## 3196  1999-08-15   2.8612708 24.26395  6.2195162    12.787879     4.303030
## 3197  1999-08-16   2.8916775 24.28567  6.2338420     2.000000     2.750000
## 3198  1999-08-17   2.9220842 24.30740  6.2481678     9.090909     6.000000
## 3199  1999-08-18   2.9524909 24.32912  6.2624936    12.190476     3.190476
## 3200  1999-08-19   2.9242545 24.27066  6.3218753    14.000000    11.000000
## 3201  1999-08-20   2.8960182 24.21220  6.3812570     3.471698     2.716981
## 3202  1999-08-21   3.2805561 24.21182  6.5707177     8.000000    11.250000
## 3203  1999-08-22   3.6650939 24.21144  6.7601785    15.190476     7.095238
## 3204  1999-08-23   3.2691788 24.13615  6.9140298     2.727273     3.818182
## 3205  1999-08-24   2.8732636 24.06085  7.0678811     5.750000    13.750000
## 3206  1999-08-25   2.4773485 23.98556  7.2217324     2.333333     3.904762
## 3207  1999-08-26   3.0813561 23.88328  7.0316476    19.090909     8.727273
## 3208  1999-08-27   3.6853636 23.78099  6.8415627    33.160000     5.840000
## 3209  1999-08-28   3.7621583 24.50410  6.4785487     8.307692     3.384615
## 3210  1999-08-29   7.0484119 24.57002  7.5076786   132.722222   197.722222
## 3211  1999-08-30   7.6253667 24.43704  7.6109222    27.619048     7.619048
## 3212  1999-08-31   2.6708143 24.34993  7.2888545     2.000000     2.000000
## 3213  1999-09-01   3.9451636 24.29965  7.0370824     4.440000     4.200000
## 3214  1999-09-02   3.3681045 24.25166  7.0232305    11.636364     9.636364
## 3215  1999-09-03   2.7910455 24.20367  7.0093785     5.280000     2.280000
## 3216  1999-09-04   2.4747197 24.22078  6.9022850     4.909091     9.090909
## 3217  1999-09-05   2.1583939 24.23789  6.7951915    16.080000     7.160000
## 3218  1999-09-06   4.4540644 24.41706  7.5552547     3.666667     7.555556
## 3219  1999-09-07   3.1750714 24.47113  7.4468110     4.000000     2.536585
## 3220  1999-09-08   4.2594333 24.27836  7.3997130    10.777778    14.111111
## 3221  1999-09-09   2.6196833 24.20255  6.6471554   167.951220    17.707317
## 3222  1999-09-10   2.9856235 24.14553  6.5346579     2.000000     2.000000
## 3223  1999-09-11   3.3515636 24.08852  6.4221603     6.720000     5.000000
## 3224  1999-09-12   2.6681970 24.13518  6.3902398    13.090909     3.090909
## 3225  1999-09-13   1.9848303 24.18185  6.3583194     6.680000     4.440000
## 3226  1999-09-14   2.3135939 24.11965  6.3815767     4.327869     2.819672
## 3227  1999-09-15   2.4574870 24.50970  6.5771559     4.000000    14.000000
## 3228  1999-09-16   2.6013800 24.89976  6.7727351     5.018868     8.037736
## 3229  1999-09-17   2.4440265 24.93490  6.7066167     8.363636     3.454545
## 3230  1999-09-18   2.2866729 24.97004  6.6404983    23.875000   273.833333
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## 3231  1999-09-19   2.3229458 24.86947  6.8460927     2.625000     2.458333
## 3232  1999-09-20   3.3075121 24.51421  8.3514239     2.904762     2.142857
## 3233  1999-09-21   7.2711222 24.58227  7.5247200     4.181818    11.954545
## 3234  1999-09-22   4.8642571 24.67565  7.4008819     4.341463     3.121951
## 3235  1999-09-23   6.5645091 24.73476  7.1449952     2.000000     2.222222
## 3236  1999-09-24   1.7669333 24.37823  7.9564950     3.212121     2.181818
## 3237  1999-09-25   0.7000000 23.93200  6.6600000     4.250000     7.500000
## 3238  1999-09-26   1.3778212 24.19970  7.3600700    38.545455     4.727273
## 3239  1999-09-27   2.0556424 24.46740  8.0601400     2.428571     3.619048
## 3240  1999-09-28   2.1505606 24.42898  8.1198752     8.000000     5.250000
## 3241  1999-09-29   2.2454788 24.39055  8.1796103     3.773585    11.207547
## 3242  1999-09-30   2.2495864 24.46346  7.9767085     3.250000     3.000000
## 3243  1999-10-01   2.2536939 24.53636  7.7738067    23.047619    11.571429
## 3244  1999-10-02   2.3008311 24.55392  7.8512193    52.363636  1327.090909
## 3245  1999-10-03   2.3479682 24.57148  7.9286320    26.000000  1200.000000
## 3246  1999-10-04   2.3951053 24.58904  8.0060446     7.500000     8.500000
## 3247  1999-10-05   2.4422424 24.60660  8.0834573    32.000000     3.904762
## 3248  1999-10-06   2.2383936 24.60983  8.0289548     4.000000     2.000000
## 3249  1999-10-07   2.0345447 24.61305  7.9744524  6515.090909  2584.545455
## 3250  1999-10-08   1.8306958 24.61628  7.9199500   600.083333   440.833333
## 3251  1999-10-09   0.6685095 24.66991  7.1042048    47.400000    18.666667
## 3252  1999-10-10   0.7062697 24.80313  7.0999706    27.111111     5.888889
## 3253  1999-10-11   2.6390818 24.59230  7.9973888    37.142857     6.333333
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## 3255  1999-10-13   2.1595591 24.63058  7.8418339   809.157895   565.263158
## 3256  1999-10-14   1.9197977 24.64971  7.7640565    50.666667    80.000000
## 3257  1999-10-15   1.6800364 24.66885  7.6862791     2.619048     3.095238
## 3258  1999-10-16   3.0646422 24.70389  7.0330869    59.888889    38.500000
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## 3260  1999-10-18   2.9397259 24.74692  7.4540566   176.727273   215.090909
## 3261  1999-10-19   2.8772678 24.76843  7.6645415     3.000000     2.000000
## 3262  1999-10-20   2.8148097 24.78995  7.8750263    16.000000     5.500000
## 3263  1999-10-21   2.7523515 24.81146  8.0855112     2.000000     2.000000
## 3264  1999-10-22   2.3997174 24.80717  8.0602556   167.636364   268.363636
## 3265  1999-10-23   2.0470833 24.80288  8.0350000     2.121212     2.060606
## 3266  1999-10-24   6.9988889 24.80102  7.6097778   288.893617   350.723404
## 3267  1999-10-25   4.0692857 24.74950  7.4385714     4.580645     3.548387
## 3268  1999-10-26   7.1803030 24.80597  7.6936364     8.444444     4.555556
## 3269  1999-10-27   3.1360606 24.71891  8.3166667    11.698113     3.433962
## 3270  1999-10-28   2.3387879 24.67717  8.0803030  5457.454545  1874.000000
## 3271  1999-10-29   1.5415152 24.63542  7.8439394    97.904762    12.952381
## 3272  1999-10-30   1.7550000 24.64309  7.8348485  4336.666667  5340.000000
## 3273  1999-10-31   1.9684848 24.65076  7.8257576    15.857143    11.571429
## 3274  1999-11-01   2.8645455 24.67767  7.8839394     9.904762     5.238095
## 3275  1999-11-02   2.7789091 24.68412  7.9800606   379.090909   262.727273
## 3276  1999-11-03   2.6932727 24.69058  8.0761818   180.000000   260.000000
## 3277  1999-11-04   2.6076364 24.69703  8.1723030  1674.000000  2731.454545
## 3278  1999-11-05   2.5220000 24.70348  8.2684242  9666.666667  9266.666667
## 3279  1999-11-06   2.4363636 24.70994  8.3645455    28.952381    32.476190
## 3280  1999-11-07   2.4887879 24.74158  7.6433333   166.385281   203.965368
## 3281  1999-11-08   2.4542424 24.68220  7.8371212   303.818182   375.454545
## 3282  1999-11-09   2.4196970 24.62282  8.0309091     4.363636    19.363636
## 3283  1999-11-10   3.8462929 24.63973  7.8997879     4.000000    46.000000
## 3284  1999-11-11   5.2728889 24.65664  7.7686667   558.680851   629.872340
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## 3285  1999-11-12   2.3233333 24.71579  7.4427273    86.888889   304.444444
## 3286  1999-11-13   3.6169048 24.80760  7.2550000    45.444444   153.611111
## 3287  1999-11-14   3.8578788 24.86733  7.0166667     4.000000     2.777778
## 3288  1999-11-15   1.8085714 24.85850  7.0000000     5.708333    14.680556
## 3289  1999-11-16   1.5770833 25.16996  6.1635417     7.416667    26.583333
## 3290  1999-11-17   2.1231111 25.04873  6.4988889    76.392857   215.285714
## 3291  1999-11-18   4.8781818 24.90003  6.8890909    10.190476    15.190476
## 3292  1999-11-19  10.0054545 24.77424  7.6863636   282.000000   327.888889
## 3293  1999-11-20   6.4912689 24.88550  7.2571402   230.000000   310.000000
## 3294  1999-11-21   2.9770833 24.99675  6.8279167     2.303030     4.181818
## 3295  1999-11-22   1.2783333 25.47779  5.3387500    10.227273    40.066919
## 3296  1999-11-23   3.0288095 25.50569  5.5550000    18.151515    75.952020
## 3297  1999-11-24   4.0651515 25.39991  6.0227273    26.075758   111.837121
## 3298  1999-11-25   3.5166667 25.41200  6.3002222    34.000000   147.722222
## 3299  1999-11-26   6.9524242 25.05485  7.8751515   107.619048     4.904762
## 3300  1999-11-27   5.5262121 25.02582  7.6398485   188.000000  1538.666667
## 3301  1999-11-28   4.1000000 24.99679  7.4045455     2.000000     2.476190
## 3302  1999-11-29   5.8736364 25.22942  6.4393939     7.476190    32.476190
## 3303  1999-11-30   6.8792424 25.17330  6.4250000     2.000000   140.000000
## 3304  1999-12-01   7.8848485 25.11718  6.4106061     2.142857     3.761905
## 3305  1999-12-02   7.5893939 25.00097  7.1278788     2.190476     3.380952
## 3306  1999-12-03   4.3163636 25.41394  6.0927273     2.047619     5.238095
## 3307  1999-12-04   6.2890909 25.32352  6.4245455     2.523810    30.119048
## 3308  1999-12-05   6.1746970 25.38000  6.3912121     3.000000    55.000000
## 3309  1999-12-06   6.0603030 25.43648  6.3578788     2.380952     5.523810
## 3310  1999-12-07   6.1054640 25.53270  5.7737311     2.500000     7.250000
## 3311  1999-12-08   6.1506250 25.62892  5.1895833    52.610169   126.000000
## 3312  1999-12-09   8.5944444 25.47831  5.8386667     2.042553     2.936170
## 3313  1999-12-10   4.5916667 25.54204  5.1883333    13.500000   188.333333
## 3314  1999-12-11   9.5566667 24.93067  8.1248485    33.476190     2.190476
## 3315  1999-12-12  14.3445238 25.10477  7.0111147     8.750000     5.000000
## 3316  1999-12-13  19.1323810 25.27888  5.8973810     2.133333     2.066667
## 3317  1999-12-14  15.9603030 25.29833  5.9872727     2.896552     5.724138
## 3318  1999-12-15  14.3995556 25.34467  5.3273333     2.222222     2.944444
## 3319  1999-12-16   6.4208333 25.25825  5.8891667     2.303030     2.848485
## 3320  1999-12-17   7.7223864 25.11229  6.6494318     4.250000     2.000000
## 3321  1999-12-18   9.0239394 24.96633  7.4096970     7.360000    17.040000
## 3322  1999-12-19   7.3033333 25.08477  6.9456566    88.000000    54.000000
## 3323  1999-12-20   5.5827273 25.20320  6.4816162     2.750000     2.750000
## 3324  1999-12-21   3.8621212 25.32164  6.0175758     5.952381    32.095238
## 3325  1999-12-22   5.3537157 25.30858  5.9427489    12.181818    14.545455
## 3326  1999-12-23   6.8453102 25.29553  5.8679221     3.750000     2.500000
## 3327  1999-12-24   8.3369048 25.28248  5.7930952     4.040816    39.714286
## 3328  1999-12-25  12.8128889 25.02876  6.8842222    82.055556   310.833333
## 3329  1999-12-26  16.8081818 24.82039  7.7690909    19.666667    48.222222
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## 3331  1999-12-28  13.1163131 24.46144  8.7362374     2.000000     3.500000
## 3332  1999-12-29  12.0017929 24.37775  8.4037247   102.363636    66.000000
## 3333  1999-12-30  10.8872727 24.29406  8.0712121     2.000000     2.190476
## 3334  1999-12-31   9.0808081 24.37185  7.7450505     3.250000     2.500000
## 3335  2000-01-01   7.2743434 24.44964  7.4188889     4.545455     9.272727
## 3336  2000-01-02   5.4678788 24.52742  7.0927273     2.000000     2.095238
## 3337  2000-01-03   5.5381818 24.61176  7.0369697    14.500000     2.750000
## 3338  2000-01-04   5.6084848 24.69609  6.9812121     2.490566     4.113208
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## 3339  2000-01-05   8.3860606 24.83506  7.2675758     2.250000     3.000000
## 3340  2000-01-06  11.1636364 24.97403  7.5539394     2.142857     2.000000
## 3341  2000-01-07   9.5327273 24.83109  7.7446970    37.090909     9.636364
## 3342  2000-01-08   7.9018182 24.68815  7.9354545     2.160000     2.440000
## 3343  2000-01-09   8.1834343 24.81752  7.4360606    19.454545    16.545455
## 3344  2000-01-10   8.4650505 24.94688  6.9366667     3.500000     2.250000
## 3345  2000-01-11   8.7466667 25.07624  6.4372727     2.142857     2.000000
## 3346  2000-01-12   6.2803030 25.22015  6.3196970     2.000000     2.000000
## 3347  2000-01-13   2.2869048 25.35288  6.3930952    31.102041    61.632653
## 3348  2000-01-14   4.6591111 25.42604  6.1073333   290.944444   569.500000
## 3349  2000-01-15   5.1827407 25.11533  6.5819596     2.750000     2.500000
## 3350  2000-01-16   5.7063704 24.80462  7.0565859    28.181818    71.636364
## 3351  2000-01-17   6.2300000 24.49391  7.5312121     2.523810     2.571429
## 3352  2000-01-18   4.7733333 24.61608  7.1862500     2.000000     2.181818
## 3353  2000-01-19   4.6943939 24.78710  7.1564583     2.000000     2.000000
## 3354  2000-01-20   4.6154545 24.95812  7.1266667     4.452830    11.358491
## 3355  2000-01-21  12.6665152 25.12632  7.0475758    14.250000     5.500000
## 3356  2000-01-22  20.7175758 25.29452  6.9684848     7.444444    29.000000
## 3357  2000-01-23  10.2307143 25.37988  6.5528571     3.902439     5.756098
## 3358  2000-01-24  17.8160000 25.32364  7.3517778     2.055556     2.000000
## 3359  2000-01-25  11.2891667 24.80504  7.2266667     3.212121     5.515152
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## 3362  2000-01-28   6.5945000 25.35711  5.5102778     3.636364     4.363636
## 3363  2000-01-29   7.1450000 25.41304  5.5250000     2.041667     5.431818
## 3364  2000-01-30   6.8508333 25.40015  5.3639583    27.428571     6.500000
## 3365  2000-01-31  11.5254545 24.99782  6.8957576     2.000000     2.363636
## 3366  2000-02-01  12.9153030 24.98150  7.3065152     3.272727     2.909091
## 3367  2000-02-02  14.3051515 24.96518  7.7172727     2.243902     2.292683
## 3368  2000-02-03  10.6793939 25.25909  6.9690909     9.090909     2.000000
## 3369  2000-02-04   8.9613131 25.16090  7.1081818     2.750000     3.250000
## 3370  2000-02-05   7.2432323 25.06271  7.2472727    38.000000    20.000000
## 3371  2000-02-06   5.5251515 24.96452  7.3863636     2.060606     2.000000
## 3372  2000-02-07   6.7917172 24.92243  7.3487879     3.000000     3.500000
## 3373  2000-02-08   8.0582828 24.88035  7.3112121    14.545455    34.727273
## 3374  2000-02-09   9.3248485 24.83827  7.2736364     2.000000     2.000000
## 3375  2000-02-10   8.3674242 24.87461  7.3654545     6.000000     2.500000
## 3376  2000-02-11   7.4100000 24.91094  7.4572727    23.172414    44.068966
## 3377  2000-02-12  13.6260000 24.90393  7.3933333    37.111111   136.888889
## 3378  2000-02-13   9.9919048 24.91993  7.5823810     2.000000     2.000000
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## 3380  2000-02-15   5.4592677 24.87757  6.9756061     5.750000     9.250000
## 3381  2000-02-16   3.8547854 24.95444  6.3970455     2.181818     2.000000
## 3382  2000-02-17   2.2503030 25.03130  5.8184848     2.000000     2.060606
## 3383  2000-02-18   4.5828788 25.10806  5.6400000     2.000000     3.500000
## 3384  2000-02-19   6.9154545 25.18482  5.4615152     2.060606     2.181818
## 3385  2000-02-20   7.6451515 25.08133  6.2841414    11.454545     8.363636
## 3386  2000-02-21   8.3748485 24.97785  7.1067677     2.000000     3.250000
## 3387  2000-02-22   9.1045455 24.87436  7.9293939     2.121212     2.121212
## 3388  2000-02-23   8.2595960 24.59787  7.8011111    18.500000    18.500000
## 3389  2000-02-24   7.4146465 24.32137  7.6728283    12.500000     4.000000
## 3390  2000-02-25   6.5696970 24.04488  7.5445455    25.818182   264.484848
## 3391  2000-02-26   6.6437374 24.06840  7.4553535     2.000000     2.000000
## 3392  2000-02-27   6.7177778 24.09193  7.3661616     7.875000    21.625000
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## 3393  2000-02-28   6.7918182 24.11545  7.2769697     9.333333     5.818182
## 3394  2000-02-29   6.5604545 24.26821  7.4806061    23.750000    65.250000
## 3395  2000-03-01   6.3290909 24.42097  7.6842424     4.466667     5.400000
## 3396  2000-03-02   6.4359524 24.58660  7.4897619     3.000000     5.066667
## 3397  2000-03-03   6.2866667 24.48909  7.2555556    17.666667    70.222222
## 3398  2000-03-04  11.5987500 24.23846  7.1975000     2.000000     2.000000
## 3399  2000-03-05  10.2038352 24.24049  7.1125947    21.000000     6.500000
## 3400  2000-03-06   8.8089205 24.24252  7.0276894    50.000000    58.704545
## 3401  2000-03-07   7.4140057 24.24455  6.9427841   127.636364   110.909091
## 3402  2000-03-08   6.0190909 24.24658  6.8578788   464.352941   463.588235
## 3403  2000-03-09   6.1197980 24.28053  6.8636364   420.000000   880.000000
## 3404  2000-03-10   6.2205051 24.31448  6.8693939    80.000000    83.000000
## 3405  2000-03-11   6.3212121 24.34844  6.8751515   109.750000    61.000000
## 3406  2000-03-12   6.4219192 24.38239  6.8809091     2.000000    31.500000
## 3407  2000-03-13   6.5226263 24.41635  6.8866667    20.000000     2.000000
## 3408  2000-03-14   6.6233333 24.45030  6.8924242    60.090909    60.772727
## 3409  2000-03-15   5.1688889 24.69077  6.6248754    61.000000   390.000000
## 3410  2000-03-16   3.7144444 24.93124  6.3573266     4.500000     8.444444
## 3411  2000-03-17   2.2600000 25.17171  6.0897778    20.166667     7.546296
## 3412  2000-03-18   2.3485417 25.21140  6.0637500    35.833333     6.648148
## 3413  2000-03-19   2.9975000 25.16117  6.3197917     3.508772     5.750000
## 3414  2000-03-20   7.8666667 24.50961  7.6542424     8.181818     9.151515
## 3415  2000-03-21   8.3300000 24.54270  7.7210101     2.000000    14.030303
## 3416  2000-03-22   8.7933333 24.57579  7.7877778    64.363636    18.909091
## 3417  2000-03-23   9.2566667 24.60888  7.8545455     2.780488     2.634146
## 3418  2000-03-24   7.0784848 24.87521  7.5539394     2.000000     2.222222
## 3419  2000-03-25   8.1906667 24.81536  7.6184444    11.000000   141.461538
## 3420  2000-03-26   7.7295238 24.80688  7.6378571     3.515152     4.666667
## 3421  2000-03-27   4.0083333 24.68142  7.1533333    13.375000     9.125000
## 3422  2000-03-28   3.4793939 24.80373  6.9445455    14.711111    85.681818
## 3423  2000-03-29   3.3116162 25.00861  6.7564646     2.000000    18.666667
## 3424  2000-03-30   3.1438384 25.21348  6.5683838     2.500000     3.000000
## 3425  2000-03-31   2.9760606 25.41836  6.3803030     2.818182     6.500000
## 3426  2000-04-01   7.7660606 25.30282  7.0339394     2.000000     2.000000
## 3427  2000-04-02  13.3413636 25.24399  7.6857197    17.500000     6.500000
## 3428  2000-04-03  18.9166667 25.18517  8.3375000     6.250000     2.000000
## 3429  2000-04-04   8.0808889 25.23147  7.9222222    17.170213     7.574468
## 3430  2000-04-05   9.1804762 25.29155  7.4750000     2.000000     2.000000
## 3431  2000-04-06  12.0121212 25.23809  7.9706061     2.111111     2.222222
## 3432  2000-04-07  12.6995455 25.20445  7.7657576     2.250000     2.000000
## 3433  2000-04-08  13.3869697 25.17082  7.5609091     2.000000     2.000000
## 3434  2000-04-09  14.4102020 25.14190  7.7725253     4.909091     2.909091
## 3435  2000-04-10  15.4334343 25.11298  7.9841414     2.750000     5.750000
## 3436  2000-04-11  16.4566667 25.08406  8.1957576     2.242424     2.121212
## 3437  2000-04-12  14.2452020 25.00685  8.0174242  8577.777778  6031.111111
## 3438  2000-04-13  12.0337374 24.92965  7.8390909   320.000000   135.250000
## 3439  2000-04-14   9.8222727 24.85244  7.6607576  6219.846154  4410.000000
## 3440  2000-04-15   7.6108081 24.77523  7.4824242   133.555556   302.333333
## 3441  2000-04-16   5.3993434 24.69803  7.3040909   740.000000    40.000000
## 3442  2000-04-17   3.1878788 24.62082  7.1257576   157.307692   292.692308
## 3443  2000-04-18   3.9244697 24.67595  7.3196970   130.000000    44.000000
## 3444  2000-04-19   4.6610606 24.73109  7.5136364  4490.000000 12000.000000
## 3445  2000-04-20   5.3976515 24.78623  7.7075758  2881.777778  6200.000000
## 3446  2000-04-21   6.1342424 24.84136  7.9015152   657.677419   877.500000
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## 3447  2000-04-22   5.4122222 24.80487  7.8933333   416.541667   528.680851
## 3448  2000-04-23   4.2500000 24.90890  7.6966667     5.866667     9.200000
## 3449  2000-04-24   4.0614583 24.84529  7.5614583  4029.333333  4283.333333
## 3450  2000-04-25   3.8729167 24.78167  7.4262500   482.000000   465.230769
## 3451  2000-04-26   3.7205303 24.81161  7.3473990     6.222222     6.222222
## 3452  2000-04-27   3.5681439 24.84155  7.2685480    17.272727    44.363636
## 3453  2000-04-28   3.4157576 24.87148  7.1896970     3.636364     2.000000
## 3454  2000-04-29   4.9400000 24.88733  7.4093939     5.000000    13.500000
## 3455  2000-04-30   6.4642424 24.90318  7.6290909   125.409091   318.363636
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## 3457  2000-05-02   7.6345455 24.85035  7.9743434    27.111111     4.000000
## 3458  2000-05-03   8.2196970 24.82394  8.1469697     6.000000    13.515152
## 3459  2000-05-04   7.6428283 24.85386  7.9886869    26.727273    31.818182
## 3460  2000-05-05   7.0659596 24.88378  7.8304040     5.500000     6.750000
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## 3462  2000-05-07   9.7677778 24.99189  7.3124444   310.340426   721.829787
## 3463  2000-05-08   5.6871429 25.14740  6.8921429     4.631579    17.263158
## 3464  2000-05-09   8.5715152 25.10258  7.6712121     3.000000    24.800000
## 3465  2000-05-10   8.4513636 25.12333  7.5396970     2.924242    80.000000
## 3466  2000-05-11   8.3312121 25.14409  7.4081818     2.848485     2.121212
## 3467  2000-05-12   6.1340476 25.38724  6.5428571    62.983607    28.315789
## 3468  2000-05-13   2.5545455 25.50759  5.9627273     6.681818    19.543860
## 3469  2000-05-14   1.8303636 25.64529  5.5718182    23.200000    10.771930
## 3470  2000-05-15   5.8237500 24.95971  8.1229167     2.000000     2.000000
## 3471  2000-05-16   5.5775505 24.98448  7.8026515     3.500000     6.750000
## 3472  2000-05-17   5.3313510 25.00926  7.4823864     2.727273     2.545455
## 3473  2000-05-18   5.0851515 25.03403  7.1621212     2.181818     2.000000
## 3474  2000-05-19   4.8243939 25.00653  7.3725758    46.727273    32.181818
## 3475  2000-05-20   4.5636364 24.97903  7.5830303     3.818182     8.666667
## 3476  2000-05-21   4.3075000 25.01770  7.3985606   360.000000    22.944444
## 3477  2000-05-22   4.0513636 25.05636  7.2140909    29.000000    37.222222
## 3478  2000-05-23   3.7952273 25.09503  7.0296212     7.500000    51.500000
## 3479  2000-05-24   3.5390909 25.13370  6.8451515     2.000000     2.303030
## 3480  2000-05-25   4.2827273 25.50085  6.2496970     6.068966   441.517241
## 3481  2000-05-26   3.4808889 25.50313  5.8897778     3.833333    54.166667
## 3482  2000-05-27   3.6540476 25.51319  5.9347619    85.161290   162.387097
## 3483  2000-05-28   2.8133333 25.39392  5.7704167     8.303030     8.000000
## 3484  2000-05-29   7.4674242 25.38252  6.4849337    76.000000   401.090909
## 3485  2000-05-30  12.1215152 25.37112  7.1994508   128.545455   794.181818
## 3486  2000-05-31  16.7756061 25.35973  7.9139678     2.000000     3.200000
## 3487  2000-06-01  21.4296970 25.34833  8.6284848    13.515152     2.787879
## 3488  2000-06-02  19.0974747 25.35786  8.1720202    76.000000   182.121212
## 3489  2000-06-03  16.7652525 25.36738  7.7155556    35.818182   361.454545
## 3490  2000-06-04  14.4330303 25.37691  7.2590909     5.512195     3.804878
## 3491  2000-06-05  13.4338636 25.33074  7.3958333   360.000000  2003.000000
## 3492  2000-06-06  12.4346970 25.28458  7.5325758    84.000000   440.000000
## 3493  2000-06-07  11.4355303 25.23841  7.6693182   215.730769    10.000000
## 3494  2000-06-08  10.4363636 25.19224  7.8060606   347.461538   455.115385
## 3495  2000-06-09  10.2836364 25.19039  7.5372727  3610.600000  6010.000000
## 3496  2000-06-10  10.1309091 25.18855  7.2684848  1240.000000  5600.000000
## 3497  2000-06-11   9.9781818 25.18670  6.9996970     2.444444     3.222222
## 3498  2000-06-12   9.2273939 25.17712  7.0027273     2.000000     5.250000
## 3499  2000-06-13   8.4766061 25.16755  7.0057576     7.272727     7.636364
## 3500  2000-06-14   7.7258182 25.15797  7.0087879     2.606061     3.151515
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## 3501  2000-06-15   6.9750303 25.12032  7.0118182     2.000000     4.250000
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## 3504  2000-06-18   5.7051111 25.01138  7.0486667     5.555556    18.277778
## 3505  2000-06-19   4.8843165 25.02612  7.0677980     4.250000    24.000000
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## 3518  2000-07-02   6.0349567 25.27590  6.6628701    25.684211    42.000000
## 3519  2000-07-03   6.3730736 25.37238  6.5765541    11.368421     7.263158
## 3520  2000-07-04   6.7111905 25.46886  6.4902381     2.000000     5.947368
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## 3531  2000-07-15   6.3490909 25.15885  6.8551515     5.575758    51.515152
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## 3661  2000-11-22   7.6844444 24.89944  7.1913095    27.388889    38.611111
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## 4376  2002-11-07   1.0008889 24.14289  7.1033333     2.444444     2.000000
## 4377  2002-11-08   1.1223333 24.31564  6.9970000    16.500000     7.500000
## 4378  2002-11-09   1.2437778 24.48840  6.8906667    30.392857    15.785714
## 4379  2002-11-10   1.4182222 24.59718  6.9024444     5.666667     3.396226
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## 4395  2002-11-26   1.9031111 24.70936  7.4611111    40.000000     4.589286
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## 4399  2002-11-30   1.0056237 24.96761  6.7456843    24.000000   649.619211
## 4400  2002-12-01   0.6261364 25.13459  6.1015909   664.763636  1294.181818
## 4401  2002-12-02   0.7852381 24.98952  6.5085714     5.280000     2.250000
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## 4423  2002-12-24   1.4212821 24.88021  6.4933333    18.820513     4.410256
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## 4429  2002-12-30   2.7553333 24.79908  7.4938889     4.750000    21.750000
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## 4431  2003-01-01   1.8491111 24.76807  7.5744444     2.000000     2.044444
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## 4441  2003-01-11   2.4218333 24.67341  7.2389444     2.250000     2.000000
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## 4450  2003-01-20   2.7246667 24.67511  7.0808889   494.680851   531.829787
## 4451  2003-01-21   2.7787879 24.82545  6.2551515     2.111111     2.000000
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## 4453  2003-01-23   1.8883519 24.82536  6.4751667  1800.000000  6400.000000
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## 4462  2003-02-01   3.6304444 24.26200  7.0922222     2.000000     2.133333
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## 4483  2003-02-22   2.0738095 23.98269  7.8776190    27.959184    13.673469
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## 4490  2003-03-01   2.3771111 23.67355  7.0184444     4.000000     2.000000
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## 4492  2003-03-03   2.3771111 23.95531  7.2117778     3.000000     4.250000
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## 4497  2003-03-08   1.6462222 24.20191  6.9620000     3.571429     3.214286
## 4498  2003-03-09   2.8060000 24.11702  6.8535556     2.113208     3.886792
## 4499  2003-03-10   2.4515556 24.09124  7.1755556     3.892857     2.428571
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## 4507  2003-03-18   2.5803556 24.24406  7.7514222    17.500000     5.000000
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## 4511  2003-03-22   2.4700741 24.33770  7.5620000    46.545455    12.181818
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## 4514  2003-03-25   2.5759259 24.54048  7.2535556   101.272727    43.090909
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## 4521  2003-04-01   2.1097619 24.64507  7.4711905     2.000000     2.000000
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## 4524  2003-04-04   1.3649545 24.92730  6.6158447     3.500000     2.750000
## 4525  2003-04-05   0.7649091 25.20418  5.9812727    25.054545     7.284091
## 4526  2003-04-06   1.0747619 24.80788  7.0919048     5.320755    11.818182
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## 4534  2003-04-14   2.2706222 24.51659  7.3464000  1434.363636  1577.272727
## 4535  2003-04-15   2.3812444 24.53735  7.3099111  2213.333333  6090.000000
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## 4537  2003-04-17   2.6024889 24.57888  7.2369333    70.000000   300.000000
## 4538  2003-04-18   2.7131111 24.59964  7.2004444     5.142857     4.178571
## 4539  2003-04-19   2.7524444 24.64959  7.0871111     4.500000     3.500000
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## 4546  2003-04-26   1.3393333 24.70091  7.0804444     2.714286     3.214286
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## 4558  2003-05-08   1.2388000 24.63495  7.4932444   110.545455    56.363636
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## 4561  2003-05-11   1.3077333 24.59884  7.4902667  6020.000000   650.753535
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## 4577  2003-05-27   1.7114286 24.92833  6.9550000     6.952381  1148.090909
## 4578  2003-05-28   0.5645455 25.19868  6.1727273   229.125000  2120.000000
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## 4580  2003-05-30   2.9313333 24.69311  7.9160000   494.561404   393.642857
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## 4591  2003-06-10   1.4913016 24.87208  6.9424762  1181.636364  1120.909091
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## 4593  2003-06-12   1.2862857 24.91640  6.7470476   323.000000  3000.000000
## 4594  2003-06-13   1.1837778 24.93856  6.6493333    26.800000    52.533333
## 4595  2003-06-14   1.1802222 24.89983  6.6598148  5600.000000  9800.000000
## 4596  2003-06-15   1.1766667 24.86110  6.6702963 12000.000000 12000.000000
## 4597  2003-06-16   1.1731111 24.82238  6.6807778  5684.842105  2617.263158
## 4598  2003-06-17   1.1695556 24.78365  6.6912593   557.714286   165.000000
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## 4600  2003-06-19   1.1624444 24.70620  6.7122222   118.192308    41.955556
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## 4604  2003-06-23   2.0998667 24.84624  6.3712444    32.000000    22.246465
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## 4665  2003-08-23   4.7839259 24.23087  8.6141481     2.909091     2.000000
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## 4669  2003-08-27   2.2446667 23.83617  8.0007778     4.500000     6.750000
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## 4812  2004-01-17   4.3666667 24.49311  7.6286667     2.000000     2.000000
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## 4814  2004-01-19   3.6648889 24.16216  8.1705926     4.000000    10.911111
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## 4821  2004-01-26   1.7422222 23.93998  7.9384444     2.000000     2.000000
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## 4823  2004-01-28   1.2853333 23.67896  8.0709778     2.000000     2.454545
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## 4827  2004-02-01   1.8877778 23.70661  8.1695556     7.090909     2.000000
## 4828  2004-02-02   1.7708889 23.62873  8.0693333     2.000000     2.000000
## 4829  2004-02-03   1.2442424 23.99864  7.8336364     7.062500     4.500000
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## 4833  2004-02-07   0.8257143 24.41702  7.3423810    57.584906    27.272727
## 4834  2004-02-08   0.5422727 24.69520  6.7975000    34.428816    19.027056
## 4835  2004-02-09   0.2896364 24.87487  6.5447273    11.272727    10.781385
## 4836  2004-02-10   2.2697778 23.78173  7.8191111     4.357143     2.535714
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## 4839  2004-02-13   1.1995556 24.30810  7.5063704     2.000000    31.074747
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## 4848  2004-02-22   1.7288889 24.25200  7.6240000     2.088889     4.666667
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## 4855  2004-02-29   1.6600000 24.25049  8.0808889     2.000000     2.000000
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## 4857  2004-03-02   0.7338889 24.31242  7.8672222     6.914583     4.820833
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## 4861  2004-03-06   0.3429545 24.75695  7.2188636     5.727273     3.781010
## 4862  2004-03-07   0.4442857 24.50517  7.5535714     2.619048     3.216970
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## 4868  2004-03-13   0.9442222 24.68964  7.1162222    11.377778   111.733333
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## 4870  2004-03-15   1.0972000 24.60447  7.3344444  7400.000000  8466.666667
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## 4884  2004-03-29   1.0537037 24.83296  7.8290370    71.000000   106.000000
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## 4912  2004-04-26   0.9793939 24.95533  7.6339394   427.937500   560.125000
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## 4924  2004-05-08   1.6246667 25.15710  7.5836444  6037.000000  6014.000000
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## 4928  2004-05-12   0.5356364 25.55731  6.0167273   191.696970  1456.363636
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## 4930  2004-05-14   0.4613636 25.51186  5.9350000    19.288889  1515.000000
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## 4946  2004-05-30   1.7018095 24.98925  7.5543175  1682.181818  2363.090909
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## 4958  2004-06-11   1.3316296 25.03637  7.3716574   212.181818   355.272727
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## 4969  2004-06-22   0.4749091 25.59416  5.1734545    19.666667    19.454545
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## 4991  2004-07-14   6.5206667 24.80460  7.1971111     2.177778     2.888889
## 4992  2004-07-15   6.4537222 24.83263  6.8927222    17.090909    11.454545
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## 4997  2004-07-20   2.6244444 24.96469  6.1446667     3.094340     5.245283
## 4998  2004-07-21   2.4256667 24.57584  6.8482222    14.363636    25.090909
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## 5012  2004-08-04   0.8534545 25.36247  5.8145455    10.984127    12.500000
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## 5013  2004-08-05   1.9723810 25.05419  7.0566667     4.285714    22.079365
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## 5030  2004-08-22   2.9451111 24.28217  6.6928889     3.750000     2.750000
## 5031  2004-08-23   2.4682222 24.23049  6.6337778     3.178571     2.607143
## 5032  2004-08-24   2.0144444 24.25323  6.7475556     3.000000     3.750000
## 5033  2004-08-25   1.5606667 24.27596  6.8613333     2.266667     7.644444
## 5034  2004-08-26   1.7695556 24.29870  7.1163333    27.454545    28.363636
## 5035  2004-08-27   1.9784444 24.32144  7.3713333     2.000000    76.250000
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## 5037  2004-08-29   2.3962222 24.36691  7.8813333     2.188679     2.452830
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## 5181  2005-01-20   3.4722222 24.85829  5.6962222   356.035714   384.357143
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## 5184  2005-01-23   2.6700000 25.03440  5.3593333  1257.222222  1390.555556
## 5185  2005-01-24   2.3973333 25.08162  5.7505556  2433.333333  2413.333333
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## 8178  2013-04-05          NA        NA          NA            NA            NA
## 8179  2013-04-06          NA        NA          NA            NA            NA
## 8180  2013-04-07          NA        NA          NA            NA            NA
## 8181  2013-04-08          NA        NA          NA            NA            NA
## 8182  2013-04-09          NA        NA          NA            NA            NA
## 8183  2013-04-10          NA        NA          NA            NA            NA
## 8184  2013-04-11          NA        NA          NA            NA            NA
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## 8186  2013-04-13          NA        NA          NA            NA            NA
## 8187  2013-04-14          NA        NA          NA            NA            NA
## 8188  2013-04-15          NA        NA          NA            NA            NA
## 8189  2013-04-16          NA        NA          NA            NA            NA
## 8190  2013-04-17          NA        NA          NA            NA            NA
## 8191  2013-04-18          NA        NA          NA            NA            NA
## 8192  2013-04-19          NA        NA          NA            NA            NA
## 8193  2013-04-20          NA        NA          NA            NA            NA
## 8194  2013-04-21          NA        NA          NA            NA            NA
## 8195  2013-04-22          NA        NA          NA            NA            NA
## 8196  2013-04-23          NA        NA          NA            NA            NA
## 8197  2013-04-24          NA        NA          NA            NA            NA
## 8198  2013-04-25          NA        NA          NA            NA            NA
```

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## 8199  2013-04-26          NA        NA          NA            NA            NA
## 8200  2013-04-27          NA        NA          NA            NA            NA
## 8201  2013-04-28          NA        NA          NA            NA            NA
## 8202  2013-04-29          NA        NA          NA            NA            NA
## 8203  2013-04-30          NA        NA          NA            NA            NA
## 8204  2013-05-01          NA        NA          NA            NA            NA
## 8205  2013-05-02          NA        NA          NA            NA            NA
## 8206  2013-05-03          NA        NA          NA            NA            NA
## 8207  2013-05-04          NA        NA          NA            NA            NA
## 8208  2013-05-05          NA        NA          NA            NA            NA
## 8209  2013-05-06          NA        NA          NA            NA            NA
## 8210  2013-05-07          NA        NA          NA            NA            NA
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## 8213  2013-05-10          NA        NA          NA            NA            NA
## 8214  2013-05-11          NA        NA          NA            NA            NA
## 8215  2013-05-12          NA        NA          NA            NA            NA
## 8216  2013-05-13          NA        NA          NA            NA            NA
## 8217  2013-05-14          NA        NA          NA            NA            NA
## 8218  2013-05-15          NA        NA          NA            NA            NA
## 8219  2013-05-16          NA        NA          NA            NA            NA
## 8220  2013-05-17          NA        NA          NA            NA            NA
## 8221  2013-05-18          NA        NA          NA            NA            NA
## 8222  2013-05-19          NA        NA          NA            NA            NA
## 8223  2013-05-20          NA        NA          NA            NA            NA
## 8224  2013-05-21          NA        NA          NA            NA            NA
## 8225  2013-05-22          NA        NA          NA            NA            NA
## 8226  2013-05-23          NA        NA          NA            NA            NA
## 8227  2013-05-24          NA        NA          NA            NA            NA
## 8228  2013-05-25          NA        NA          NA            NA            NA
## 8229  2013-05-26          NA        NA          NA            NA            NA
## 8230  2013-05-27          NA        NA          NA            NA            NA
## 8231  2013-05-28          NA        NA          NA            NA            NA
## 8232  2013-05-29          NA        NA          NA            NA            NA
## 8233  2013-05-30          NA        NA          NA            NA            NA
## 8234  2013-05-31          NA        NA          NA            NA            NA
## 8235  2013-06-01          NA        NA          NA            NA            NA
## 8236  2013-06-02          NA        NA          NA            NA            NA
## 8237  2013-06-03          NA        NA          NA            NA            NA
## 8238  2013-06-04          NA        NA          NA            NA            NA
## 8239  2013-06-05          NA        NA          NA            NA            NA
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## 8241  2013-06-07          NA        NA          NA            NA            NA
## 8242  2013-06-08          NA        NA          NA            NA            NA
## 8243  2013-06-09          NA        NA          NA            NA            NA
## 8244  2013-06-10          NA        NA          NA            NA            NA
## 8245  2013-06-11          NA        NA          NA            NA            NA
## 8246  2013-06-12          NA        NA          NA            NA            NA
## 8247  2013-06-13          NA        NA          NA            NA            NA
## 8248  2013-06-14          NA        NA          NA            NA            NA
## 8249  2013-06-15          NA        NA          NA            NA            NA
## 8250  2013-06-16          NA        NA          NA            NA            NA
## 8251  2013-06-17          NA        NA          NA            NA            NA
## 8252  2013-06-18          NA        NA          NA            NA            NA
```

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## 8253  2013-06-19          NA        NA          NA            NA            NA
## 8254  2013-06-20          NA        NA          NA            NA            NA
## 8255  2013-06-21          NA        NA          NA            NA            NA
## 8256  2013-06-22          NA        NA          NA            NA            NA
## 8257  2013-06-23          NA        NA          NA            NA            NA
## 8258  2013-06-24          NA        NA          NA            NA            NA
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## 8266  2013-07-02          NA        NA          NA            NA            NA
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## 8269  2013-07-05          NA        NA          NA            NA            NA
## 8270  2013-07-06          NA        NA          NA            NA            NA
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## 8273  2013-07-09          NA        NA          NA            NA            NA
## 8274  2013-07-10          NA        NA          NA            NA            NA
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## 8277  2013-07-13          NA        NA          NA            NA            NA
## 8278  2013-07-14          NA        NA          NA            NA            NA
## 8279  2013-07-15          NA        NA          NA            NA            NA
## 8280  2013-07-16          NA        NA          NA            NA            NA
## 8281  2013-07-17          NA        NA          NA            NA            NA
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## 8284  2013-07-20          NA        NA          NA            NA            NA
## 8285  2013-07-21          NA        NA          NA            NA            NA
## 8286  2013-07-22          NA        NA          NA            NA            NA
## 8287  2013-07-23          NA        NA          NA            NA            NA
## 8288  2013-07-24          NA        NA          NA            NA            NA
## 8289  2013-07-25          NA        NA          NA            NA            NA
## 8290  2013-07-26          NA        NA          NA            NA            NA
## 8291  2013-07-27          NA        NA          NA            NA            NA
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## 8293  2013-07-29          NA        NA          NA            NA            NA
## 8294  2013-07-30          NA        NA          NA            NA            NA
## 8295  2013-07-31          NA        NA          NA            NA            NA
## 8296  2013-08-01          NA        NA          NA            NA            NA
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## 8299  2013-08-04          NA        NA          NA            NA            NA
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## 8301  2013-08-06          NA        NA          NA            NA            NA
## 8302  2013-08-07          NA        NA          NA            NA            NA
## 8303  2013-08-08          NA        NA          NA            NA            NA
## 8304  2013-08-09          NA        NA          NA            NA            NA
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## 8306  2013-08-11          NA        NA          NA            NA            NA
```

```
## 8307  2013-08-12          NA       NA         NA           NA           NA
## 8308  2013-08-13          NA       NA         NA           NA           NA
## 8309  2013-08-14          NA       NA         NA           NA           NA
## 8310  2013-08-15          NA       NA         NA           NA           NA
## 8311  2013-08-16          NA       NA         NA           NA           NA
## 8312  2013-08-17          NA       NA         NA           NA           NA
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## 8314  2013-08-19          NA       NA         NA           NA           NA
## 8315  2013-08-20          NA       NA         NA           NA           NA
## 8316  2013-08-21          NA       NA         NA           NA           NA
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## 8318  2013-08-23          NA       NA         NA           NA           NA
## 8319  2013-08-24          NA       NA         NA           NA           NA
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## 8322  2013-08-27          NA       NA         NA           NA           NA
## 8323  2013-08-28          NA       NA         NA           NA           NA
## 8324  2013-08-29          NA       NA         NA           NA           NA
## 8325  2013-08-30          NA       NA         NA           NA           NA
## 8326  2013-08-31          NA       NA         NA           NA           NA
## 8327  2013-09-01          NA       NA         NA           NA           NA
## 8328  2013-09-02          NA       NA         NA           NA           NA
## 8329  2013-09-03          NA       NA         NA           NA           NA
## 8330  2013-09-04          NA       NA         NA           NA           NA
## 8331  2013-09-05          NA       NA         NA           NA           NA
## 8332  2013-09-06          NA       NA         NA           NA           NA
## 8333  2013-09-07          NA       NA         NA           NA           NA
##             OG       PH  SALINITY       SUSO      TEMP      XMS
## 1    0.2000000 8.130000 33.595500  3.9964286 19.370000 60.22500
## 2    0.2000000 8.143000 33.580275  3.9964286 14.507692 80.02564
## 3    0.2000000 8.156000 33.565050  3.9964286 14.392308 83.89744
## 4    0.2000000 8.169000 33.549825  3.9964286 14.541026 78.97436
## 5    0.2000000 8.182000 33.534600  3.9964286 13.430000 80.20000
## 6    0.2000000 8.195000 33.519375  3.9964286 14.268889 86.21111
## 7    0.2000000 8.193333 33.493000  3.9964286 13.750000 80.45833
## 8    0.2000000 8.191667 33.491000  3.9964286 14.384000 84.40000
## 9    0.2000000 8.190000 33.495318  3.9964286 14.512821 72.02564
## 10   0.2000000 8.188333 33.499636  3.9964286 14.576923 68.35897
## 11   0.2000000 8.186667 33.503955  3.9964286 14.507692 76.51282
## 12   0.2000000 8.185000 33.508273  3.9964286 14.069231 78.71053
## 13   0.2000000 8.183333 33.512591  3.9964286 14.294872 82.43590
## 14   0.2000000 8.181667 33.516909  3.9964286 14.174359 81.23077
## 15   0.2000000 8.180000 33.521227  3.9964286 14.461538 72.12821
## 16   0.2000000 8.178333 33.525545  3.9964286 14.461538 69.53846
## 17   0.2000000 8.176667 33.529864  3.9964286 13.825641 79.23077
## 18   0.2000000 8.175000 33.534182  3.9964286 13.790000 80.70000
## 19   0.2000000 8.173333 33.538500  3.9964286 13.698824 77.36471
## 20   0.2000000 8.176481 33.504000  3.9964286 14.387500 77.25000
## 21   0.2000000 8.179630 33.509000  3.9964286 14.330000 81.96667
## 22   0.2000000 8.182778 33.509411  3.9964286 13.738462 78.89189
## 23   0.2000000 8.185926 33.509821  3.9964286 14.376923 80.53846
## 24   0.2000000 8.189074 33.510232  3.9964286 14.053846 82.25641
## 25   0.2000000 8.192222 33.510643  3.9964286 14.430769 82.64103
## 26   0.2000000 8.195370 33.511054  3.9964286 14.415385 63.07692
```

```
## 27   0.2000000 8.198519 33.511464  3.9964286 14.720000 64.80000
## 28   0.2000000 8.201667 33.511875  3.9964286 13.148889 80.35556
## 29   0.2000000 8.198148 33.491000  3.9964286 13.694737 66.68421
## 30   0.2000000 8.194630 33.459000  3.9964286 13.693333 77.56667
## 31   0.2000000 8.191111 33.466867  3.9964286 13.297436 75.61538
## 32   0.2000000 8.187593 33.474734  3.9964286 12.942424 72.90909
## 33   0.2000000 8.184074 33.482602  3.9964286 12.700000 58.33333
## 34   0.2000000 8.180556 33.490469  3.9964286 12.784615 73.00000
## 35   0.2000000 8.177037 33.498336  3.9964286 12.947436 71.46154
## 36   0.2000000 8.173519 33.506203  3.9964286 13.110256 69.92308
## 37   0.2000000 8.170000 33.514070  3.9964286 13.273077 68.38462
## 38   0.2000000 8.166481 33.521937  3.9964286 13.435897 66.84615
## 39   0.2000000 8.162963 33.529805  3.9964286 13.433333 75.92105
## 40   0.2000000 8.159444 33.537672  3.9964286 13.500000 74.33333
## 41   0.2000000 8.155926 33.545539  3.9964286 13.125641 82.65789
## 42   0.2000000 8.152407 33.553406  3.9964286 13.194872 81.09818
## 43   0.2000000 8.148889 33.561273  3.9964286 13.264103 79.53846
## 44   0.2000000 8.145370 33.569141  3.9964286 14.248718 73.56410
## 45   0.2000000 8.141852 33.577008  3.9964286 13.130000 72.90000
## 46   0.2000000 8.138333 33.584875  3.9964286 12.688889 79.80000
## 47   0.2000000 8.133333 33.528000  3.9964286 13.463158 64.52632
## 48   0.2000000 8.128333 33.548500  3.9964286 13.126667 68.93333
## 49   0.2000000 8.123333 33.557292  3.9964286 13.192308 74.42105
## 50   0.2000000 8.118333 33.566083  3.9964286 12.979487 74.71053
## 51   0.2000000 8.113333 33.574875  3.9964286 12.766667 75.00000
## 52   0.2000000 8.108333 33.583667  3.9964286 12.956410 76.56410
## 53   0.2000000 8.103333 33.592458  3.9964286 11.987179 78.68421
## 54   0.2000000 8.098333 33.601250  3.9964286 13.515385 78.25641
## 55   0.2000000 8.093333 33.610042  3.9964286 13.957692 76.98718
## 56   0.2000000 8.088333 33.618833  3.9964286 14.400000 75.71795
## 57   0.2000000 8.083333 33.627625  3.9964286 11.715385 77.64103
## 58   0.2000000 8.078333 33.636417  3.9964286 13.279487 66.82051
## 59   0.2000000 8.073333 33.645208  3.9964286 13.169231 71.84211
## 60   0.2000000 8.068333 33.654000  3.9964286 12.750000 73.10000
## 61   0.2000000 8.063333 33.227857  3.9964286 11.525000 78.65000
## 62   0.2000000 8.083194 33.653000  3.9964286 13.347368 78.15789
## 63   0.2000000 8.103056 33.648500  3.9964286 12.600000 79.41379
## 64   0.2000000 8.122917 33.640075  3.9964286 12.305128 74.56410
## 65   0.2000000 8.142778 33.631650  3.9964286 12.520513 76.51282
## 66   0.2000000 8.162639 33.623225  3.9964286 13.802564 68.28205
## 67   0.2000000 8.182500 33.614800  3.9964286 13.169231 70.34211
## 68   0.2000000 8.202361 33.606375  3.9964286 15.138462 66.94872
## 69   0.2000000 8.222222 33.597950  3.9964286 15.103846 66.15385
## 70   0.2000000 8.242083 33.589525  3.9964286 15.069231 65.35897
## 71   0.2000000 8.261944 33.581100  3.9964286 13.658974 70.64103
## 72   0.2000000 8.281806 33.572675  3.9964286 14.500000 77.50000
## 73   0.2000000 8.301667 33.564250  3.9964286 12.565556 71.36667
## 74   0.2000000 8.294679 33.579000  3.9964286 14.705263 66.57895
## 75   0.2000000 8.287692 33.591000  3.9964286 13.720000 70.89655
## 76   0.2000000 8.280705 33.581391  3.9964286 15.787179 74.25641
## 77   0.2000000 8.273718 33.571782  3.9964286 15.988462 74.60256
## 78   0.2000000 8.266731 33.562174  3.9964286 16.189744 74.94872
## 79   0.2000000 8.259744 33.552565  3.9964286 14.502564 73.61538
## 80   0.2000000 8.252756 33.542956  3.9964286 14.271795 74.79487
```

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## 81   0.2000000 8.245769 33.533347  3.9964286 14.041026 75.97436
## 82   0.2000000 8.238782 33.523738  3.9964286 13.674359 68.76316
## 83   0.2000000 8.231795 33.514130  3.9964286 13.674359 68.76316
## 84   0.2000000 8.224808 33.504521  3.9964286 13.674359 68.76316
## 85   0.2000000 8.217821 33.494912  3.9964286 13.674359 68.76316
## 86   0.2000000 8.210833 33.485303  3.9964286 13.500000 75.70000
## 87   0.2000000 8.203846 33.475694  3.9964286 13.209756 81.04878
## 88   0.2000000 8.211340 33.470000  3.9964286 14.884211 76.94737
## 89   0.2000000 8.218835 33.482000  3.9964286 14.320000 78.53333
## 90   0.2000000 8.226329 33.485425  3.9964286 15.346154 75.60526
## 91   0.2000000 8.233824 33.488851  3.9964286 16.057692 78.61032
## 92   0.2000000 8.241318 33.492276  3.9964286 16.769231 81.61538
## 93   0.2000000 8.248812 33.495702  3.9964286 13.538462 81.78947
## 94   0.2000000 8.256307 33.499127  3.9964286 15.502564 80.15385
## 95   0.2000000 8.263801 33.502553  3.9964286 15.502564 80.15385
## 96   0.2000000 8.271295 33.505978  3.9964286 15.502564 80.15385
## 97   0.2000000 8.278790 33.509404  3.9964286 15.502564 80.15385
## 98   0.2000000 8.286284 33.512829  3.9964286 16.251282 80.23077
## 99   0.2000000 8.293778 33.516255  3.9964286 15.256410 70.25641
## 100  0.2000000 8.301273 33.519680  3.9964286 14.419231 73.06410
## 101  0.2000000 8.308767 33.523106  3.9964286 13.582051 75.87179
## 102  0.2000000 8.316261 33.526531  3.9964286 14.461538 75.30769
## 103  0.2000000 8.323756 33.529957  3.9964286 15.080000 48.30000
## 104  0.2000000 8.331250 33.533382  3.9964286 13.774359 80.73077
## 105  0.2000000 8.329167 33.509000  3.9964286 16.552632 84.52632
## 106  0.2000000 8.327083 33.483500  3.9964286 14.916667 86.73333
## 107  0.2000000 8.325000 33.476319  3.9964286 16.700000 83.71795
## 108  0.2000000 8.322917 33.469138  3.9964286 16.700000 83.71795
## 109  0.2000000 8.320833 33.461957  3.9964286 16.605128 82.38462
## 110  0.2000000 8.318750 33.454776  3.9964286 16.605128 82.38462
## 111  0.2000000 8.316667 33.447595  3.9964286 15.182051 77.87179
## 112  0.2000000 8.314583 33.440414  3.9964286 15.039744 78.26923
## 113  0.2000000 8.312500 33.433233  3.9964286 14.897436 78.66667
## 114  0.2000000 8.310417 33.426052  3.9964286 14.543590 82.64103
## 115  0.2000000 8.308333 33.418871  3.9964286 15.171795 83.19231
## 116  0.2000000 8.306250 33.411690  3.9964286 15.800000 83.74359
## 117  0.2000000 8.304167 33.404509  3.9964286 15.292308 81.35897
## 118  0.2000000 8.302083 33.397328  3.9964286 14.590000 80.50000
## 119  0.2000000 8.300000 33.390147  3.9964286 14.328205 86.85897
## 120  0.2000000 8.296591 33.370000  3.9964286 15.694737 83.05263
## 121  0.2000000 8.293182 33.379000  3.9964286 15.423333 86.53333
## 122  0.2000000 8.289773 33.374765  3.9964286 15.643718 84.10000
## 123  0.2000000 8.286364 33.370529  3.9964286 15.864103 81.66667
## 124  0.2000000 8.282955 33.366294  3.9964286 17.715385 76.87179
## 125  0.2000000 8.279545 33.362059  3.9964286 15.933333 80.02564
## 126  0.2000000 8.276136 33.357824  3.9964286 15.807692 80.25641
## 127  0.2000000 8.272727 33.353588  3.9964286 15.682051 80.48718
## 128  0.2000000 8.269318 33.349353  3.9964286 15.258974 79.42105
## 129  0.2000000 8.265909 33.345118  3.9964286 15.830000 83.40000
## 130  0.2000000 8.262500 33.340882  3.9964286 14.119231 85.96154
## 131  0.2000000 8.258929 33.288000  3.9964286 15.378947 81.05263
## 132  0.2000000 8.255357 33.294500  3.9964286 15.246667 85.10000
## 133  0.2000000 8.251786 33.258341  3.9964286 16.787179 79.00000
## 134  0.2000000 8.248214 33.222181  3.9964286 16.533333 78.02564
```

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## 135  0.2000000 8.244643 33.186022  3.9964286 16.279487 77.05128
## 136  0.2000000 8.241071 33.149863  3.9964286 17.215385 82.51282
## 137  0.2000000 8.237500 33.113703  3.9964286 17.288462 83.10256
## 138  0.2000000 8.233929 33.077544  3.9964286 17.361538 83.69231
## 139  0.2000000 8.230357 33.041385  3.9964286 15.884615 69.89744
## 140  0.2000000 8.226786 33.005225  3.9964286 15.743590 74.38462
## 141  0.2000000 8.223214 32.969066  3.9964286 15.602564 78.87179
## 142  0.2000000 8.219643 32.932907  3.9964286 15.474359 82.33333
## 143  0.2000000 8.216071 32.896748  3.9964286 14.760000 81.70000
## 144  0.2000000 8.212500 32.860588  3.9964286 15.050000 85.75641
## 145  0.2000000 8.181875 33.367333  3.9964286 16.895918 83.44898
## 146  0.2000000 8.151250 33.448222  3.9964286 15.684615 75.97436
## 147  0.2000000 8.120625 33.529111  3.9964286 16.976667 75.63333
## 148  0.2000000 8.090000 33.610000  3.9964286 16.295000 47.35400
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## 188  0.2000000 8.334972 29.276275  3.9964286 15.230769 64.90756
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## 396  0.2000000 8.162500 33.102647  3.9964286 14.971795 77.82051
## 397  0.2000000 8.150694 33.028000  3.9964286 15.173469 73.83673
## 398  0.2000000 8.138889 33.025668  3.9964286 11.528205 27.66667
## 399  0.2000000 8.127083 33.023337  3.9964286 15.330769 36.56410
## 400  0.2000000 8.115278 33.021005  3.9964286 15.217949 50.61538
## 401  0.2000000 8.103472 33.018674  3.9964286 15.117949 70.64103
## 402  0.2000000 8.091667 33.016342  3.9964286 15.041026 62.23077
## 403  0.2000000 8.079861 33.014011  3.9964286 15.346154 47.12821
## 404  0.2000000 8.068056 33.011679  3.9964286 15.207692 57.66667
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## 405  0.2000000 8.056250 33.009348  3.9964286 14.269231 51.38462
## 406  0.2000000 8.044444 33.007016  3.9964286 14.512821 61.23077
## 407  0.2000000 8.032639 33.004684  3.9964286 14.930000 66.70000
## 408  0.2000000 8.020833 33.002353  3.9964286 13.878205 69.70513
## 409  0.2000000 8.017468 32.919000  3.9964286 14.291837 68.97959
## 410  0.2000000 8.014103 32.961069  3.9964286 14.194872 58.94872
## 411  0.2000000 8.010737 33.003137  3.9964286 13.938462 60.58974
## 412  0.2000000 8.007372 33.045206  3.9964286 14.597436 70.92308
## 413  0.2000000 8.004006 33.087275  3.9964286 14.880769 74.11538
## 414  0.2000000 8.000641 33.129343  3.9964286 15.164103 77.30769
## 415  0.2000000 7.997276 33.171412  3.9964286 13.987179 77.71795
## 416  0.2000000 7.993910 33.213480  3.9964286 14.269231 75.07692
## 417  0.2000000 7.990545 33.255549  3.9964286 15.305128 71.79487
## 418  0.2000000 7.987179 33.297618  3.9964286 15.507692 74.76923
## 419  0.2000000 7.983814 33.339686  3.9964286 13.017949 63.12821
## 420  0.2000000 7.980449 33.381755  3.9964286 13.480000 72.10000
## 421  0.2000000 7.977083 33.423824  3.9964286 12.239744 68.74359
## 422  0.2000000 7.985714 33.413000  3.9964286 12.824490 64.75510
## 423  0.2000000 7.994345 33.418550  3.9964286 13.528205 65.28205
## 424  0.2000000 8.002976 33.424100  3.9964286 13.884615 66.65385
## 425  0.2000000 8.011607 33.429649  3.9964286 14.241026 68.02564
## 426  0.2000000 8.020238 33.435199  3.9964286 15.197436 72.51282
## 427  0.2000000 8.028869 33.440749  3.9964286 13.905128 63.05128
## 428  0.2000000 8.037500 33.446299  3.9964286 14.264103 73.33333
## 429  0.2000000 8.046131 33.451848  3.9964286 13.169231 71.41026
## 430  0.2000000 8.054762 33.457398  3.9964286 14.117949 71.57692
## 431  0.2000000 8.063393 33.462948  3.9964286 15.066667 71.74359
## 432  0.2000000 8.072024 33.468498  3.9964286 16.215385 76.56410
## 433  0.2000000 8.080655 33.474048  3.9964286 15.972692 78.78205
## 434  0.2000000 8.089286 33.479597  3.9964286 15.730000 81.00000
## 435  0.2000000 8.097917 33.485147  3.9964286 13.400000 80.19231
## 436  0.2000000 8.095313 33.458176  3.9964286 14.443590 79.63462
## 437  0.2000000 8.092708 33.431206  3.9964286 15.487179 79.07692
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## 439  0.2000000 8.087500 33.377265  3.9964286 13.801709 76.37607
## 440  0.2000000 8.084896 33.350294  3.9964286 12.958974 75.02564
## 441  0.2000000 8.082292 33.323324  3.9964286 15.076923 71.10256
## 442  0.2000000 8.079688 33.296353  3.9964286 14.873260 71.77656
## 443  0.2000000 8.077083 33.269382  3.9964286 14.669597 72.45055
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## 446  0.2000000 8.069271 33.188471  3.9964286 14.058608 74.47253
## 447  0.2000000 8.066667 33.161500  3.9964286 13.854945 75.14652
## 448  0.2000000 8.064062 33.134529  3.9964286 13.651282 75.82051
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## 456  0.2000000 8.049520 32.296333  3.9964286 15.291837 76.53061
## 457  0.2000000 8.053207 32.337289  3.9964286 18.833333 81.66667
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## 459  0.2000000 8.060581 32.419199  3.9964286 17.335897 81.57692
## 460  0.2000000 8.064268 32.460154  3.9964286 17.948718 81.33333
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## 463  0.2000000 8.075329 32.583020  3.9964286 14.156410 78.17949
## 464  0.2000000 8.079015 32.623975  3.9964286 16.128205 83.56410
## 465  0.2000000 8.082702 32.664931  3.9964286 16.642308 83.85897
## 466  0.2000000 8.086389 32.705886  3.9964286 17.156410 84.15385
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## 487  0.2000000 8.075000 33.381437  3.9964286 15.506410 81.92308
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## 495  0.2000000 8.125000 33.328518  3.9964286 19.253846 84.84615
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## 506  0.2000000 8.147487 33.338396  3.9964286 17.920513 83.10256
## 507  0.2000000 8.147128 33.339962  3.9964286 17.566667 85.05128
## 508  0.2000000 8.146769 33.341527  3.9964286 17.241026 85.12821
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## 511  0.2000000 8.145692 33.346225  3.9964286 18.341026 87.61538
## 512  0.2000000 8.145333 33.347791  3.9964286 18.584615 89.10256
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## 513  0.2000000 8.144974 33.349357  3.9964286 18.320000 89.30000
## 514  0.2000000 8.144615 33.350923  3.9964286 15.822667 88.70667
## 515  0.2000000 8.244000 27.803000  3.9964286 15.326531 77.69388
## 516  0.2000000 8.244312  0.000000  3.9964286  0.000000  0.00000
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## 530  0.2000000 8.248673 29.149577  3.9964286 17.484615 83.41026
## 531  0.2000000 8.248984 31.231690  3.9964286 17.710000 84.40000
## 532  0.2000000 8.249296 33.313803  3.9964286 16.307407 80.37037
## 533  0.2000000 8.276667 33.303000  3.9964286 16.767347 80.22449
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## 537  0.2000000 8.100000 33.593000  3.9964286 16.506250 79.36325
## 538  0.2000000 8.111576 33.559416  3.9964286 15.971795 81.84615
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## 541  0.2000000 8.146303 33.458664  3.9964286 16.517241 86.06897
## 542  0.2000000 8.157879 33.425080  3.9964286 16.606897 84.24138
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## 544  0.2000000 8.181030 33.357913  3.9964286 15.989655 77.77011
## 545  0.2000000 8.192606 33.324329  3.9964286 16.077586 76.27011
## 546  0.2000000 8.204182 33.290745  3.9964286 16.165517 74.77011
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## 548  0.2000000 8.227917 33.265121  5.2230769 15.656897 84.39655
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## 550  0.2011111 8.116998 33.269849  5.5520513 15.300000 68.37931
## 551  0.2022222 8.103212 33.263999  5.1310256 13.978495 87.68011
## 552  0.2033333 8.079416 33.294960  4.7100000 13.581218 87.01523
## 553  0.2030000 8.091906 33.296749  4.5928462 14.773563 72.25287
## 554  0.2026667 8.104397 33.298538  4.4756923 14.754023 74.44828
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## 556  0.2020000 8.129377 33.302115  4.2413846 14.387356 82.27586
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## 559  0.2010000 8.166848 33.307482  3.8899231 14.686458 75.72917
## 560  0.2006667 8.179338 33.309270  3.7727692 14.758333 72.39583
## 561  0.2003333 8.191828 33.311059  3.6556154 14.725000 80.64583
## 562  0.2000000 8.204318 33.312848  3.5384615 14.643182 85.56818
## 563  0.2062500 8.169148 33.363349  4.3178571 14.202469 85.54321
## 564  0.2125000 8.201310 33.355229  4.6653846 14.420690 84.74138
## 565  0.2095833 8.203457 33.342427  4.9043590 14.852083 83.20833
## 566  0.2066667 8.205604 33.329624  5.1433333 14.074176 89.93407
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## 567  0.2059259 8.121486 33.332796  5.0573219 14.993750 79.10417
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## 569  0.2044444 8.058358 33.322393  4.8852991 15.282979 84.51064
## 570  0.2037037 8.079347 33.308818  4.7992877 14.605263 76.94737
## 571  0.2029630 8.100337 33.295243  4.7132764 14.464583 80.18750
## 572  0.2022222 8.121327 33.281668  4.6272650 14.247826 80.80435
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## 576  0.2000000 8.199817 33.270248  6.7428571 14.458537 82.28049
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## 583  0.2184615 8.131537 33.379492  4.7228797 12.971642 88.24378
## 584  0.2166154 8.136068 33.363134  4.6782840 13.720031 83.30610
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## 586  0.2129231 8.145128 33.330418  4.5890927 14.374359 82.69231
## 587  0.2110769 8.149659 33.314060  4.5444970 14.405128 85.38462
## 588  0.2092308 8.154189 33.297703  4.4999014 14.220513 83.69231
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## 603  0.2010000 8.024198 33.486232  4.6356410 14.702564 80.10256
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## 615  0.2078222 7.886952 33.646563  4.1500000 11.096620 87.45070
## 616  0.2110667 7.905453 33.646069  3.9350000 12.689744 77.30769
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## 619  0.2208000 7.960954 33.644587  3.2900000 12.412821 73.94872
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## 621  0.2272889 7.926744 33.697294  3.5625000 11.171951 80.08537
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## 624  0.2370222 8.010924 33.607953  3.9927778 14.882051 79.92308
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## 878  0.2000000 7.999646 33.520739  4.2881556 13.602778 76.80556
## 879  0.2000000 8.027954 33.510469  4.3562063 13.879167 75.79167
## 880  0.2000000 8.056263 33.500199  4.4242570 13.587500 74.25000
## 881  0.2000000 8.084571 33.489929  4.4923077 13.550000 79.35714
## 882  0.2000000 8.085400 33.507600  8.2416667 13.780000 82.70000
## 883  0.2000000 8.109875 33.424896  4.2153846 14.900000 81.87500
## 884  0.2000000 7.946983 33.540955  4.0081731 13.442000 84.01750
## 885  0.2000000 7.784090 33.657015  3.8009615 11.984000 86.16000
## 886  0.2000000 7.760118 33.675924  3.5937500 11.676471 85.92157
## 887  0.2000000 7.809027 33.649643  3.5088942 13.591304 79.91304
## 888  0.2000000 7.857936 33.623363  3.4240385 13.560870 79.56522
## 889  0.2000000 7.906845 33.597083  3.3391827 13.732518 78.94928
## 890  0.2000000 7.955754 33.570803  3.2543269 13.904167 78.33333
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## 891  0.2000000 8.004662 33.544523  3.1694712 13.762500 81.25000
## 892  0.2000000 8.053571 33.518243  3.0846154 13.028571 79.14286
## 893  0.2000000 8.145391 33.510235  3.9000000 14.000000 75.56522
## 894  0.2000000 8.080333 33.505989  3.9392045 13.122222 78.55556
## 895  0.2000000 7.886442 33.641079  3.9784091 11.715385 82.71154
## 896  0.2000000 7.901216 33.639680  4.0176136 11.774510 82.26471
## 897  0.2000000 7.897267 33.658066  4.0568182 12.837255 78.73652
## 898  0.2000000 7.893319 33.676452  4.0960227 13.900000 75.20833
## 899  0.2000000 7.889370 33.694838  4.1352273 14.762500 76.16667
## 900  0.2000000 7.885422 33.713224  4.1744318 14.683333 76.33333
## 901  0.2000000 7.881473 33.731609  4.2136364 14.370833 76.10417
## 902  0.2000000 7.877525 33.749995  4.2528409 14.058333 75.87500
## 903  0.2000000 7.873576 33.768381  4.2920455 13.362500 75.70833
## 904  0.2000000 7.869627 33.786767  4.3312500 11.349020 81.96078
## 905  0.2000000 7.908824 33.818272  5.1208333 11.137255 85.93137
## 906  0.2000000 7.961224 33.768105  5.9104167 12.372794 76.96569
## 907  0.2000000 8.013625 33.717937  6.7000000 13.608333 68.00000
## 908  0.2000000 7.957375 33.748917  4.8120000 12.512500 75.91667
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## 910  0.2000000 7.957083 33.735668  4.5941111 15.416667 80.66667
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## 912  0.2000000 7.956792 33.722419  4.3762222 17.600000 74.08333
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## 916  0.2000000 8.130292 33.820004  3.3576923 16.958333 80.00000
## 917  0.2000000 7.875922 33.900595  3.9725962 12.007843 86.02941
## 918  0.2000000 7.880269 33.917013  4.5875000 12.023077 85.36538
## 919  0.2000000 7.913144 33.895802  4.4500000 15.400000 70.91667
## 920  0.2000000 7.946019 33.874591  4.3125000 16.035417 73.87500
## 921  0.2000000 7.978893 33.853380  4.1750000 16.670833 76.83333
## 922  0.2000000 8.011768 33.832168  4.0375000 15.385417 78.20238
## 923  0.2000000 8.044643 33.810957  3.9000000 14.100000 79.57143
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## 925  0.2000000 7.984500 33.805310  6.7583333 14.380000 80.70000
## 926  0.2143167 7.951360 33.829782  6.0168403 15.821250 80.01667
## 927  0.2286333 7.918221 33.854254  5.2753472 17.262500 79.33333
## 928  0.2429500 7.885081 33.878726  4.5338542 16.716667 81.41667
## 929  0.2572667 7.851942 33.903198  3.7923611 14.394967 84.13903
## 930  0.2715833 7.818802 33.927670  3.0508681 12.073267 86.86139
## 931  0.2859000 7.652173 33.903065  2.3093750 12.036538 85.65385
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## 939  0.2000000 7.913900 34.019450  3.9416667 12.500000 75.10000
## 940  0.2000000 7.899098 34.006261  3.9765625 13.177083 75.84167
## 941  0.2000000 7.884296 33.993072  4.0114583 13.854167 76.58333
## 942  0.2000000 7.869494 33.979883  4.0463542 12.848237 79.71474
## 943  0.2000000 7.854692 33.966694  4.0812500 11.842308 82.84615
## 944  0.2000000 7.773618 33.980779  3.9619231 11.667647 86.03922
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## 945  0.2000000 7.792213 33.930088  3.8425962 15.504167 71.62500
## 946  0.2000000 7.810809 33.879397  3.7232692 15.920833 72.00000
## 947  0.2000000 7.829404 33.828706  3.6039423 15.445833 82.66667
## 948  0.2000000 7.848000 33.778014  3.4846154 14.907143 80.07143
## 949  0.2000000 7.953800 33.787240  4.1333333 14.580000 82.30000
## 950  0.2000000 8.042167 34.098204  2.8192308 17.183333 77.75000
## 951  0.2000000 7.965177 33.990233  2.9120280 17.264583 79.91667
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## 954  0.2000000 7.814262 33.779382  3.1904196 18.983333 83.79167
## 955  0.2000000 7.817327 33.784473  3.2832168 13.567308 86.96154
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## 957  0.2000000 7.910426 33.740808  3.4688112 17.513889 85.31944
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## 968  0.2000000 8.002203 33.648341  2.9701389 18.000000 87.10417
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## 976  0.2000000 8.002458 33.559503  3.2438462 16.148611 81.36111
## 977  0.2000000 8.001895 33.558942  3.0042308 16.529167 80.75000
## 978  0.2000000 8.001332 33.558380  2.7646154 16.562500 82.87500
## 979  0.2000000 8.000769 33.557819  2.5250000 13.617308 90.30769
## 980  0.2000000 7.997886 33.567575  2.7921667 14.719071 85.25801
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## 989  0.2000000 8.009779 33.591518  2.9573317 16.139808 68.47154
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## 997  0.2000000 7.909308 33.551388  4.1478365 14.820833 79.16667
## 998  0.2000000 7.879740 33.602368  4.1379808 14.529167 84.50000
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## 999  0.2000000 7.850173 33.653348  4.1281250 12.240385 90.32692
## 1000 0.2000000 7.872853 33.640034  4.2240785 12.318627 89.06863
## 1001 0.2000000 7.917774 33.615018  4.3200321 14.500000 85.66667
## 1002 0.2000000 7.962695 33.590002  4.4159856 14.854167 88.66667
## 1003 0.2000000 8.007616 33.564986  4.5119391 15.116667 80.31250
## 1004 0.2000000 8.052537 33.539970  4.6078926 15.379167 71.95833
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## 1006 0.2326000 8.041208 33.559737  3.5320000 12.933333 86.25000
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## 1009 0.2130400 7.948330 33.560987  3.3778000 13.962500 79.20833
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## 1012 0.2000000 7.895624 33.557921  3.2568000 12.581188 88.72277
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## 1020 0.2000000 7.759844 33.655456  3.4290264 13.783333 81.08333
## 1021 0.2000000 7.647098 33.715712  3.6156250 11.401961 86.96078
## 1022 0.2000000 7.703000 33.772046  3.7604167 11.239604 87.60396
## 1023 0.2000000 7.832854 33.686473  3.9052083 12.219802 83.63531
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## 1026 0.2000000 7.804499 33.665637  2.8672187 13.683333 84.37500
## 1027 0.2000000 7.785539 33.688203  2.5104375 15.387500 82.16667
## 1028 0.2000000 7.766580 33.710770  2.1536563 14.270833 84.37500
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## 1034 0.2000000 8.029083 33.634333  4.1538462 15.320833 84.87500
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## 1053 0.2000000 7.687967 33.708042  3.3958000 18.183333 80.50000
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## 1101 0.2000000 8.040176 33.457267  2.1995833 20.393750 79.10417
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## 1107 0.2000000 8.069198 33.417919  2.8512821 16.463736 90.54945
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## 1109 0.2000000 8.088182 33.501299  3.2256410 19.739583 81.16667
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## 1124 0.2000000 8.076533 33.552787  2.5666667 16.826667 88.60000
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## 1130 0.2000000 8.009316 33.883530  3.1824631 17.537500 85.91667
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## 1139 0.2000000 8.016212 33.881333  5.3679121 17.500000 73.35714
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## 1158 0.2000000 7.868482 33.671450  4.2061197 15.406250 76.97917
## 1159 0.2000000 7.895903 33.659552  4.4257436 14.525000 74.45833
## 1160 0.2000000 7.923324 33.647654  4.6453675 15.479167 82.87500
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## 1369 0.2000000 7.997306 33.618756  5.1276923 14.861490 83.22475
## 1370 0.2000000 7.988709 33.615301  4.8934615 14.348485 82.54545
## 1371 0.2000000 7.980112 33.611846  4.6592308 14.437879 84.46970
## 1372 0.2000000 7.971515 33.608391  4.4250000 14.527273 86.39394
## 1373 0.2000000 7.959827 33.630540  5.8645833 13.919231 82.76923
## 1374 0.2000000 7.960000 33.597306  4.3250000 14.148485 80.87879
## 1375 0.2000000 7.936283 33.623527  4.1955357 14.587879 85.60606
## 1376 0.2000000 7.912567 33.649748  4.0660714 14.901515 83.65152
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## 1377 0.2000000 7.888850 33.675969  3.9366071 15.215152 81.69697
## 1378 0.2000000 7.865133 33.702190  3.8071429 13.003333 84.41515
## 1379 0.2000000 7.889800 33.677047  3.4611111 13.406667 87.13333
## 1380 0.2000000 7.733417 33.738158  3.4440000 12.113889 90.04167
## 1381 0.2000000 8.008958 33.629971  4.9307692 14.304167 83.70833
## 1382 0.2000000 8.006470 33.630925  5.1989744 14.382386 83.68750
## 1383 0.2000000 8.003982 33.631880  5.4671795 14.460606 83.66667
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## 1386 0.2000000 7.996518 33.634743  6.2717949 16.809091 80.06061
## 1387 0.2000000 7.994030 33.635697  6.5400000 13.739394 79.09091
## 1388 0.2000000 7.956113 33.664387  8.0270833 13.116981 81.35849
## 1389 0.2000000 7.966848 33.639697  6.3416667 13.260606 86.72727
## 1390 0.2000000 7.954829 33.649440  5.8513889 13.240404 84.87879
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## 1393 0.2000000 7.918772 33.678670  4.3805556 13.463636 81.07576
## 1394 0.2000000 7.906753 33.688413  3.8902778 13.727273 80.96970
## 1395 0.2000000 7.894733 33.698157  3.4000000 13.073333 88.03333
## 1396 0.2000000 7.918200 33.649133  6.0555556 13.286667 80.86667
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## 1427 0.2000000 8.028866 33.577123  4.5767857 13.653977 73.00947
## 1428 0.2000000 8.036024 33.581046  4.3535714 13.345455 69.39394
## 1429 0.2000000 8.043182 33.584970  4.1303571 13.466667 73.19697
## 1430 0.2000000 8.050339 33.588893  3.9071429 13.587879 77.00000
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## 1431 0.2000000 8.057497 33.592816  3.6839286 13.678788 71.63636
## 1432 0.2000000 8.064655 33.596739  3.4607143 13.659706 77.59943
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## 1435 0.2000000 8.122424 33.605536  3.8200000 13.809091 77.96970
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## 1437 0.2000000 8.063357 33.637019  3.5285714 12.628571 86.54762
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## 1485 0.2050000 7.770633 33.679270  3.9464286 12.263333 82.30000
## 1486 0.2000000 7.691378 33.789956  3.6344828 11.102222 86.84444
## 1487 0.2000000 7.933000 33.578742  3.8676724 14.141667 77.66667
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## 1539 0.2000000 8.133975 34.031955  4.6622088 15.362121 78.62121
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## 1593 0.2000000 8.042638 33.600923  5.3976190 16.223990 79.09848
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## 1643 0.2096667 7.910539 33.648858  5.3139423 13.857576 74.67677
## 1644 0.2112778 7.924163 33.630625  5.1720353 13.648485 74.42424
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## 1860 0.2000000 7.881606 33.744439 10.3150000 11.684848 75.36364
## 1861 0.2000000 7.874659 33.742937  4.1764706 11.424390 85.17073
## 1862 0.2000000 7.872045 33.768193  7.4394737 11.543182 79.34091
```

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## 1863 0.2000000 7.876522 33.773305  6.7445789 12.027273 79.96970
## 1864 0.2000000 7.880998 33.778417  6.0496842 12.966667 68.33333
## 1865 0.2000000 7.885474 33.783529  5.3547895 11.964833 79.16167
## 1866 0.2000000 7.889950 33.788641  4.6598947 10.963000 89.99000
## 1867 0.2000000 8.017273 33.662330  3.9650000 12.375758 83.15152
## 1868 0.2000000 7.929651 33.638723  3.2921053 12.720930 83.11628
## 1869 0.2000000 7.895500 33.660629  6.7382353 12.890476 84.76190
## 1870 0.2000000 7.888689 33.679615  6.8705882 13.593939 84.48485
## 1871 0.2000000 7.881878 33.698601  7.0029412 13.446465 84.36364
## 1872 0.2000000 7.875067 33.717587  7.1352941 13.298990 84.24242
## 1873 0.2000000 7.868256 33.736574  7.2676471 13.151515 84.12121
## 1874 0.2000000 7.861444 33.755560  7.4000000 11.357778 90.24444
## 1875 0.2000000 8.178958 33.656163  2.6961538 15.200000 80.75000
## 1876 0.2000000 7.910903 33.708774  8.2035714 12.406452 86.61290
## 1877 0.2000000 7.915837 33.776109  7.9303571 14.281818 81.36364
## 1878 0.2000000 7.920770 33.843444  7.6571429 11.330000 89.99000
## 1879 0.2000000 7.905408 33.830184  7.3839286 12.745455 82.33333
## 1880 0.2000000 7.890046 33.816924  7.1107143 12.772727 80.90909
## 1881 0.2000000 7.874684 33.803663  6.8375000 12.800000 79.48485
## 1882 0.2000000 7.859323 33.790403  6.5642857 11.629032 85.22581
## 1883 0.2000000 7.769000 33.858371  6.5689655 10.868889 82.44624
## 1884 0.2000000 8.222417 33.698954  4.1423077 14.100000 79.66667
## 1885 0.2000000 8.184846 33.701104  4.3397285 13.960606 80.19697
## 1886 0.2000000 8.147274 33.703253  4.5371493 13.821212 80.72727
## 1887 0.2000000 8.109703 33.705403  4.7345701 13.779182 81.91574
## 1888 0.2000000 8.072132 33.707553  4.9319910 13.737152 83.10421
## 1889 0.2000000 8.034561 33.709702  5.1294118 13.695122 84.29268
## 1890 0.2000000 7.953939 33.734685  8.2050000 12.569697 77.96970
## 1891 0.2000000 7.967182 33.761627  7.5578947 12.122727 78.47727
## 1892 0.2000000 7.926448 33.787135  7.4655075 13.590909 78.84848
## 1893 0.2000000 7.885713 33.812642  7.3731203 12.509517 84.14299
## 1894 0.2000000 7.844979 33.838149  7.2807331 11.428125 89.43750
## 1895 0.2000000 7.874255 33.809015  7.1883459 14.836364 81.21212
## 1896 0.2000000 7.903531 33.779882  7.0959586 13.932698 82.54154
## 1897 0.2000000 7.932806 33.750748  7.0035714 13.029032 83.87097
## 1898 0.2000000 7.680273 33.764355  6.5965517 11.538636 90.13636
## 1899 0.2000000 8.102333 33.996704  5.6269231 15.541667 80.50000
## 1900 0.2000000 8.081806 33.905211  5.6284750 16.572348 82.53788
## 1901 0.2000000 8.061278 33.813718  5.6300270 17.603030 84.57576
## 1902 0.2000000 8.040750 33.722225  5.6315789 16.031818 82.95455
## 1903 0.2000000 7.936818 33.762697  6.7100000 16.018182 81.42424
## 1904 0.2000000 7.840262 33.720810  5.5735294 13.797619 85.97619
## 1905 0.2000000 7.824192 33.733369  5.9087395 15.800325 84.57900
## 1906 0.2000000 7.808121 33.745929  6.2439496 17.803030 83.18182
## 1907 0.2000000 7.792051 33.758488  6.5791597 15.690909 83.21212
## 1908 0.2000000 7.775980 33.771048  6.9143697 11.750000 91.11765
## 1909 0.2000000 7.843138 33.743174  7.2495798 13.655303 87.18004
## 1910 0.2000000 7.910296 33.715301  7.5847899 15.560606 83.24242
## 1911 0.2000000 7.977455 33.687427  7.9200000 14.021212 76.39394
## 1912 0.2000000 7.923439 33.666120  6.1764706 14.234146 83.00000
## 1913 0.2000000 8.063422 33.649727  4.7447368 14.304444 83.88889
## 1914 0.2011000 8.017518 33.659990  4.6514098 15.335556 83.48990
## 1915 0.2022000 7.971614 33.670254  4.5580827 16.366667 83.09091
## 1916 0.2033000 7.925710 33.680517  4.4647556 15.075269 85.28739
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## 1917 0.2044000 7.879806 33.690781  4.3714286 13.783871 87.48387
## 1918 0.2055000 8.115917 33.700012  4.9461538 16.937500 85.04167
## 1919 0.2066000 7.797578 33.708033  6.0206897 12.362222 90.00000
## 1920 0.2077000 7.816407 33.717180  6.2161686 17.939394 84.75758
## 1921 0.2088000 7.835236 33.726327  6.4116475 16.777273 83.95455
## 1922 0.2099000 7.854066 33.735474  6.6071264 15.615152 83.15152
## 1923 0.2110000 7.872895 33.744621  6.8026054 13.910127 86.94310
## 1924 0.2121000 7.891724 33.753767  6.9980843 12.205102 90.73469
## 1925 0.2132000 7.903627 33.710488  7.1935632 15.712121 83.03030
## 1926 0.2143000 7.915529 33.667208  7.3890421 15.739394 82.81818
## 1927 0.2154000 7.927431 33.623928  7.5845211 15.587879 81.93939
## 1928 0.2165000 7.939333 33.580648  7.7800000 12.784848 79.30303
## 1929 0.2000000 7.979432 33.563455  6.6736842 13.031818 76.00000
## 1930 0.2000000 7.868805 33.604185  5.5500000 13.187805 83.09756
## 1931 0.2000000 7.822903 33.677894  4.7714286 13.835484 88.19355
## 1932 0.2000000 8.090792 33.694935  6.8769231 15.737500 83.50000
## 1933 0.2000000 7.852289 33.711976 11.3724138 12.315556 88.62222
## 1934 0.2000000 7.841773 33.713781 10.7856404 14.694141 85.02323
## 1935 0.2000000 7.831258 33.715587 10.1988670 17.072727 81.42424
## 1936 0.2000000 7.820742 33.717393  9.6120936 14.175758 78.21212
## 1937 0.2000000 7.810227 33.719198  9.0253202 13.480570 81.44534
## 1938 0.2000000 7.799712 33.721004  8.4385468 12.785383 84.67855
## 1939 0.2000000 7.789196 33.722810  7.8517734 12.090196 87.91176
## 1940 0.2000000 8.026939 33.576506  7.2650000 15.242424 81.72727
## 1941 0.2000000 8.037026 33.559892  8.4029412 15.639474 85.34211
## 1942 0.2000000 8.058911 33.547271 10.1131579 16.002222 73.93333
## 1943 0.2000000 7.991730 33.571742  8.4565789 18.100000 82.03030
## 1944 0.2000000 7.924548 33.596213  6.8000000 14.106452 89.29032
## 1945 0.2000000 7.742744 33.611360  8.4758621 12.809302 91.32558
## 1946 0.2000000 8.059958 33.573975  6.3307692 17.995833 86.12500
## 1947 0.2000000 8.025313 33.577797  6.4612393 16.641856 84.62311
## 1948 0.2000000 7.990668 33.581619  6.5917094 15.287879 83.12121
## 1949 0.2000000 7.956023 33.585441  6.7221795 14.612968 84.60071
## 1950 0.2000000 7.921378 33.589264  6.8526496 13.938057 86.08021
## 1951 0.2000000 7.886733 33.593086  6.9831197 13.263146 87.55971
## 1952 0.2000000 7.852088 33.596908  7.1135897 12.588235 89.03922
## 1953 0.2000000 7.920003 33.552979  7.2440598 15.103030 82.03030
## 1954 0.2000000 7.987918 33.509050  7.3745299 16.172727 81.60606
## 1955 0.2000000 8.055833 33.465121  7.5050000 15.108333 74.25000
## 1956 0.2000000 7.934156 33.385787  8.0315789 14.342222 82.51111
## 1957 0.2367000 7.917381 33.371012  2.8941176 14.080952 87.30952
## 1958 0.2348154 7.946333 33.413456  3.0270308 14.971429 83.90476
## 1959 0.2329308 7.957651 33.408476  3.1599440 15.606061 83.57576
## 1960 0.2310462 7.968968 33.403497  3.2928571 13.290323 88.93548
## 1961 0.2291615 7.912256 33.485895  2.4103448 12.400000 90.23256
## 1962 0.2272769 7.962208 33.375087  2.7038462 14.454167 84.37500
## 1963 0.2253923 7.938166 33.418960  2.8802036 15.042235 83.94508
## 1964 0.2235077 7.914124 33.462832  3.0565611 15.630303 83.51515
## 1965 0.2216231 7.890082 33.506705  3.2329186 15.430303 85.00000
## 1966 0.2197385 7.866040 33.550577  3.4092760 12.450495 89.47525
## 1967 0.2178538 7.904571 33.493638  3.5856335 14.072217 86.14671
## 1968 0.2159692 7.943103 33.436698  3.7619910 15.693939 82.81818
## 1969 0.2140846 7.981635 33.379759  3.9383484 15.475758 83.24242
## 1970 0.2122000 8.020167 33.322819  4.1147059 14.261905 86.04762
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## 1971 0.2001667 8.024756 33.310847  4.5131579 14.188889 84.37778
## 1972 0.2191667 8.004152 33.336312  2.4600000 13.903030 83.48485
## 1973 0.2175694 7.942097 33.415845  2.6321429 13.351613 84.16129
## 1974 0.2159722 8.048833 33.392458  4.8923077 15.170833 78.62500
## 1975 0.2143750 7.892795 33.508641  2.8793103 12.870455 89.68182
## 1976 0.2127778 8.120000 33.588000  3.0073402 19.230000 71.80000
## 1977 0.2111806 8.074684 33.556717  3.1353700 17.668485 74.75556
## 1978 0.2095833 8.029368 33.525433  3.2633999 16.106970 77.71111
## 1979 0.2079861 7.984051 33.494150  3.3914297 14.545455 80.66667
## 1980 0.2063889 7.938735 33.462867  3.5194596 13.132353 89.42157
## 1981 0.2047917 7.951485 33.445948  3.6474894 14.793939 78.42424
## 1982 0.2031944 7.964234 33.429030  3.7755193 15.106061 78.16667
## 1983 0.2015972 7.976984 33.412112  3.9035491 15.418182 77.90909
## 1984 0.2000000 7.989733 33.395193  4.0315789 15.733333 82.51111
## 1985 0.2000000 7.993212 33.382530  3.1450000 15.509091 85.15152
## 1986 0.2127000 7.887429 33.382598  3.1382353 15.476190 87.04762
## 1987 0.2118533 7.983677 33.385184  3.0285714 14.103226 86.25806
## 1988 0.2110067 8.063250 33.373321  4.1884615 15.725000 77.37500
## 1989 0.2101600 7.929867 33.461573  3.3827586 13.108889 87.60000
## 1990 0.2093133 7.931072 33.458876  3.4004454 13.051616 87.52323
## 1991 0.2084667 7.932277 33.456179  3.4181322 12.994343 87.44646
## 1992 0.2076200 7.933482 33.453481  3.4358190 12.937071 87.36970
## 1993 0.2067733 7.934687 33.450784  3.4535057 12.879798 87.29293
## 1994 0.2059267 7.944612 33.435880  3.4711925 14.927273 75.18182
## 1995 0.2050800 7.954538 33.420976  3.4888793 14.642424 73.63636
## 1996 0.2042333 7.964463 33.406072  3.5065661 14.357576 72.09091
## 1997 0.2033867 7.974389 33.391168  3.5242529 14.072727 70.54545
## 1998 0.2025400 7.984314 33.376264  3.5419397 14.108081 71.71717
## 1999 0.2016933 7.994240 33.361360  3.5596264 14.143434 72.88889
## 2000 0.2008467 8.004165 33.346456  3.5773132 14.178788 74.06061
## 2001 0.2000000 8.014091 33.331552  3.5950000 14.036364 75.54545
## 2002 0.2000000 8.021165 33.339878  4.6063235 14.256277 74.17749
## 2003 0.2000000 8.028238 33.348205  5.6176471 14.476190 72.80952
## 2004 0.2000000 8.041311 33.338380  5.2684211 14.642222 73.42222
## 2005 0.2000000 8.002188 33.370032  3.5859962 14.757576 71.39394
## 2006 0.2000000 7.963065 33.401684  1.9035714 13.506452 85.22581
## 2007 0.2000000 7.916000 33.483973  1.3000000 12.922727 89.97727
## 2008 0.2000000 7.935958 33.366483  3.6000000 14.079167 79.04167
## 2009 0.2000000 7.926763 33.396615  3.5577778 14.538068 80.67235
## 2010 0.2000000 7.917567 33.426746  3.5155556 14.996970 82.30303
## 2011 0.2000000 7.908372 33.456877  3.4733333 14.681818 75.27273
## 2012 0.2000000 7.899176 33.487009  3.4311111 13.809046 81.62166
## 2013 0.2000000 7.889980 33.517140  3.3888889 12.936275 87.97059
## 2014 0.2000000 7.935750 33.484376  3.3466667 14.039349 87.15196
## 2015 0.2000000 7.981520 33.451611  3.3044444 15.142424 86.33333
## 2016 0.2000000 8.027291 33.418846  3.2622222 15.239394 86.78788
## 2017 0.2000000 8.073061 33.386082  3.2200000 14.854545 83.09091
## 2018 0.2000000 8.072159 33.381552  3.2368421 14.838636 81.63636
## 2019 0.2000000 8.070595 33.397433  2.4558824 14.883333 87.85714
## 2020 0.2000000 7.968524 33.424071  5.7153846 13.142857 90.00000
## 2021 0.2000000 7.969526 33.409932  2.9142857 14.178947 89.00000
## 2022 0.2000000 7.964694 33.302100  3.4550000 15.269444 85.08333
## 2023 0.2000000 8.045000 33.352609  2.1187500 14.513636 90.27273
## 2024 0.2000000 8.014684 33.395558  2.2381250 14.894697 81.92424
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## 2025 0.2000000 7.984368 33.438507  2.3575000 15.275758 73.57576
## 2026 0.2000000 7.954051 33.481455  2.4768750 13.979545 82.40553
## 2027 0.2000000 7.923735 33.524404  2.5962500 12.683333 91.23529
## 2028 0.2000000 7.925804 33.511827  2.7156250 15.157576 80.00000
## 2029 0.2000000 7.927873 33.499250  2.8350000 15.068182 79.10606
## 2030 0.2000000 7.929942 33.486674  2.9543750 14.978788 78.21212
## 2031 0.2000000 7.932011 33.474097  3.0737500 14.849242 78.55303
## 2032 0.2000000 7.934080 33.461520  3.1931250 14.719697 78.89394
## 2033 0.2000000 7.936149 33.448943  3.3125000 14.590152 79.23485
## 2034 0.2000000 7.938218 33.436367  3.4318750 14.460606 79.57576
## 2035 0.2000000 7.940286 33.423790  3.5512500 14.543939 79.60606
## 2036 0.2000000 7.942355 33.411213  3.6706250 14.627273 79.63636
## 2037 0.2000000 7.944424 33.398636  3.7900000 13.654545 80.57576
## 2038 0.2000000 7.927167 33.444195  3.1764706 13.380952 83.35714
## 2039 0.2000000 7.962386 33.402793  5.1342105 13.852273 76.52273
## 2040 0.2083333 7.798461 33.713014  4.9327530 11.872549 89.85294
## 2041 0.2166667 7.817179 33.636586  4.7312955 12.117953 86.34804
## 2042 0.2250000 7.835897 33.560159  4.5298381 12.363358 82.84314
## 2043 0.2333333 7.854615 33.483732  4.3283806 12.608762 79.33824
## 2044 0.2416667 7.873333 33.407304  4.1269231 12.854167 75.83333
## 2045 0.2500000 7.819581 33.617658  3.8357143 11.964516 84.09677
## 2046 0.2583333 7.702375 33.804778  2.5421053 11.246875 86.65625
## 2047 0.2666667 7.776308 33.791015  4.1700000 13.106522 77.32609
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## 2049 0.2833333 7.899098 33.661952  5.0876316 13.799144 76.44203
## 2050 0.2916667 7.960494 33.597421  5.5464474 14.145455 76.00000
## 2051 0.3000000 8.021889 33.532889  6.0052632 13.746667 75.13333
## 2052 0.6166667 7.999576 33.554518  6.3150000 13.096970 74.63636
## 2053 0.3400000 7.942595 33.567255  5.3970588 12.557143 79.78571
## 2054 0.3489583 7.866032 33.734461  3.9821429 11.812903 84.25806
## 2055 0.3579167 7.799907 33.828679  4.2931034 11.223256 88.11628
## 2056 0.3668750 8.055667 33.633696  4.1923077 13.366667 79.95833
## 2057 0.3758333 8.024558 33.662380  4.3928994 13.478788 78.64899
## 2058 0.3847917 7.993449 33.691065  4.5934911 13.590909 77.33965
## 2059 0.3937500 7.962340 33.719749  4.7940828 13.703030 76.03030
## 2060 0.4027083 7.931231 33.748434  4.9946746 13.548485 76.43182
## 2061 0.4116667 7.900123 33.777119  5.1952663 13.393939 76.83333
## 2062 0.4206250 7.869014 33.805803  5.3958580 13.239394 77.23485
## 2063 0.4295833 7.837905 33.834488  5.5964497 13.084848 77.63636
## 2064 0.4385417 7.806796 33.863172  5.7970414 12.384848 77.39394
## 2065 0.4475000 7.775687 33.891857  5.9976331 11.538503 82.37834
## 2066 0.4564583 7.744578 33.920541  6.1982249 10.692157 87.36275
## 2067 0.4654167 7.833729 33.816820  6.3988166 12.233333 73.75758
## 2068 0.4743750 7.922880 33.713100  6.5994083 13.769697 64.63636
## 2069 0.4833333 8.012030 33.609379  6.8000000 13.403030 66.00000
## 2070 0.2000000 8.011273 33.573095  5.0552632 13.586364 74.79545
## 2071 0.2000000 7.951643 33.573974  3.6294118 12.978571 85.00000
## 2072 0.2125000 7.784140 33.818279  2.9172414 11.062791 88.11628
## 2073 0.2250000 7.838806 33.763332  3.2285714 12.306452 84.87097
## 2074 0.2375000 7.970792 33.790669  4.0653846 13.400000 81.75000
## 2075 0.2500000 7.885028 33.818005  4.0061589 13.484848 80.34470
## 2076 0.2625000 7.799263 33.845342  3.9469331 13.569697 78.93939
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## 2079 0.3000000 7.704531 33.841543  3.7692559 12.242543 85.32620
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## 2081 0.3250000 7.858123 33.724599  3.6508044 14.506061 80.60606
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## 2087 0.2000000 7.849355 33.657642  3.4392857 12.322581 85.32258
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## 2090 0.2000000 7.767128 33.763232  2.8428571 14.093131 80.68813
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## 2092 0.2000000 7.743429 33.771506  2.9285714 11.630612 87.82653
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## 2094 0.2000000 7.794972 33.730737  3.0142857 16.387879 80.87879
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## 2101 0.2000000 8.045644 33.542496  4.3973684 16.722222 80.40000
## 2102 0.2000000 8.099833 33.498974  2.7294118 15.457143 84.80952
## 2103 0.2000000 8.094589 33.493562  2.9117380 16.597691 83.02453
## 2104 0.2000000 8.089345 33.488151  3.0940642 17.738240 81.23954
## 2105 0.2000000 8.084102 33.482740  3.2763904 18.878788 79.45455
## 2106 0.2000000 8.078858 33.477329  3.4587166 18.308081 80.52525
## 2107 0.2000000 8.073614 33.471917  3.6410428 17.737374 81.59596
## 2108 0.2000000 8.068370 33.466506  3.8233690 17.166667 82.66667
## 2109 0.2000000 8.063126 33.461095  4.0056952 16.649495 82.51515
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## 2112 0.2000000 8.047394 33.444861  4.5526738 15.351515 79.69697
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## 2117 0.3444444 8.023333 33.440618  3.6250327 14.145455 77.78788
## 2118 0.4166667 8.110848 33.426124  3.7743137 16.196970 76.69697
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## 2129 0.5666667 8.071419 33.377374  7.1187500 17.543434 73.09343
## 2130 0.6888889 8.085588 33.372235  7.2472222 17.586869 73.06187
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## 2136 1.4222222 8.032364 33.280633  8.0180556 15.203030 71.89394
## 2137 1.5444444 8.071182 33.258330  8.1465278 15.342424 66.06061
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## 3101 0.2000000 7.937583 33.506110  5.6409067 12.697917 88.56250
## 3102 0.2000000 7.823222 33.499227  5.8128527 12.704444 86.33333
## 3103 0.2000000 8.081091 33.278203  5.9847988 13.657576 60.21212
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## 3107 0.2000000 8.065040 33.379637  6.6725829 13.609091 76.07071
## 3108 0.2000000 8.055091 33.393979  6.8445290 13.521212 76.00000
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## 3591 0.2000000 8.081212 33.348667  3.4645556 14.149242 81.88697
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## 3595 0.2000000 8.086000 33.230489  3.1910526 13.843333 83.06889
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## 3649 0.3352941 8.094141 33.394758  4.0507941 13.657879 77.95616
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## 3653 0.2811765 8.103434 33.399727  4.1026765 13.461717 73.61354
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## 8092        NA        NA        NA        NA        NA        NA
## 8093        NA        NA        NA        NA        NA        NA
## 8094        NA        NA        NA        NA        NA        NA
## 8095        NA        NA        NA        NA        NA        NA
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```

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## 8332        NA        NA        NA         NA        NA        NA
## 8333        NA        NA        NA         NA        NA        NA
##  [ reached 'max' / getOption("max.print") -- omitted 3035 rows ]
```

```
####### 5 YEAR - 1996 - 2001 ########################################
ts_chlorophyll <- ts(owt_df02_gb04_mrgd$CHLOROPHYLL, start = c(1996, 1), freq = 365)
ts_1996_2001_chl <- window(ts_chlorophyll, start=c(1999, 1))
stl_chl <- stl(ts_1996_2001_chl, s.window="periodic")
#labels.chart = seq(as.Date("1990-11-15"), as.Date("2021-12-29"), by = "weeks")
plot(stl_chl)
mtext("CHLOROPHYLL", side=3, line = -5)
```

```
ts_do <- ts(owt_df02_gb04_mrgd$DO, start = c(1996, 1), freq = 365)
ts_1996_2001_do <- window(ts_do, start=c(1999, 1))
stl_do <- stl(ts_1996_2001_do, s.window="periodic")
#labels.chart = seq(as.Date("1990-11-15"), as.Date("2021-12-29"), by = "weeks")
plot(stl_do)
mtext("DO", side=3, line = -5)
```

```
ts_ent <- ts(owt_df02_gb04_mrgd$ENTERO, start = c(1996, 1), freq = 365)
ts_1996_2001_ent <- window(ts_ent, start=c(1999, 1))
stl_ent <- stl(ts_1996_2001_ent, s.window="periodic")
#labels.chart = seq(as.Date("1990-11-15"), as.Date("2021-12-29"), by = "weeks")
plot(stl_ent)
mtext("ENTERO", side=3, line = -5)
```

```
ts_fecal <- ts(owt_df02_gb04_mrgd$FECAL, start = c(1996, 1), freq = 365)
ts_1996_2001_fecal <- window(ts_fecal, start=c(1999, 1))
stl_fecal <- stl(ts_1996_2001_fecal, s.window="periodic")
#labels.chart = seq(as.Date("1990-11-15"), as.Date("2021-12-29"), by = "weeks")
plot(stl_fecal)
mtext("FECAL", side=3, line = -5)
```

```
ts_og <- ts(owt_df02_gb04_mrgd$OG, start = c(1996, 1), freq = 365)
ts_1996_2001_og <- window(ts_og, start=c(1999, 1))
stl_og <- stl(ts_1996_2001_og, s.window="periodic")
#labels.chart = seq(as.Date("1990-11-15"), as.Date("2021-12-29"), by = "weeks")
plot(stl_og)
mtext("OG", side=3, line = -5)
```

```
ts_ph <- ts(owt_df02_gb04_mrgd$PH, start = c(1996, 1), freq = 365)
ts_1996_2001_ph <- window(ts_ph, start=c(1999, 1))
stl_ph <- stl(ts_1996_2001_ph, s.window="periodic")
#labels.chart = seq(as.Date("1990-11-15"), as.Date("2021-12-29"), by = "weeks")
plot(stl_ph)
mtext("PH", side=3, line = -5)
```

```
ts_salinity <- ts(owt_df02_gb04_mrgd$SALINITY, start = c(1996, 1), freq = 365)
ts_1996_2001_salinity <- window(ts_salinity, start=c(1999, 1))
stl_salinity <- stl(ts_1996_2001_salinity, s.window="periodic")
#labels.chart = seq(as.Date("1990-11-15"), as.Date("2021-12-29"), by = "weeks")
plot(stl_salinity)
mtext("SALINITY", side=3, line = -5)
```

```
ts_suso <- ts(owt_df02_gb04_mrgd$SUSO, start = c(1996, 1), freq = 365)
ts_1996_2001_suso <- window(ts_suso, start=c(1999, 1))
stl_suso <- stl(ts_1996_2001_suso, s.window="periodic")
#labels.chart = seq(as.Date("1990-11-15"), as.Date("2021-12-29"), by = "weeks")
plot(stl_suso)
mtext("SUSO", side=3, line = -5)
```

```
ts_temp <- ts(owt_df02_gb04_mrgd$TEMP, start = c(1996, 1), freq = 365)
ts_1996_2001_temp <- window(ts_temp, start=c(1999, 1))
stl_temp <- stl(ts_1996_2001_temp, s.window="periodic")
#labels.chart = seq(as.Date("1990-11-15"), as.Date("2021-12-29"), by = "weeks")
plot(stl_temp)
mtext("TEMP", side=3, line = -5)
```

```
ts_xms <- ts(owt_df02_gb04_mrgd$XMS, start = c(1996, 1), freq = 365)
ts_1996_2001_xms <- window(ts_xms, start=c(1999, 1))
stl_xms <- stl(ts_1996_2001_xms, s.window="periodic")
#labels.chart = seq(as.Date("1990-11-15"), as.Date("2021-12-29"), by = "weeks")
plot(stl_xms)
mtext("XMS", side=3, line = -5)
```

{r CC-EDA-STL-1YEARPERIOD}

1 YEAR - 2001

ts_chlorophyll <- ts(owt_df02_gb04_mrgd$CHLOROPHYLL, start = c(2001, 1), freq = 365) ts_1996_2001_chl <- window(ts_chlorophyll, start=c(2001, 1), end=c(2001, 2)) plot(ts_1996_2001_chl) stl_chl <- stl(ts_1996_2001_chl, s.window="periodic") #labels.chart = seq(as.Date("1990-11-15"), as.Date("2021-12-29"), by = "weeks") plot(stl_chl) mtext("CHLOROPHYLL", side=3, line = -5)

```
library(forecast)

# All parameters exhibited seasonal cycles within a year range, so
# it would make sense to have several years worth of datapoints for the training period.
↪  This set below can be used for all parameters.
train <- head(owt_df02_gb04_mrgd, round(NROW(owt_df02_gb04_mrgd) * 0.6))
h <- length(owt_df02_gb04_mrgd) - NROW(train)
test <- tail(owt_df02_gb04_mrgd, h)
```

Display new dataframes (no longer applicable)

```
#print(head(owt_df02_gb04_mrgd, 17))
#print(head(owt_df02_gb09_mrgd, 17))
#print(head(owt_df02_gb07_mrgd, 17))

#owt_df02_gb04_tbbl <- as_tibble(owt_df02_gb04_mrgd, index = date_sample)
#owt_df02_gb04_wkly_tbbl <- as_tibble(owt_df02_gb04_wkly, index = date_sample)
#owt_df02_gb09_tbbl <- as_tibble(owt_df02_gb09_mrgd, key = project, index = date_sample)
```

```
#owt_df02_gb09_wkly_tbbl <- as_tibble(owt_df02_gb09_wkly, key = project, index =
↪  date_sample)
#owt_df02_gb07_tbbl <- as_tibble(owt_df02_gb07_mrgd, key = c(project, depth_m_bin), index
↪  = date_sample)
#owt_df02_gb07_wkly_tbbl <- as_tibble(owt_df02_gb07_wkly, key = c(project, depth_m_bin),
↪  index = date_sample)

#print(head(owt_df02_gb04_tbbl, 17))
#print(head(owt_df02_gb04_wkly_tbbl, 17))
#print(head(owt_df02_gb09_tbbl, 17))
#print(head(owt_df02_gb09_wkly_tbbl, 17))
#print(head(owt_df02_gb07_tbbl, 17))
#print(head(owt_df02_gb07_wkly_tbbl, 17))
```

Define custom function to produce scatterplots comparing multiple predictors to one target

```
param_lst03 <- c("CHLOROPHYLL",
                 "DENSITY",
                 "DO",
                 "FECAL",
                 "OG",
                 "PH",
                 "SALINITY",
                 "SUSO",
                 "TEMP",
                 "XMS")

scatr <- function(df = NA,
                  y = NA,
                  x_lst = c()) {
  for (p in x_lst) {
    plot <- ggplot(df, aes(df[, p], df[, y])) +
    geom_point() +
    stat_smooth(method = "lm",
                formula = y ~ x,
                geom = "smooth") +
    labs(x = p,
         y = y,
         title = "Figure",
         subtitle = paste0("Scatterplot of ", p, " and ", y, " Series"))
    print(plot)
  }
}
```

Run custom function on data aggregated by `date_sample` and `parameter`

```
# All data
scatr(df = owt_df02_gb04_wkly,
      y = "ENTERO",
      x_lst = param_lst03)
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
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## to continuous.
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## to continuous.
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## to continuous.
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## to continuous.
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## to continuous.
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## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
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## to continuous.
```

Figure

Scatterplot of XMS and ENTERO Series

```
# Excluding outliers
print(head(owt_df02_gb04_wkly02, 17))
```

```
##    date_sample CHLOROPHYLL DENSITY       DO      ENTERO     FECAL OG       PH
## 1   1990-11-19        1.07  23.854 6.980000          NA        NA NA 8.130000
## 2   1991-01-07          NA      NA       NA   25.384615  88.46154 NA       NA
## 3   1991-01-14          NA      NA 5.445417   58.129735 137.21730 NA 8.195000
## 4   1991-01-21          NA      NA       NA   23.205128  59.61538 NA       NA
## 5   1991-01-28          NA      NA       NA   31.818910  69.78365 NA       NA
## 6   1991-02-04          NA      NA       NA  154.230769 428.58974 NA       NA
## 7   1991-02-11          NA      NA       NA   16.838141  14.63141 NA       NA
## 8   1991-02-18          NA      NA 5.597500   45.317879 112.33029 NA 8.173333
## 9   1991-02-25          NA      NA       NA    9.083333  16.10737 NA       NA
## 10  1991-03-04          NA      NA       NA   16.512821  15.05128 NA       NA
## 11  1991-03-11          NA      NA 4.808333   43.496041 247.95270 NA 8.201667
## 12  1991-03-18          NA      NA       NA   32.542347 179.98990 NA       NA
## 13  1991-03-25          NA      NA       NA 1370.111538 517.44812 NA       NA
## 14  1991-04-01          NA      NA       NA   15.025641  33.15385 NA       NA
## 15  1991-04-08          NA      NA       NA   38.837607 136.90598 NA       NA
## 16  1991-04-15          NA      NA 4.730833   43.944524 190.35018 NA 8.138333
## 17  1991-04-22          NA      NA       NA   24.313390  77.44160 NA       NA
##    SALINITY SUSO     TEMP      XMS
## 1  33.59550   NA 19.37000 60.22500
## 2        NA   NA 14.45000 81.96154
## 3  33.50113   NA 14.07478 82.04876
## 4        NA   NA 14.54487 70.19231
```

```
## 5        NA   NA 14.28846 77.61167
## 6        NA   NA 14.23462 81.83333
## 7        NA   NA 14.46154 70.83333
## 8  33.51717   NA 14.00639 79.30243
## 9        NA   NA 14.05769 79.71518
## 10       NA   NA 14.24231 82.44872
## 11 33.48729   NA 13.93447 70.49667
## 12       NA   NA 12.97995 68.95260
## 13       NA   NA 13.11026 69.92308
## 14       NA   NA 13.46667 75.12719
## 15       NA   NA 13.19487 81.09818
## 16 33.55379   NA 13.33149 71.94475
## 17       NA   NA 12.97949 74.71053
```

```
scatr(df = owt_df02_gb04_wkly02,
      y = "ENTERO",
      x_lst = param_lst03)
```

```
## Warning: Removed 618 rows containing non-finite values (`stat_smooth()`).
```

```
## Warning: Removed 618 rows containing missing values (`geom_point()`).
```

Figure

Scatterplot of CHLOROPHYLL and ENTERO Series

```
## Warning: Removed 579 rows containing non-finite values (`stat_smooth()`).
```

```
## Warning: Removed 579 rows containing missing values (`geom_point()`).
```

Figure

Scatterplot of DENSITY and ENTERO Series

```
## Warning: Removed 473 rows containing non-finite values (`stat_smooth()`).
## Warning: Removed 473 rows containing missing values (`geom_point()`).
```

Figure

Scatterplot of DO and ENTERO Series

```
## Warning: Removed 71 rows containing non-finite values (`stat_smooth()`).
## Warning: Removed 71 rows containing missing values (`geom_point()`).
```

Figure

Scatterplot of FECAL and ENTERO Series

```
## Warning: Removed 1273 rows containing non-finite values (`stat_smooth()`).
## Warning: Removed 1273 rows containing missing values (`geom_point()`).
```

```
## Warning: Removed 476 rows containing non-finite values (`stat_smooth()`).
## Warning: Removed 476 rows containing missing values (`geom_point()`).
```

Figure

Scatterplot of PH and ENTERO Series

```
## Warning: Removed 474 rows containing non-finite values (`stat_smooth()`).
## Warning: Removed 474 rows containing missing values (`geom_point()`).
```

Figure

Scatterplot of SALINITY and ENTERO Series

```
## Warning: Removed 1255 rows containing non-finite values (`stat_smooth()`).
## Warning: Removed 1255 rows containing missing values (`geom_point()`).
```

Figure

Scatterplot of SUSO and ENTERO Series

```
## Warning: Removed 132 rows containing non-finite values (`stat_smooth()`).
## Warning: Removed 132 rows containing missing values (`geom_point()`).
```

Figure

Scatterplot of TEMP and ENTERO Series

```
## Warning: Removed 146 rows containing non-finite values (`stat_smooth()`).
## Warning: Removed 146 rows containing missing values (`geom_point()`).
```

Define custom function to display time series plots at multiple agg levels

```
# i = parameter
# j = project
# k = depth
time_plt <- function(df = NA,
                     date = NA,
                     l1 = c(),
                     l2_name = NA,
                     l2 = c(),
                     l3_name = NA,
                     l3 = c()) {
  if(length(l3) == 0 & length(l2) == 0) {
    for(i in l1) {
      df_01a <- df
      par(mar = c(5,5,5,2))
      try(print(acf(df_01a[, i],
                    pl = TRUE,
                    na.action = na.pass,
                    main = paste0("ACF Plot for ", i))))
      plot <- ggplot(df_01a, aes(x = df_01a[, date], y = df_01a[, i], group = 1)) +
        geom_line() +
        labs(x = "Time",
             y = i,
             title = "Figure",
```

```
            subtitle = paste0("Time Series Plot for ", i))
      print(plot)
    }
  }
  if(length(l3) == 0) {
    for(i in l1) {
      for(j in l2) {
          df_01a <- df[df[, l2_name] == j, ]
          par(mar = c(5,5,5,2))
          try(print(acf(df_01a[, i],
                        pl = TRUE,
                        na.action = na.pass,
                        main = paste0("ACF Plot for ", i, " (", j, ")"))))
          plot <- ggplot(df_01a, aes(x = df_01a[, date], y = df_01a[, i], group = 1)) +
            geom_line() +
            labs(x = "Time",
                 y = i,
                 title = "Figure",
                 subtitle = paste0("Time Series Plot for ", i, " (", j, ")"))
          print(plot)
      }
    }
  }
  else {
    for(i in l1) {
      for(j in l2) {
        for(k in l3) {
          df_01a <- df[df[, l2_name] == j & df[, l3_name] == k, ]
          par(mar = c(5,5,5,2))
          try(print(acf(df_01a[, i],
                        pl = TRUE,
                        na.action = na.pass,
                        main = paste0("ACF Plot for ", i, " (", j, ": ", k, ")"))))
          plot <- ggplot(df_01a, aes(x = df_01a[, date], y = df_01a[, i], group = 1)) +
            geom_line() +
            labs(x = "Time",
                 y = i,
                 title = "Figure",
                 subtitle = paste0("Time Series Plot for ", i, " (", j, ": ", k, ")"))
          print(plot)
        }
      }
    }
  }
}
```

Setup reference value lists for time series plotting

```
param_lst04 <- c("CHLOROPHYLL",
                 "DENSITY",
                 "DO",
                 "ENTERO",
```

```
                 "FECAL",
                 "PH",
                 "SALINITY",
                 "TEMP",
                 "XMS")

param_lst05 <- c("ENTERO")

uniq_proj <- unique(owt_df02_gb07_mrgd$project)
uniq_depth <- unique(owt_df02_gb07_mrgd$depth_m_bin)
uniq_proj
```

```
## [1] PLOO SBOO
## Levels: PLOO SBOO
```

```
uniq_depth
```

```
## [1] "[8,33)"    "[0,8)"     "[33,47)"   "[47,70)"   "[70,90)"   "Unknown"
## [7] "[112,120]" "[90,112)"
```

Run custom function on data aggregated by `date_sample` and `parameter`

```
time_plt(df = owt_df02_gb04_mrgd,
         date = "date_sample",
         l1 = param_lst05)
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##     0     1     2     3     4     5     6     7     8     9    10    11    12
## 1.000 0.236 0.453 0.202 0.252 0.270 0.175 0.318 0.194 0.210 0.250 0.254 0.142
##    13    14    15    16    17    18    19    20    21    22    23    24    25
## 0.253 0.171 0.273 0.158 0.218 0.182 0.137 0.223 0.153 0.154 0.168 0.189 0.208
```

```
##    26    27    28    29    30    31    32    33    34    35    36    37    38
## 0.130 0.219 0.261 0.156 0.224 0.163 0.138 0.073 0.089 0.200 0.084 0.138 0.118
##    39    40
## 0.136 0.082
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

Run custom function on data aggregated by `date_sample`, `project`, and `parameter`

```
time_plt(df = owt_df02_gb09_mrgd,
         date = "date_sample",
         l1 = param_lst05,
         l2_name = "project",
         l2 = uniq_proj)
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##     0     1     2     3     4     5     6     7     8     9    10    11    12
## 1.000 0.142 0.136 0.168 0.115 0.106 0.063 0.061 0.098 0.091 0.121 0.089 0.059
##    13    14    15    16    17    18    19    20    21    22    23    24    25
## 0.069 0.074 0.073 0.064 0.122 0.067 0.080 0.105 0.053 0.073 0.077 0.045 0.091
##    26    27    28    29    30    31    32    33    34    35    36    37    38
## 0.057 0.052 0.048 0.040 0.055 0.058 0.041 0.045 0.053 0.036 0.044 0.058 0.049
##    39    40
## 0.049 0.043
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##     0     1     2     3     4     5     6     7     8     9    10    11    12
## 1.000 0.356 0.573 0.234 0.358 0.312 0.227 0.312 0.246 0.233 0.297 0.362 0.169
##    13    14    15    16    17    18    19    20    21    22    23    24    25
## 0.311 0.168 0.367 0.206 0.313 0.194 0.184 0.257 0.162 0.206 0.189 0.247 0.238
##    26    27    28    29    30    31    32    33    34    35    36    37    38
## 0.184 0.255 0.275 0.178 0.266 0.158 0.172 0.080 0.094 0.185 0.084 0.135 0.146
##    39    40
## 0.143 0.086
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

Run custom function on data aggregated by `date_sample`, `project`, `depth_m_bin` and `parameter`

```
time_plt(df = owt_df02_gb07_mrgd,
         date = "date_sample",
         l1 = param_lst05,
         l2_name = "project",
         l2 = uniq_proj,
         l3_name = "depth_m_bin",
         l3 = uniq_depth)
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##     0     1     2     3     4     5     6     7     8     9    10    11    12
## 1.000 0.455 0.610 0.454 0.469 0.317 0.319 0.298 0.269 0.347 0.219 0.312 0.356
##    13    14    15    16    17    18    19    20    21    22    23    24    25
## 0.259 0.478 0.462 0.357 0.360 0.173 0.354 0.200 0.321 0.269 0.245 0.180 0.304
##    26    27    28    29    30    31    32    33    34    35    36    37    38
## 0.403 0.324 0.434 0.221 0.418 0.312 0.223 0.383 0.258 0.343 0.335 0.432 0.193
##    39    40
## 0.193 0.333
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##     0     1     2     3     4     5     6     7     8     9    10    11    12
## 1.000 0.073 0.200 0.394 0.219 0.211 0.098 0.217 0.107 0.182 0.271 0.155 0.161
##    13    14    15    16    17    18    19    20    21    22    23    24    25
## 0.090 0.274 0.050 0.142 0.225 0.131 0.150 0.092 0.148 0.051 0.151 0.138 0.148
##    26    27    28    29    30    31    32    33    34    35    36    37    38
## 0.119 0.050 0.151 0.046 0.071 0.181 0.064 0.099 0.028 0.082 0.042 0.075 0.058
##    39    40
## 0.072 0.062
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10
##  1.000  0.068  0.019  0.004 -0.004  0.010  0.125 -0.022 -0.039 -0.008 -0.004
##     11     12     13     14     15     16     17     18     19     20     21
## -0.008 -0.012  0.012  0.027  0.000  0.015 -0.020  0.000 -0.004  0.009  0.030
##     22     23     24     25     26     27     28     29     30     31     32
## -0.021 -0.016  0.003  0.038  0.054  0.021  0.016  0.016 -0.001  0.028  0.098
##     33     34     35     36     37     38
##  0.004  0.022  0.003 -0.008  0.028  0.006
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10
##  1.000 -0.010  0.022  0.006  0.000  0.003  0.198 -0.018  0.070 -0.017  0.024
##     11     12     13     14     15     16     17     18     19     20     21
## -0.004  0.003  0.002  0.192  0.014  0.001 -0.054  0.019 -0.015 -0.006  0.002
##     22     23     24     25     26     27     28     29     30     31     32
## -0.064 -0.058 -0.007 -0.005  0.101  0.015  0.101 -0.016  0.008 -0.002  0.019
##     33     34     35     36     37     38     39     40
## -0.026  0.022  0.001 -0.034  0.008  0.094 -0.009  0.003
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10
##  1.000 -0.011  0.019 -0.058  0.070 -0.054  0.413 -0.291  0.985  0.044 -0.186
##     11     12     13     14     15     16     17     18     19     20     21
## -0.070 -0.204 -0.006  0.044 -0.069 -0.018  0.010  0.019  0.011 -0.110  0.055
##     22     23     24     25     26     27     28     29     30     31     32
##  0.056  0.019  0.387  0.212 -0.035  0.043  0.121 -0.039  0.172 -0.063  0.062
##     33     34     35     36     37     38     39     40
##  0.021  0.061  0.267 -0.034  0.083  0.020  0.012 -0.023
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##     0     1     2     3     4     5     6     7     8     9    10    11    12
## 1.000 0.600 0.382 0.628 0.471 0.367 0.066 0.201 0.113 0.369 0.300 0.139 0.024
##    13    14    15    16    17    18    19    20    21    22    23    24    25
## 0.156 0.087 0.134 0.120 0.297 0.095 0.422 0.487 0.124 0.165 0.382 0.037 0.748
##    26    27    28    29    30    31    32    33    34    35    36    37    38
## 0.381 0.281 0.079 0.074 0.061 0.129 0.029 0.111 0.168 0.058 0.042 0.097 0.125
##    39    40
## 0.153 0.118
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10
##  1.000  0.009  0.024  0.007 -0.108  0.015  0.000  0.010 -0.218     NA  0.006
##     11     12     13     14     15     16     17     18     19     20     21
## -0.003  0.004  0.011  0.008  0.009  0.006  0.001  0.005  0.008 -0.030  0.028
##     22     23     24     25     26     27     28     29     30     31     32
##  0.012 -0.014  0.003  0.004 -0.034 -0.058  0.017  0.006 -0.021  0.000 -0.012
##     33     34     35
##  0.006  0.007 -0.018
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10
##  1.000 -0.005 -0.004 -0.037  0.007  0.015  0.602  0.037 -0.008  0.012  0.006
##     11     12     13     14     15     16     17     18     19     20     21
##  0.002 -0.145 -0.008  0.020 -0.028  0.005 -0.007  0.011  0.013 -0.168  0.240
##     22     23     24     25     26     27     28     29     30     31     32
##  0.106 -0.012  0.050 -0.040 -0.130  0.190  0.010 -0.064 -0.072 -0.034  0.063
##     33     34     35     36     37     38     39     40
## -0.002 -0.008  0.018 -0.056 -0.016  0.025  0.004  0.007
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10
##  1.000  0.940  0.260  0.178  0.099  0.097  0.089  0.116  0.256  0.168 -0.008
##     11     12     13     14     15     16     17     18     19     20     21
##  0.028  0.059  0.022  0.077 -0.029  0.038 -0.010 -0.008 -0.033 -0.009 -0.002
##     22     23     24     25     26     27     28     29     30     31     32
## -0.010 -0.013 -0.013 -0.001 -0.012 -0.004 -0.011  0.003 -0.004 -0.009  0.011
##     33     34     35     36     37     38     39
## -0.003 -0.010  0.005 -0.010 -0.011 -0.006 -0.011
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10
##  1.000  1.000  0.056  0.073  0.027  0.461  0.121  0.400  0.743  0.266  0.050
##     11     12     13     14     15     16     17     18     19     20     21
##  0.013  0.069  0.210  0.258 -0.017  0.083  0.016  0.027 -0.013  0.004  0.095
##     22     23     24     25     26     27     28     29     30     31     32
##  0.063 -0.010  0.010  0.025 -0.006 -0.019 -0.013  0.025  0.050 -0.005  0.023
##     33     34     35     36     37     38     39     40
## -0.009  0.006  0.010 -0.016  0.017  0.018  0.004 -0.011
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10
##  1.000  0.012 -0.014 -0.056  0.005 -0.016  0.000 -0.005  0.001 -0.050 -0.045
##     11     12     13     14     15     16     17     18     19     20     21
## -0.039  0.000  0.002  0.004  0.004  0.002  0.004  0.003  0.002  0.005  0.005
##     22     23     24     25     26     27     28     29     30     31     32
##  0.005  0.004  0.003 -0.001  0.002 -0.018  0.063 -0.013  0.002 -0.005  0.006
##     33     34     35     36     37     38     39
## -0.026 -0.026 -0.003  0.003  0.000  0.005  0.002
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10
##  1.000  0.088 -0.001 -0.129  0.008     NA  0.003 -0.007 -0.004 -0.005 -0.035
##     11     12     13     14     15     16     17     18     19     20     21
## -0.046 -0.001 -0.008  0.004  0.007  0.002  0.006  0.005 -0.002  0.009  0.008
##     22     23     24     25     26     27     28     29     30     31     32
##  0.008  0.004  0.005  0.044 -0.028 -0.029  0.091 -0.010  0.004 -0.001  0.011
##     33     34     35     36     37     38     39
## -0.027 -0.025 -0.024  0.004  0.055  0.003  0.003
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
## Warning in as.ts.zoo(x): 'x' does not have an underlying regularity
```

```
## Error in ts(coredata(x)) : 'ts' object must have one or more observations
```

```
##
## Autocorrelations of series 'df_01a[, i]', by lag
##
##     0     1     2     3     4     5     6     7     8     9    10    11    12
## 1.000 0.615 0.848 0.464 0.643 0.374 0.253 0.258 0.375 0.321 0.348 0.721 0.136
##    13    14    15    16    17    18    19    20    21    22    23    24    25
## 0.510 0.234 0.625 0.225 0.631 0.400 0.228 0.326 0.212 0.259 0.208 0.389 0.469
##    26    27    28    29    30    31    32    33    34    35    36    37    38
## 0.263 0.375 0.240 0.328 0.381 0.329 0.306 0.043 0.023 0.161 0.035 0.108 0.243
##    39
## 0.153
```

```
## Don't know how to automatically pick scale for object of type <zoo>. Defaulting
## to continuous.
```

```
## Warning in as.ts.zoo(x): 'x' does not have an underlying regularity
```

```
## Error in ts(coredata(x)) : 'ts' object must have one or more observations
## Warning in as.ts.zoo(x): 'x' does not have an underlying regularity
```

```
## Error in ts(coredata(x)) : 'ts' object must have one or more observations
```

Convert df's to `timetk` tibbles for data aggregated by `date_sample`, `project`, and `parameter`

```
# Citation: https://business-science.github.io/timetk/index.html

#++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
# Convert PLOO data for 01/18/1999 and 01/03/2022 to `timetk` TS tibble
owt_df02_gb09_ploo_wkly03_df01 <- owt_df02_gb09_wkly03[owt_df02_gb09_wkly03$project ==
↪  "PLOO" & owt_df02_gb09_wkly03$date_sample >= "1999-1-18", ]
owt_df02_gb09_ploo_wkly03_df02 <- owt_df02_gb09_ploo_wkly03_df01[, -c(2, 8, 11)]
#owt_df02_gb09_ploo_wkly03_df02$date_sample <-
↪  yearweek(owt_df02_gb09_ploo_wkly03_df02$date_sample, week_start =
↪  getOption("lubridate.week.end", 1))

owt_df02_gb09_ploo_wkly03_tb01 <- tibble(owt_df02_gb09_ploo_wkly03_df02)
owt_df02_gb09_ploo_wkly03_tb02 <- pad_by_time(.data = owt_df02_gb09_ploo_wkly03_tb01,
                                              .date_var = date_sample,
                                              .by = "week")

#print(head(owt_df02_gb09_ploo_wkly03_df02, 2000))
#print(head(owt_df02_gb09_ploo_wkly03_tb01, 2000))
#print(head(owt_df02_gb09_ploo_wkly03_tb02, 2000))
#print(tail(owt_df02_gb09_ploo_wkly03_df02, 17))

#-------------------------------------------------------------------------------
# Convert PLOO data (excluding outliers) for 01/18/1999 and 01/03/2022 to `timetk` TS
↪  tibble
owt_df02_gb09_ploo_wkly02_df01 <- owt_df02_gb09_wkly02[owt_df02_gb09_wkly02$project ==
↪  "PLOO" & owt_df02_gb09_wkly02$date_sample >= "1999-1-18", ]
owt_df02_gb09_ploo_wkly02_df02 <- owt_df02_gb09_ploo_wkly02_df01[, -c(2, 8, 11)]

owt_df02_gb09_ploo_wkly02_tb01 <- tibble(owt_df02_gb09_ploo_wkly02_df02)
```

```
owt_df02_gb09_ploo_wkly02_tb02 <- pad_by_time(.data = owt_df02_gb09_ploo_wkly02_tb01,
                                              .date_var = date_sample,
                                              .by = "week")

#print(head(owt_df02_gb09_ploo_wkly02_df02, 2000))
#print(head(owt_df02_gb09_ploo_wkly02_tb01, 2000))
#print(head(owt_df02_gb09_ploo_wkly02_tb02, 2000))
#print(tail(owt_df02_gb09_ploo_wkly02_df02, 17))

#++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
# Convert SBOO data for 01/18/1999 and 01/03/2022 to `timetk` TS tibble
owt_df02_gb09_sboo_wkly03_df01 <- owt_df02_gb09_wkly03[owt_df02_gb09_wkly03$project ==
↪  "SBOO" & owt_df02_gb09_wkly03$date_sample >= "1999-1-18", ]
owt_df02_gb09_sboo_wkly03_df02 <- owt_df02_gb09_sboo_wkly03_df01[, -c(2, 8, 11)]

owt_df02_gb09_sboo_wkly03_tb01 <- tibble(owt_df02_gb09_sboo_wkly03_df02)
owt_df02_gb09_sboo_wkly03_tb02 <- pad_by_time(.data = owt_df02_gb09_sboo_wkly03_tb01,
                                              .date_var = date_sample,
                                              .by = "week")

#print(head(owt_df02_gb09_sboo_wkly03_df02, 2000))
#print(head(owt_df02_gb09_sboo_wkly03_tb01, 2000))
#print(head(owt_df02_gb09_sboo_wkly03_tb02, 2000))
#print(tail(owt_df02_gb09_sboo_wkly03_df02, 17))

#-----------------------------------------------------------------------------
# Convert SBOO data (excluding outliers) for 01/18/1999 and 01/03/2022 to `timetk` TS
↪  tibble
owt_df02_gb09_sboo_wkly02_df01 <- owt_df02_gb09_wkly02[owt_df02_gb09_wkly02$project ==
↪  "SBOO" & owt_df02_gb09_wkly02$date_sample >= "1999-1-18", ]
owt_df02_gb09_sboo_wkly02_df02 <- owt_df02_gb09_sboo_wkly02_df01[, -c(2, 8, 11)]

owt_df02_gb09_sboo_wkly02_tb01 <- tibble(owt_df02_gb09_sboo_wkly02_df02)
owt_df02_gb09_sboo_wkly02_tb02 <- pad_by_time(.data = owt_df02_gb09_sboo_wkly02_tb01,
                                              .date_var = date_sample,
                                              .by = "week")

#print(head(owt_df02_gb09_sboo_wkly02_df02, 2000))
#print(head(owt_df02_gb09_sboo_wkly02_tb01, 2000))
#print(head(owt_df02_gb09_sboo_wkly02_tb02, 2000))
#print(tail(owt_df02_gb09_sboo_wkly02_df02, 17))
```

Partition tibbles for data aggregated by `date_sample`, `project`, and `parameter`

```
#++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
# PLOO All
#print(head(owt_df02_gb09_ploo_wkly03_tb02, 10))
#print(dim(owt_df02_gb09_ploo_wkly03_tb02))

# PLOO All - Training partition (01/18/1999-01/04/2021)
owt_df02_gb09_ploo_wkly03_train_tb02 <- owt_df02_gb09_ploo_wkly03_tb02 %>%
  filter_by_time(date_sample,
```

```
                 .end_date = "2021-01-04")
#print(head(owt_df02_gb09_ploo_wkly03_train_tb02, 10))
#print(dim(owt_df02_gb09_ploo_wkly03_train_tb02))

# PLOO All - Test partition (01/11/2021-01/03/2022)
owt_df02_gb09_ploo_wkly03_test_tb02 <- owt_df02_gb09_ploo_wkly03_tb02 %>%
  filter_by_time(date_sample,
                 .start_date = "2021-01-11")
#print(head(owt_df02_gb09_ploo_wkly03_test_tb02, 10))
#print(dim(owt_df02_gb09_ploo_wkly03_test_tb02))

#-------------------------------------------------------------------------------
# PLOO Excluding Outliers
#print(head(owt_df02_gb09_ploo_wkly02_tb02, 10))
#print(dim(owt_df02_gb09_ploo_wkly02_tb02))

# PLOO Excluding Outliers - Training partition (01/18/1999-01/04/2021)
owt_df02_gb09_ploo_wkly02_train_tb02 <- owt_df02_gb09_ploo_wkly02_tb02 %>%
  filter_by_time(date_sample,
                 .end_date = "2021-01-04")
#print(head(owt_df02_gb09_ploo_wkly02_train_tb02, 10))
#print(dim(owt_df02_gb09_ploo_wkly02_train_tb02))

# PLOO Excluding Outliers - Test partition (01/11/2021-01/03/2022)
owt_df02_gb09_ploo_wkly02_test_tb02 <- owt_df02_gb09_ploo_wkly02_tb02 %>%
  filter_by_time(date_sample,
                 .start_date = "2021-01-11")
#print(head(owt_df02_gb09_ploo_wkly02_test_tb02, 10))
#print(dim(owt_df02_gb09_ploo_wkly02_test_tb02))

#+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
# SBOO All
#print(head(owt_df02_gb09_sboo_wkly03_tb02, 10))
#print(dim(owt_df02_gb09_sboo_wkly03_tb02))

# SBOO All - Training partition (01/18/1999-01/04/2021)
owt_df02_gb09_sboo_wkly03_train_tb02 <- owt_df02_gb09_sboo_wkly03_tb02 %>%
  filter_by_time(date_sample,
                 .end_date = "2021-01-04")
#print(head(owt_df02_gb09_sboo_wkly03_train_tb02, 10))
#print(dim(owt_df02_gb09_sboo_wkly03_train_tb02))

# SBOO All - Test partition (01/11/2021-01/03/2022)
owt_df02_gb09_sboo_wkly03_test_tb02 <- owt_df02_gb09_sboo_wkly03_tb02 %>%
  filter_by_time(date_sample,
                 .start_date = "2021-01-11")
#print(head(owt_df02_gb09_sboo_wkly03_test_tb02, 10))
#print(dim(owt_df02_gb09_sboo_wkly03_test_tb02))

#-------------------------------------------------------------------------------
# SBOO Excluding Outliers
#print(head(owt_df02_gb09_sboo_wkly02_tb02, 10))
#print(dim(owt_df02_gb09_sboo_wkly02_tb02))
```

```r
# SBOO Excluding Outliers - Training partition (01/18/1999-01/04/2021)
owt_df02_gb09_sboo_wkly02_train_tb02 <- owt_df02_gb09_sboo_wkly02_tb02 %>%
  filter_by_time(date_sample,
                 .end_date = "2021-01-04")
#print(head(owt_df02_gb09_sboo_wkly02_train_tb02, 10))
#print(dim(owt_df02_gb09_sboo_wkly02_train_tb02))

# SBOO Excluding Outliers - Test partition (01/11/2021-01/03/2022)
owt_df02_gb09_sboo_wkly02_test_tb02 <- owt_df02_gb09_sboo_wkly02_tb02 %>%
  filter_by_time(date_sample,
                 .start_date = "2021-01-11")
#print(head(owt_df02_gb09_sboo_wkly02_test_tb02, 10))
#print(dim(owt_df02_gb09_sboo_wkly02_test_tb02))

#print(tail(owt_df02_gb09_sboo_wkly02_tb02, 53))
```

```r
# Data sets for modeling
param_lst04
```

```
## [1] "CHLOROPHYLL" "DENSITY"     "DO"          "ENTERO"      "FECAL"
## [6] "PH"          "SALINITY"    "TEMP"        "XMS"
```

```r
#++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
# PLOO All
print(head(owt_df02_gb09_ploo_wkly03_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO  FECAL    PH SALIN~1  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl>  <dbl> <dbl>   <dbl> <dbl> <dbl>
##  1 1999-01-18         4.22    25.2  6.88  19.2   95.6   7.97    33.6  13.5  87.8
##  2 1999-01-25        NA       NA   NA      3.08   2.58 NA       NA    14.1  75.6
##  3 1999-02-01        NA       NA   NA     44.4   17.1  NA       NA    13.5  85.6
##  4 1999-02-08        NA       NA   NA      6.17   2.42 NA       NA    13.4  83.7
##  5 1999-02-15        NA       NA   NA     24.8    8.65 NA       NA    13.0  82.2
##  6 1999-02-22        NA       NA   NA      7.58  28.5  NA       NA    12.4  73.9
##  7 1999-03-01         3.22    25.8  5.94  48.3  324.    7.81    33.8  11.3  82.5
##  8 1999-03-08        NA       NA   NA      2      2.25 NA       NA    12.6  79.9
##  9 1999-03-15        NA       NA   NA      3.89   4.35 NA       NA    12.4  81.4
## 10 1999-03-22         4.78    25.7  6.64  43.4  331.    7.87    33.7  11.7  85.5
## # ... with abbreviated variable name 1: SALINITY
```

```r
print(dim(owt_df02_gb09_ploo_wkly03_tb02))
```

```
## [1] 1199   10
```

```r
# PLOO All - Training partition (01/18/1999-01/04/2021)
print(head(owt_df02_gb09_ploo_wkly03_train_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO  FECAL    PH SALIN~1  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl>  <dbl> <dbl>   <dbl> <dbl> <dbl>
##  1 1999-01-18         4.22    25.2  6.88  19.2   95.6   7.97    33.6  13.5  87.8
##  2 1999-01-25        NA       NA   NA      3.08   2.58 NA       NA    14.1  75.6
##  3 1999-02-01        NA       NA   NA     44.4   17.1  NA       NA    13.5  85.6
```

```
##  4 1999-02-08        NA       NA   NA      6.17   2.42 NA       NA    13.4  83.7
##  5 1999-02-15        NA       NA   NA     24.8    8.65 NA       NA    13.0  82.2
##  6 1999-02-22        NA       NA   NA      7.58  28.5  NA       NA    12.4  73.9
##  7 1999-03-01         3.22    25.8  5.94  48.3  324.    7.81    33.8  11.3  82.5
##  8 1999-03-08        NA       NA   NA      2      2.25 NA       NA    12.6  79.9
##  9 1999-03-15        NA       NA   NA      3.89   4.35 NA       NA    12.4  81.4
## 10 1999-03-22         4.78    25.7  6.64  43.4  331.    7.87    33.7  11.7  85.5
## # ... with abbreviated variable name 1: SALINITY
```

```
print(dim(owt_df02_gb09_ploo_wkly03_train_tb02))
```

```
## [1] 1147   10
```

```
# PLOO All - Test partition (01/11/2021-01/03/2022)
print(head(owt_df02_gb09_ploo_wkly03_test_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO  FECAL    PH SALIN~1  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl>  <dbl> <dbl>   <dbl> <dbl> <dbl>
##  1 2021-01-11         1.08    25.1  6.61   3.17   4     7.98    33.6  13.9  72.3
##  2 2021-01-18         1.54    25.2  6.63   3.44   7.81  8.00    33.6  13.6  84.0
##  3 2021-01-25         1.62    25.0  7.32   2.12   3.21  8.05    33.6  14.4  73.8
##  4 2021-02-01         1.06    25.0  7.41   4.75   4.31  8.15    33.6  14.4  72.7
##  5 2021-02-08         1.95    24.9  7.59   3      3.17  8.15    33.5  14.4  78.8
##  6 2021-02-15         1.92    25.0  7.30   3.88   5.88  8.11    33.5  14.1  80.5
##  7 2021-02-22         2.08    25.1  7.30   2.12   2.67  8.06    33.6  14.0  73.6
##  8 2021-03-01         1.03    25.5  5.72  25.5    6.54  7.93    33.7  12.2  82.5
##  9 2021-03-08         1.51    25.1  7.37   2.25   3.5   8.08    33.6  14.0  82.2
## 10 2021-03-15         2.36    24.9  7.97   7.88 171.    8.14    33.5  14.6  74.1
## # ... with abbreviated variable name 1: SALINITY
```

```
print(dim(owt_df02_gb09_ploo_wkly03_test_tb02))
```

```
## [1] 52 10
```

```
#-------------------------------------------------------------------------------
# PLOO Excluding Outliers
print(head(owt_df02_gb09_ploo_wkly02_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO  FECAL    PH SALIN~1  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl>  <dbl> <dbl>   <dbl> <dbl> <dbl>
##  1 1999-01-18         4.22    25.2  6.88  19.2   95.6   7.97    33.6  13.5  87.8
##  2 1999-01-25        NA       NA   NA      3.08   2.58 NA       NA    14.1  75.6
##  3 1999-02-01        NA       NA   NA     44.4   17.1  NA       NA    13.5  85.6
##  4 1999-02-08        NA       NA   NA      6.17   2.42 NA       NA    13.4  83.7
##  5 1999-02-15        NA       NA   NA     24.8    8.65 NA       NA    13.0  82.2
##  6 1999-02-22        NA       NA   NA      7.58  28.5  NA       NA    12.4  73.9
##  7 1999-03-01         3.22    25.8  5.94  48.3  324.    7.81    33.8  11.3  82.5
##  8 1999-03-08        NA       NA   NA      2      2.25 NA       NA    12.6  79.9
##  9 1999-03-15        NA       NA   NA      3.89   4.35 NA       NA    12.4  81.4
## 10 1999-03-22         4.78    25.7  6.64  43.4  331.    7.87    33.7  11.7  85.5
## # ... with abbreviated variable name 1: SALINITY
```

```
print(dim(owt_df02_gb09_ploo_wkly02_tb02))
```

```
## [1] 1199   10
```

```r
# PLOO Excluding Outliers - Training partition (01/18/1999-01/04/2021)
print(head(owt_df02_gb09_ploo_wkly02_train_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO  FECAL    PH SALIN~1  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl>  <dbl> <dbl>   <dbl> <dbl> <dbl>
##  1 1999-01-18         4.22    25.2  6.88  19.2   95.6   7.97    33.6  13.5  87.8
##  2 1999-01-25        NA       NA   NA      3.08   2.58 NA       NA    14.1  75.6
##  3 1999-02-01        NA       NA   NA     44.4   17.1  NA       NA    13.5  85.6
##  4 1999-02-08        NA       NA   NA      6.17   2.42 NA       NA    13.4  83.7
##  5 1999-02-15        NA       NA   NA     24.8    8.65 NA       NA    13.0  82.2
##  6 1999-02-22        NA       NA   NA      7.58  28.5  NA       NA    12.4  73.9
##  7 1999-03-01         3.22    25.8  5.94  48.3  324.    7.81    33.8  11.3  82.5
##  8 1999-03-08        NA       NA   NA      2      2.25 NA       NA    12.6  79.9
##  9 1999-03-15        NA       NA   NA      3.89   4.35 NA       NA    12.4  81.4
## 10 1999-03-22         4.78    25.7  6.64  43.4  331.    7.87    33.7  11.7  85.5
## # ... with abbreviated variable name 1: SALINITY
```

```r
print(dim(owt_df02_gb09_ploo_wkly02_train_tb02))
```

```
## [1] 1147   10
```

```r
# PLOO Excluding Outliers - Test partition (01/11/2021-01/03/2022)
print(head(owt_df02_gb09_ploo_wkly02_test_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO  FECAL    PH SALIN~1  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl>  <dbl> <dbl>   <dbl> <dbl> <dbl>
##  1 2021-01-11         1.08    25.1  6.61   3.17   4     7.98    33.6  13.9  72.3
##  2 2021-01-18         1.54    25.2  6.63   3.44   7.81  8.00    33.6  13.6  84.0
##  3 2021-01-25         1.62    25.0  7.32   2.12   3.21  8.05    33.6  14.4  73.8
##  4 2021-02-01         1.06    25.0  7.41   4.75   4.31  8.15    33.6  14.4  72.7
##  5 2021-02-08         1.95    24.9  7.59   3      3.17  8.15    33.5  14.4  78.8
##  6 2021-02-15         1.92    25.0  7.30   3.88   5.88  8.11    33.5  14.1  80.5
##  7 2021-02-22         2.08    25.1  7.30   2.12   2.67  8.06    33.6  14.0  73.6
##  8 2021-03-01         1.03    25.5  5.72  25.5    6.54  7.93    33.7  12.2  82.5
##  9 2021-03-08         1.51    25.1  7.37   2.25   3.5   8.08    33.6  14.0  82.2
## 10 2021-03-15         2.36    24.9  7.97   7.88 171.    8.14    33.5  14.6  74.1
## # ... with abbreviated variable name 1: SALINITY
```

```r
print(dim(owt_df02_gb09_ploo_wkly02_test_tb02))
```

```
## [1] 52 10
```

```r
#++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
# SBOO All
print(head(owt_df02_gb09_sboo_wkly03_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO FECAL    PH SALINITY  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl> <dbl> <dbl>    <dbl> <dbl> <dbl>
##  1 1999-01-18        NA       NA   NA      NA   243   NA        NA    NA    NA
##  2 1999-01-25        NA       NA   NA      39.3 161.  NA        NA    13.6  58.3
##  3 1999-02-01        NA       25.3  6.80  315.  330.   7.89     33.6  13.0  74.4
```

```
##  4 1999-02-08         5.27    25.2  8.39  115.  117.   8.02     33.5  13.2  79.6
##  5 1999-02-15        NA       NA   NA     208.  309.  NA        NA    12.6  73.0
##  6 1999-02-22        NA       NA   NA     248.   68.3 NA        NA    12.1  65.9
##  7 1999-03-01        NA       NA   NA      16.2 350.  NA        NA    NA    NA
##  8 1999-03-08        12.7     25.6  8.53   17.4 193.   7.97     33.7  12.3  77.1
##  9 1999-03-15        NA       NA   NA      91.2  70.8 NA        NA    12.1  76.7
## 10 1999-03-22        NA       NA   NA     109.  279.  NA        NA    11.7  78.7
```

```r
print(dim(owt_df02_gb09_sboo_wkly03_tb02))
```

```
## [1] 1199   10
```

```r
# SBOO All - Training partition (01/18/1999-01/04/2021)
print(head(owt_df02_gb09_sboo_wkly03_train_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO FECAL    PH SALINITY  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl> <dbl> <dbl>    <dbl> <dbl> <dbl>
##  1 1999-01-18        NA       NA   NA      NA   243   NA        NA    NA    NA
##  2 1999-01-25        NA       NA   NA      39.3 161.  NA        NA    13.6  58.3
##  3 1999-02-01        NA       25.3  6.80  315.  330.   7.89     33.6  13.0  74.4
##  4 1999-02-08         5.27    25.2  8.39  115.  117.   8.02     33.5  13.2  79.6
##  5 1999-02-15        NA       NA   NA     208.  309.  NA        NA    12.6  73.0
##  6 1999-02-22        NA       NA   NA     248.   68.3 NA        NA    12.1  65.9
##  7 1999-03-01        NA       NA   NA      16.2 350.  NA        NA    NA    NA
##  8 1999-03-08        12.7     25.6  8.53   17.4 193.   7.97     33.7  12.3  77.1
##  9 1999-03-15        NA       NA   NA      91.2  70.8 NA        NA    12.1  76.7
## 10 1999-03-22        NA       NA   NA     109.  279.  NA        NA    11.7  78.7
```

```r
print(dim(owt_df02_gb09_sboo_wkly03_train_tb02))
```

```
## [1] 1147   10
```

```r
# SBOO All - Test partition (01/11/2021-01/03/2022)
print(head(owt_df02_gb09_sboo_wkly03_test_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO  FECAL    PH SALIN~1  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl>  <dbl> <dbl>   <dbl> <dbl> <dbl>
##  1 2021-01-11         2.51    25.1  6.98 5.79e3 7.84e3  8.04    33.6  13.9  58.8
##  2 2021-01-18         3.37    25.1  7.66 2.00e2 4.75e2  8.07    33.6  13.7  72.1
##  3 2021-01-25         2.69    24.9  7.99 1.52e2 3.55e2  8.12    33.6  14.6  70.4
##  4 2021-02-01         1.54    25.1  7.08 9.63e2 1.57e3  8.15    33.6  13.9  58.4
##  5 2021-02-08         4.13    24.9  7.88 3.45e3 4.62e3  8.18    33.5  14.6  59.8
##  6 2021-02-15         2.45    25.0  7.53 3.92e2 8.33e2  8.09    33.5  14.1  77.7
##  7 2021-02-22         5.15    25.0  7.39 3.03e3 7.31e3  8.09    33.6  14.3  55.4
##  8 2021-03-01         2.57    25.3  6.12 8.91e2 1.42e3  7.95    33.6  13.0  63.7
##  9 2021-03-08         2.08    25.1  7.44 6.56e0 8.38e0  8.08    33.6  14.2  71.3
## 10 2021-03-15         4.71    24.8  8.59 3.60e3 4.25e3  8.23    33.5  14.9  59.6
## # ... with abbreviated variable name 1: SALINITY
```

```r
print(dim(owt_df02_gb09_sboo_wkly03_test_tb02))
```

```
## [1] 52 10
```

```r
#-------------------------------------------------------------------------------
# SBOO Excluding Outliers
```

```r
print(head(owt_df02_gb09_sboo_wkly02_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO FECAL    PH SALINITY  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl> <dbl> <dbl>    <dbl> <dbl> <dbl>
##  1 1999-01-18        NA       NA   NA      NA   243   NA        NA    NA    NA
##  2 1999-01-25        NA       NA   NA      39.3 161.  NA        NA    13.6  58.3
##  3 1999-02-01        NA       25.3  6.80  315.  330.   7.89     33.6  13.0  74.4
##  4 1999-02-08         5.27    25.2  8.39  115.  117.   8.02     33.5  13.2  79.6
##  5 1999-02-15        NA       NA   NA     208.  309.  NA        NA    12.6  73.0
##  6 1999-02-22        NA       NA   NA     248.   68.3 NA        NA    12.1  65.9
##  7 1999-03-01        NA       NA   NA      16.2 350.  NA        NA    NA    NA
##  8 1999-03-08        12.7     25.6  8.53   17.4 193.   7.97     33.7  12.3  77.1
##  9 1999-03-15        NA       NA   NA      91.2  70.8 NA        NA    12.1  76.7
## 10 1999-03-22        NA       NA   NA     109.  279.  NA        NA    11.7  78.7
```

```r
print(dim(owt_df02_gb09_sboo_wkly02_tb02))
```

```
## [1] 1199   10
```

```r
# SBOO Excluding Outliers - Training partition (01/18/1999-01/04/2021)
print(head(owt_df02_gb09_sboo_wkly02_train_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO FECAL    PH SALINITY  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl> <dbl> <dbl>    <dbl> <dbl> <dbl>
##  1 1999-01-18        NA       NA   NA      NA   243   NA        NA    NA    NA
##  2 1999-01-25        NA       NA   NA      39.3 161.  NA        NA    13.6  58.3
##  3 1999-02-01        NA       25.3  6.80  315.  330.   7.89     33.6  13.0  74.4
##  4 1999-02-08         5.27    25.2  8.39  115.  117.   8.02     33.5  13.2  79.6
##  5 1999-02-15        NA       NA   NA     208.  309.  NA        NA    12.6  73.0
##  6 1999-02-22        NA       NA   NA     248.   68.3 NA        NA    12.1  65.9
##  7 1999-03-01        NA       NA   NA      16.2 350.  NA        NA    NA    NA
##  8 1999-03-08        12.7     25.6  8.53   17.4 193.   7.97     33.7  12.3  77.1
##  9 1999-03-15        NA       NA   NA      91.2  70.8 NA        NA    12.1  76.7
## 10 1999-03-22        NA       NA   NA     109.  279.  NA        NA    11.7  78.7
```

```r
print(dim(owt_df02_gb09_sboo_wkly02_train_tb02))
```

```
## [1] 1147   10
```

```r
# SBOO Excluding Outliers - Test partition (01/11/2021-01/03/2022)
print(head(owt_df02_gb09_sboo_wkly02_test_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPH~1 DENSITY    DO ENTERO   FECAL    PH SALIN~2  TEMP   XMS
##    <date>           <dbl>   <dbl> <dbl>  <dbl>   <dbl> <dbl>   <dbl> <dbl> <dbl>
##  1 2021-01-11        2.51    25.1  6.98  NA      NA     8.04    33.6  13.9  58.8
##  2 2021-01-18        3.37    25.1  7.66 200.    475.    8.07    33.6  13.7  72.1
##  3 2021-01-25        2.69    24.9  7.99 152.    355.    8.12    33.6  14.6  70.4
##  4 2021-02-01        1.54    25.1  7.08 963.   1566.    8.15    33.6  13.9  58.4
##  5 2021-02-08        4.13    24.9  7.88  NA      NA     8.18    33.5  14.6  59.8
##  6 2021-02-15        2.45    25.0  7.53 392.    833.    8.09    33.5  14.1  77.7
##  7 2021-02-22        5.15    25.0  7.39  NA      NA     8.09    33.6  14.3  55.4
##  8 2021-03-01        2.57    25.3  6.12 891.   1419.    7.95    33.6  13.0  63.7
```

```
##  9 2021-03-08        2.08    25.1  7.44   6.56    8.38  8.08    33.6  14.2  71.3
## 10 2021-03-15        4.71    24.8  8.59  NA      NA     8.23    33.5  14.9  59.6
## # ... with abbreviated variable names 1: CHLOROPHYLL, 2: SALINITY
```

```
print(dim(owt_df02_gb09_sboo_wkly02_test_tb02))
```

```
## [1] 52 10
```

STL plotting - *WORK IN PROGRESS*

```
owt_df02_gb09_sboo_wkly02_tb02 %>%
  plot_time_series(date_sample,
                   ENTERO)
```

Imputation - *WORK IN PROGRESS*

```
# Impute missing values using TS imputation w/ seasonality
print(owt_df02_gb09_sboo_wkly02_tb02$ENTERO)
```

```
##    [1]          NA   39.252525  315.155053  114.697917  208.096296  248.383838
##    [7]   16.181818   17.428819   91.232323  109.121212    8.363636    5.900000
##   [13]  121.133739   82.737374   13.939394    4.434343    4.895833    4.200000
##   [19]          NA  108.747475   11.090909    2.738095    9.818182   54.181818
##   [25]    2.666667    9.069444    4.404040    8.545455   31.454545    7.880952
##   [31]    3.272727    2.363636    4.666667    3.000000    6.807517    5.084175
##   [37]    3.272727    4.929293    2.346032    6.000000    7.818182  123.818182
##   [43]    6.787302   28.909091    2.727273   33.828283   25.900000   11.058532
##   [49]    8.727273   86.818182    3.636364    5.771825    8.030303   12.100000
##   [55]   10.181818   47.307323   12.300000   30.000000          NA  404.777778
##   [61]  131.324675  536.919192   16.407407   75.589226   27.629960   31.100000
##   [67]   10.000000   25.818182    5.785951    7.030303    4.909091  100.400000
##   [73]    7.150000    5.863095    5.090909   55.454545    4.818182   11.137548
##   [79]   18.000000   13.090909    2.661111   29.474747    4.383929   11.272727
##   [85]    3.393939    3.454545   18.257639   14.030303   20.111111   11.848485
##   [91]   14.798742   33.646465    9.454545    6.722222   91.939394    7.295635
##   [97] 1124.700000 1104.727273   11.818182    4.363636    3.008333   32.000000
##  [103]    2.000000    4.775958          NA  185.727273   40.800000  664.515152
##  [109]   11.475397          NA  145.696970 1999.407407  680.727295  811.582492
##  [115]   97.151515   23.515152  112.000000  209.920139   63.696970    9.272727
##  [121]    3.818182   16.909091    6.318446    2.727273    6.759259   13.289236
##  [127]    3.272727    8.909091   16.000000   58.363636   41.500000   31.272727
##  [133]    9.611111   20.922559    5.200000    2.636364   92.181818    2.272727
##  [139]    3.000000    4.213889   31.818182    2.303030    9.686525    3.090909
##  [145]   24.363636    3.818182    4.181818   29.195070   47.333333   26.000000
##  [151]   33.950000  436.636364   13.497222    2.727273  392.858586    7.411111
##  [157]    8.750253   17.454545   59.909091  213.204545   19.302846   19.090909
##  [163]  561.363636    8.727273    4.000000          NA   71.295560    8.545455
##  [169]    2.907280    8.363636   70.181818    3.000000   16.500000   88.000000
##  [175]    6.272727   10.418487   14.727273 1094.000000  124.980556    3.000000
##  [181]    5.198653    3.141414          NA    2.000000    2.000000    6.222222
##  [187]    4.677778   94.909091    8.090909    9.818182   67.377203   11.595960
##  [193]    5.636364    7.818182   31.732950  158.636364    8.545455   10.090909
##  [199]    2.150000   93.426491    4.363636   22.181818    2.400000   22.943617
```

```
## [205]    6.545455 2145.245791 1533.250000  100.062500   21.826869   10.909091
## [211]  101.144781    4.272727   28.208333 1769.272727  124.571429          NA
## [217]  200.680404  222.406087  247.636364  470.883333   19.733333    3.454545
## [223] 1239.106061  266.841751    5.666667  138.065406   11.636364    6.545455
## [229]   26.454545   66.916076  138.909091   75.525253    2.363636   16.232323
## [235]   69.356513    7.272727   10.000000   10.242424    6.844129   19.650000
## [241]    4.727273    5.909091  105.865517   51.727273   27.818182    4.373737
## [247]   21.237778  134.363636   25.010101   10.100000    6.111111   42.599527
## [253]   22.500000    7.242424   23.272727    6.181818    4.234988   78.727273
## [259]   29.300000   21.477273   17.686998   15.181818   39.600000    6.772727
## [265]    2.000000    2.000000    4.200000 1172.571429  136.370370   29.575758
## [271]   12.111111    6.000000    9.020202   60.529721    4.272727    2.000000
## [277]   10.788889   10.236458   27.727273    2.100000  302.909091    3.000000
## [283]    2.787356    2.272727   25.225589    6.181818  129.209596    3.242424
## [289]    3.272727    7.545455   11.780332    2.727273    5.181818    2.343434
## [295]    5.292929   18.206061   19.461279    3.818182    5.030303    6.893939
## [301]    3.181818          NA          NA   57.485450  462.216667   55.727273
## [307]   67.037037   20.781145  701.458236   19.225589   24.909091          NA
## [313]  975.377778  197.666667  470.168350  202.978632 1724.026936   16.454545
## [319] 1301.750842          NA  220.956733 1423.212121  994.937063  578.500000
## [325] 1383.448148   10.168910  557.037879  574.629630 1235.651515  746.450000
## [331]   28.109195    9.973064    6.080808    3.838384   44.996633   95.953507
## [337]    3.727273   10.044444   48.060606   52.293103   12.363636   12.400000
## [343]    8.016566   14.545455   60.313131    3.000000    3.000000    4.500000
## [349]   22.040152    7.966330    3.161616   46.662963    3.383838   47.808081
## [355]    4.200000    3.171717    4.281166    5.636364    2.300000    2.417508
## [361]    4.681616    5.545455    3.727273   11.090909 1061.400000   67.863515
## [367]    3.292929    5.225589   12.202020    9.330556    8.300000  552.303030
## [373]          NA  213.037180  393.863636 1118.363636   83.696970          NA
## [379]   25.973737   11.629630   10.766330          NA    8.145466   10.636364
## [385]  811.277389   50.718519    9.388810    6.900000    5.589226   18.181818
## [391]    3.818182   49.544700    8.077020   13.818182    3.636364    7.680556
## [397]    9.212121   72.909091    3.150000    4.090909    9.665909    3.454545
## [403]    5.272727   19.272727   26.381226  571.824675    7.800000    2.200000
## [409]    5.454545   12.707273    6.909091   33.372222    3.020202  122.723093
## [415]   33.777778   10.363636   12.508772   22.968013    2.090909    2.350000
## [421]  251.447811    3.363636   10.407407 1179.948316  350.803030    4.849054
## [427]   11.700000   64.228956   48.272727    2.957995    4.010101    4.818182
## [433]    4.909091    3.030303    4.482836    3.363636    4.363636    8.242424
## [439]   11.219858   41.636364    4.909091    2.100000   99.616162    6.900000
## [445]   18.363636    6.272727    2.650000   25.566414   11.090909    4.949495
## [451]    7.272727   13.272727    3.372475    6.727273    3.900000   41.411348
## [457]    2.181818    2.000000    4.272727    3.794444    3.476753   46.474747
## [463]    4.300000    2.363636   61.460205    9.056911   28.818182    7.656566
## [469]    7.242424  888.562290  250.624481   26.700000 1787.545455  600.904887
## [475]   36.323232 2214.344444          NA  447.691919   57.636364   66.627305
## [481]    2.100000    2.648787   18.181818   11.150000    2.727273    2.303030
## [487]   26.090909    3.093434    3.636364    3.800000   14.667424    4.090909
## [493]    6.181818    5.104377    2.454545   36.454545    5.503546    2.000000
## [499]    2.300000    3.540199    2.181818    2.800000    2.979798    6.363636
## [505]   15.916627   35.000000    4.060606    3.818182    2.000000   68.301182
## [511]    2.000000    4.450000  169.240266   10.300000    2.000000    5.909091
## [517]   38.209184    6.898990          NA          NA  254.545455  141.254741
## [523]   63.119192  587.626263   39.723906   80.820687 1332.281818 1653.550000
```

```
## [529]          NA  356.869949   12.363636    2.200000   12.262626    4.200000
## [535]   31.963866  433.824916    2.600000   11.710438    6.191919    3.853283
## [541]    3.898990   10.600000    2.090909    8.762121    4.800000    5.804714
## [547]    2.333333   10.212121    7.333333   36.727273    8.545455    8.191919
## [553]   19.407859    7.767677    5.900000    7.501684   14.545455   41.312590
## [559]    7.360269   13.676768    6.148148    2.444444    8.101010    4.300000
## [565]    5.181818    3.669377   20.272727    6.400000   21.979798 2131.590245
## [571]  366.654040   89.863636   84.818182  100.639569   27.600000          NA
## [577] 1386.404040  379.090909          NA  106.060606  222.346288  146.478114
## [583]  709.818182   82.060606   70.518519   12.000000    2.000000    2.500000
## [589]    2.111111    2.500000   77.340067    2.417369   52.823529    7.090909
## [595]   35.354562   52.181818    3.272727    2.772222   19.767677   10.727273
## [601]  109.892051   15.090909    5.600000    4.467480    2.818182    2.636364
## [607]   11.062500    8.272727   20.761175    2.090909    5.225589   53.916667
## [613]   11.398148    8.222222  440.727273   95.400000   19.333333   22.787879
## [619]    5.959596   15.300000    2.550000    5.820331    3.676768          NA
## [625] 1727.555556          NA   12.636364  877.525000   26.727273   69.214752
## [631]  334.727273    2.696970  110.209596   55.510598   57.367003  113.074747
## [637] 1438.258333    5.747475    8.100271 1331.494949   23.565657   46.950000
## [643]   10.090909    2.845548   11.040404   30.121212   14.550000    2.206414
## [649]   17.300000    2.121212   95.272727    3.579042    2.000000    2.800000
## [655]   10.606061    2.090909    2.090909    2.727273    2.299764    3.100000
## [661]    3.300000    2.055556    2.272727   13.164983    2.829268    4.909091
## [667]    2.000000   17.636364    2.272727          NA   16.366667  488.262626
## [673]    9.589226    2.203704  764.945022   50.171717  423.454545    3.901820
## [679]  613.454545   18.090909  490.234848  133.995455   23.275971 1763.441616
## [685]   17.900000    6.000000    3.669377   22.478788  312.876263  134.950000
## [691]   39.818182  690.159091    5.653185          NA    8.784091   10.242424
## [697]    2.000000    2.545455    2.000000    2.182927    2.000000    6.909091
## [703]    3.100000    3.818182    2.243902    6.727273    2.272727    4.950000
## [709]    2.636364    3.103448   21.878788   27.700000    3.139719    3.636364
## [715]   19.681818    2.424242    4.081301    2.181818   33.333333    2.000000
## [721]    4.424242    2.942529    8.666667   12.181818    3.461111    2.791017
## [727]   13.545455   11.644444    4.363636   39.272727  306.888385   21.811111
## [733]    5.838384   20.000000   90.871360   24.131313    9.454545    3.515152
## [739]    2.275862  135.829787  305.984848    4.363636    2.284848   12.909091
## [745]  166.181818    2.111111    4.100000   50.385834    3.151515    2.181818
## [751]    4.800000    2.717114    3.545455    2.000000    2.074074    3.000000
## [757]    2.000000    6.437710   11.090909    3.000000    3.181818    9.818182
## [763]    3.799458    2.636364    2.206897    5.363636   36.767677    2.909091
## [769]    3.172577    5.272727   16.636364    9.272727   10.370370   18.198166
## [775]   14.100000   48.902357  730.127273   55.289559  396.390572    9.818182
## [781]   22.800000   88.636364    3.818182   58.181818   37.545455    6.659933
## [787]   26.353535   45.636364   15.850000    3.818182  468.391919   38.065657
## [793]   18.600000   34.545455  557.939394    6.909091    2.636364   11.600000
## [799]    4.700337    5.454545    4.590805   36.600000    2.545455   15.545455
## [805]   81.328283   52.000000    2.545455    5.367003    2.600000  108.107744
## [811]   37.090909    4.255892    2.208672    8.363636   37.545455    2.000000
## [817]    9.100000   16.898990    2.458333    3.090909    4.000000  175.274747
## [823]    8.511785  145.700000   21.090909   41.000000   18.450000    2.122143
## [829]   14.700000   35.313131   16.040404 1406.625000   90.500000          NA
## [835]   63.850340  700.407273   25.375000    7.090909   15.035908    6.363636
## [841]    3.272727          NA  852.489679    7.761905   14.250000   16.888889
## [847]    7.909091   14.727273    2.363636    3.437500    3.000000    3.207372
```

```
##  [853]   29.976912   74.479578    8.617605    7.917749    2.922078   58.545455
##  [859]    3.181818    5.090909    7.000000    3.030303  470.075758    7.619048
##  [865]    2.573171    2.181818   13.090909    6.406250    8.818182    2.428571
##  [871]   59.312500    3.151515    6.454545  955.636364   13.750000  128.320346
##  [877]   11.515152   26.740260    7.574747   19.575758   48.781250   60.320346
##  [883]    6.956710   30.778409          NA  527.727273          NA   12.380952
##  [889]   29.531250    5.779221 2202.909091   37.504968    4.363636    8.687500
##  [895]   28.606061   62.681818   40.526407    7.818182   15.909091    8.591631
##  [901]    7.316017    2.500000   67.454545    3.774892  882.820883   20.940837
##  [907]   65.454545   12.257440   18.000000    4.454545   13.399711    3.636364
##  [913]  184.090909    2.000000   21.250000    4.759019   12.383017    7.818182
##  [919]  297.090909    2.727273    3.375000    5.312500    3.000000  370.972583
##  [925]   43.272727   37.818182   24.272727   51.636364   12.090909    3.297872
##  [931]    8.320346   14.334776 1239.232323   13.464286   39.624820   12.864583
##  [937]          NA          NA          NA  926.254941          NA          NA
##  [943] 1313.792727 1544.960253          NA 1789.897186          NA  201.060023
##  [949]   17.610390  250.121212  161.090909  412.635046   78.129870   28.753247
##  [955]   10.242424    6.459132  121.513986    9.102453    3.134199   13.086310
##  [961]    9.108225    3.425595    9.272727   74.272727    7.320346    2.502165
##  [967]    2.062500   87.562500    5.416893    8.727273  130.865801    4.272727
##  [973]    4.181818   11.375000    2.242424   23.818182    4.411255   25.294372
##  [979]    4.625000    8.125000  138.424242   24.047619    2.391017    4.000000
##  [985]    2.909091  239.562771   23.875000    2.922078    5.818182    6.937500
##  [991]    5.909091          NA   24.593750   22.645022   32.454545    2.421875
##  [997]   21.692641    8.062500  568.138528    6.727273  389.564214   67.000000
## [1003]   22.363636   25.696970    5.545455    7.363636    2.783550  160.305556
## [1009]    5.727273    2.046875    2.978355   77.062500    2.952381   92.489177
## [1015]   11.818182  130.386147   16.181818   52.017316    6.181818    3.636364
## [1021]   12.969697   18.454545    4.545455    5.506366  129.727273    6.125000
## [1027]   14.851371    4.818182    3.090909    7.272727    2.727273    2.727273
## [1033]   13.090909   78.891775    4.475810   10.000000    3.818182    7.636364
## [1039]          NA  732.732857  533.183333  982.126812  192.906250  129.961039
## [1045] 1391.065476   97.569986          NA          NA          NA          NA
## [1051]          NA  479.181818          NA   67.618182 1718.103030   21.861472
## [1057]   27.138528  107.090909   10.312500   40.138889    6.000000   12.435268
## [1063]          NA 1890.443723    8.489177    5.480519    9.735931   29.083333
## [1069]    8.277056   12.285714    5.250000    6.818182   21.437500   12.909091
## [1075]    7.778321  294.095238    4.047619  293.500000  116.750000    9.437500
## [1081]    4.062500   14.727273  250.277056   28.062500    2.937500    9.187500
## [1087]   42.229437    2.519792  104.545455          NA          NA  862.588506
## [1093]          NA          NA          NA  430.537634          NA 1173.365517
## [1099]  159.241379          NA          NA 1378.676042  477.375000          NA
## [1105]          NA          NA   94.593750          NA          NA          NA
## [1111] 2266.546875          NA          NA          NA   31.731602  995.183611
## [1117]   10.812500          NA   11.156250          NA          NA          NA
## [1123]          NA          NA  194.645833  295.312500    6.000000   15.181818
## [1129]    5.019231   22.909091    5.666667   37.090909   41.545455   31.181818
## [1135]    7.406926   27.000000   40.062500   49.090909   52.145089  473.212121
## [1141]    7.687500  548.597403    5.000000  551.363636  207.687500  373.414141
## [1147]  420.363636          NA  199.601732  151.687500  963.389610          NA
## [1153]  392.387429          NA  890.649621    6.562500          NA          NA
## [1159]          NA          NA 1602.979167          NA          NA   54.312500
## [1165]   86.291485   30.406926  140.687500    9.281385   15.812500   75.000000
## [1171]   39.062500   29.187500    7.000000    2.000000    2.000000   33.818182
```

```
## [1177]    6.272727    4.631366   19.744589    6.437500   31.250000   17.375000
## [1183]  639.125000   29.138528   84.090909  134.250000  471.277056   19.545455
## [1189]    9.242424   54.385281    4.178708   19.090909    4.687500    8.272727
## [1195]   31.750000  970.969697   15.238095  159.812500 1941.562771
```

```
owt_df02_gb09_sboo_wkly02_tb02$ENTERO <-
↪  ts_impute_vec(owt_df02_gb09_sboo_wkly02_tb02$ENTERO,
                                                        period = 3,
                                                        lambda = NULL)

print(owt_df02_gb09_sboo_wkly02_tb02$ENTERO)
```

```
##    [1]   35.661401   39.252525  315.155053  114.697917  208.096296  248.383838
##    [7]   16.181818   17.428819   91.232323  109.121212    8.363636    5.900000
##   [13]  121.133739   82.737374   13.939394    4.434343    4.895833    4.200000
##   [19]   51.821613  108.747475   11.090909    2.738095    9.818182   54.181818
##   [25]    2.666667    9.069444    4.404040    8.545455   31.454545    7.880952
##   [31]    3.272727    2.363636    4.666667    3.000000    6.807517    5.084175
##   [37]    3.272727    4.929293    2.346032    6.000000    7.818182  123.818182
##   [43]    6.787302   28.909091    2.727273   33.828283   25.900000   11.058532
##   [49]    8.727273   86.818182    3.636364    5.771825    8.030303   12.100000
##   [55]   10.181818   47.307323   12.300000   30.000000  225.662214  404.777778
##   [61]  131.324675  536.919192   16.407407   75.589226   27.629960   31.100000
##   [67]   10.000000   25.818182    5.785951    7.030303    4.909091  100.400000
##   [73]    7.150000    5.863095    5.090909   55.454545    4.818182   11.137548
##   [79]   18.000000   13.090909    2.661111   29.474747    4.383929   11.272727
##   [85]    3.393939    3.454545   18.257639   14.030303   20.111111   11.848485
##   [91]   14.798742   33.646465    9.454545    6.722222   91.939394    7.295635
##   [97] 1124.700000 1104.727273   11.818182    4.363636    3.008333   32.000000
##  [103]    2.000000    4.775958  101.090982  185.727273   40.800000  664.515152
##  [109]   11.475397   81.429674  145.696970 1999.407407  680.727295  811.582492
##  [115]   97.151515   23.515152  112.000000  209.920139   63.696970    9.272727
##  [121]    3.818182   16.909091    6.318446    2.727273    6.759259   13.289236
##  [127]    3.272727    8.909091   16.000000   58.363636   41.500000   31.272727
##  [133]    9.611111   20.922559    5.200000    2.636364   92.181818    2.272727
##  [139]    3.000000    4.213889   31.818182    2.303030    9.686525    3.090909
##  [145]   24.363636    3.818182    4.181818   29.195070   47.333333   26.000000
##  [151]   33.950000  436.636364   13.497222    2.727273  392.858586    7.411111
##  [157]    8.750253   17.454545   59.909091  213.204545   19.302846   19.090909
##  [163]  561.363636    8.727273    4.000000   31.302716   71.295560    8.545455
##  [169]    2.907280    8.363636   70.181818    3.000000   16.500000   88.000000
##  [175]    6.272727   10.418487   14.727273 1094.000000  124.980556    3.000000
##  [181]    5.198653    3.141414    5.015562    2.000000    2.000000    6.222222
##  [187]    4.677778   94.909091    8.090909    9.818182   67.377203   11.595960
##  [193]    5.636364    7.818182   31.732950  158.636364    8.545455   10.090909
##  [199]    2.150000   93.426491    4.363636   22.181818    2.400000   22.943617
##  [205]    6.545455 2145.245791 1533.250000  100.062500   21.826869   10.909091
##  [211]  101.144781    4.272727   28.208333 1769.272727  124.571429  152.038012
##  [217]  200.680404  222.406087  247.636364  470.883333   19.733333    3.454545
##  [223] 1239.106061  266.841751    5.666667  138.065406   11.636364    6.545455
##  [229]   26.454545   66.916076  138.909091   75.525253    2.363636   16.232323
##  [235]   69.356513    7.272727   10.000000   10.242424    6.844129   19.650000
##  [241]    4.727273    5.909091  105.865517   51.727273   27.818182    4.373737
##  [247]   21.237778  134.363636   25.010101   10.100000    6.111111   42.599527
```

```
## [253]   22.500000    7.242424   23.272727    6.181818    4.234988   78.727273
## [259]   29.300000   21.477273   17.686998   15.181818   39.600000    6.772727
## [265]    2.000000    2.000000    4.200000 1172.571429  136.370370   29.575758
## [271]   12.111111    6.000000    9.020202   60.529721    4.272727    2.000000
## [277]   10.788889   10.236458   27.727273    2.100000  302.909091    3.000000
## [283]    2.787356    2.272727   25.225589    6.181818  129.209596    3.242424
## [289]    3.272727    7.545455   11.780332    2.727273    5.181818    2.343434
## [295]    5.292929   18.206061   19.461279    3.818182    5.030303    6.893939
## [301]    3.181818   23.804482   46.650212   57.485450  462.216667   55.727273
## [307]   67.037037   20.781145  701.458236   19.225589   24.909091  503.845368
## [313]  975.377778  197.666667  470.168350  202.978632 1724.026936   16.454545
## [319] 1301.750842  759.268839  220.956733 1423.212121  994.937063  578.500000
## [325] 1383.448148   10.168910  557.037879  574.629630 1235.651515  746.450000
## [331]   28.109195    9.973064    6.080808    3.838384   44.996633   95.953507
## [337]    3.727273   10.044444   48.060606   52.293103   12.363636   12.400000
## [343]    8.016566   14.545455   60.313131    3.000000    3.000000    4.500000
## [349]   22.040152    7.966330    3.161616   46.662963    3.383838   47.808081
## [355]    4.200000    3.171717    4.281166    5.636364    2.300000    2.417508
## [361]    4.681616    5.545455    3.727273   11.090909 1061.400000   67.863515
## [367]    3.292929    5.225589   12.202020    9.330556    8.300000  552.303030
## [373]  386.199003  213.037180  393.863636 1118.363636   83.696970   55.951709
## [379]   25.973737   11.629630   10.766330   12.668701    8.145466   10.636364
## [385]  811.277389   50.718519    9.388810    6.900000    5.589226   18.181818
## [391]    3.818182   49.544700    8.077020   13.818182    3.636364    7.680556
## [397]    9.212121   72.909091    3.150000    4.090909    9.665909    3.454545
## [403]    5.272727   19.272727   26.381226  571.824675    7.800000    2.200000
## [409]    5.454545   12.707273    6.909091   33.372222    3.020202  122.723093
## [415]   33.777778   10.363636   12.508772   22.968013    2.090909    2.350000
## [421]  251.447811    3.363636   10.407407 1179.948316  350.803030    4.849054
## [427]   11.700000   64.228956   48.272727    2.957995    4.010101    4.818182
## [433]    4.909091    3.030303    4.482836    3.363636    4.363636    8.242424
## [439]   11.219858   41.636364    4.909091    2.100000   99.616162    6.900000
## [445]   18.363636    6.272727    2.650000   25.566414   11.090909    4.949495
## [451]    7.272727   13.272727    3.372475    6.727273    3.900000   41.411348
## [457]    2.181818    2.000000    4.272727    3.794444    3.476753   46.474747
## [463]    4.300000    2.363636   61.460205    9.056911   28.818182    7.656566
## [469]    7.242424  888.562290  250.624481   26.700000 1787.545455  600.904887
## [475]   36.323232 2214.344444 1337.436553  447.691919   57.636364   66.627305
## [481]    2.100000    2.648787   18.181818   11.150000    2.727273    2.303030
## [487]   26.090909    3.093434    3.636364    3.800000   14.667424    4.090909
## [493]    6.181818    5.104377    2.454545   36.454545    5.503546    2.000000
## [499]    2.300000    3.540199    2.181818    2.800000    2.979798    6.363636
## [505]   15.916627   35.000000    4.060606    3.818182    2.000000   68.301182
## [511]    2.000000    4.450000  169.240266   10.300000    2.000000    5.909091
## [517]   38.209184    6.898990   86.561673  182.704314  254.545455  141.254741
## [523]   63.119192  587.626263   39.723906   80.820687 1332.281818 1653.550000
## [529] 1016.088261  356.869949   12.363636    2.200000   12.262626    4.200000
## [535]   31.963866  433.824916    2.600000   11.710438    6.191919    3.853283
## [541]    3.898990   10.600000    2.090909    8.762121    4.800000    5.804714
## [547]    2.333333   10.212121    7.333333   36.727273    8.545455    8.191919
## [553]   19.407859    7.767677    5.900000    7.501684   14.545455   41.312590
## [559]    7.360269   13.676768    6.148148    2.444444    8.101010    4.300000
## [565]    5.181818    3.669377   20.272727    6.400000   21.979798 2131.590245
## [571]  366.654040   89.863636   84.818182  100.639569   27.600000  700.930854
```

```
## [577] 1386.404040  379.090909  235.963306  106.060606  222.346288  146.478114
## [583]  709.818182   82.060606   70.518519   12.000000    2.000000    2.500000
## [589]    2.111111    2.500000   77.340067    2.417369   52.823529    7.090909
## [595]   35.354562   52.181818    3.272727    2.772222   19.767677   10.727273
## [601]  109.892051   15.090909    5.600000    4.467480    2.818182    2.636364
## [607]   11.062500    8.272727   20.761175    2.090909    5.225589   53.916667
## [613]   11.398148    8.222222  440.727273   95.400000   19.333333   22.787879
## [619]    5.959596   15.300000    2.550000    5.820331    3.676768  895.702251
## [625] 1727.555556  859.847948   12.636364  877.525000   26.727273   69.214752
## [631]  334.727273    2.696970  110.209596   55.510598   57.367003  113.074747
## [637] 1438.258333    5.747475    8.100271 1331.494949   23.565657   46.950000
## [643]   10.090909    2.845548   11.040404   30.121212   14.550000    2.206414
## [649]   17.300000    2.121212   95.272727    3.579042    2.000000    2.800000
## [655]   10.606061    2.090909    2.090909    2.727273    2.299764    3.100000
## [661]    3.300000    2.055556    2.272727   13.164983    2.829268    4.909091
## [667]    2.000000   17.636364    2.272727   12.778079   16.366667  488.262626
## [673]    9.589226    2.203704  764.945022   50.171717  423.454545    3.901820
## [679]  613.454545   18.090909  490.234848  133.995455   23.275971 1763.441616
## [685]   17.900000    6.000000    3.669377   22.478788  312.876263  134.950000
## [691]   39.818182  690.159091    5.653185   13.579270    8.784091   10.242424
## [697]    2.000000    2.545455    2.000000    2.182927    2.000000    6.909091
## [703]    3.100000    3.818182    2.243902    6.727273    2.272727    4.950000
## [709]    2.636364    3.103448   21.878788   27.700000    3.139719    3.636364
## [715]   19.681818    2.424242    4.081301    2.181818   33.333333    2.000000
## [721]    4.424242    2.942529    8.666667   12.181818    3.461111    2.791017
## [727]   13.545455   11.644444    4.363636   39.272727  306.888385   21.811111
## [733]    5.838384   20.000000   90.871360   24.131313    9.454545    3.515152
## [739]    2.275862  135.829787  305.984848    4.363636    2.284848   12.909091
## [745]  166.181818    2.111111    4.100000   50.385834    3.151515    2.181818
## [751]    4.800000    2.717114    3.545455    2.000000    2.074074    3.000000
## [757]    2.000000    6.437710   11.090909    3.000000    3.181818    9.818182
## [763]    3.799458    2.636364    2.206897    5.363636   36.767677    2.909091
## [769]    3.172577    5.272727   16.636364    9.272727   10.370370   18.198166
## [775]   14.100000   48.902357  730.127273   55.289559  396.390572    9.818182
## [781]   22.800000   88.636364    3.818182   58.181818   37.545455    6.659933
## [787]   26.353535   45.636364   15.850000    3.818182  468.391919   38.065657
## [793]   18.600000   34.545455  557.939394    6.909091    2.636364   11.600000
## [799]    4.700337    5.454545    4.590805   36.600000    2.545455   15.545455
## [805]   81.328283   52.000000    2.545455    5.367003    2.600000  108.107744
## [811]   37.090909    4.255892    2.208672    8.363636   37.545455    2.000000
## [817]    9.100000   16.898990    2.458333    3.090909    4.000000  175.274747
## [823]    8.511785  145.700000   21.090909   41.000000   18.450000    2.122143
## [829]   14.700000   35.313131   16.040404 1406.625000   90.500000   72.376610
## [835]   63.850340  700.407273   25.375000    7.090909   15.035908    6.363636
## [841]    3.272727  433.328821  852.489679    7.761905   14.250000   16.888889
## [847]    7.909091   14.727273    2.363636    3.437500    3.000000    3.207372
## [853]   29.976912   74.479578    8.617605    7.917749    2.922078   58.545455
## [859]    3.181818    5.090909    7.000000    3.030303  470.075758    7.619048
## [865]    2.573171    2.181818   13.090909    6.406250    8.818182    2.428571
## [871]   59.312500    3.151515    6.454545  955.636364   13.750000  128.320346
## [877]   11.515152   26.740260    7.574747   19.575758   48.781250   60.320346
## [883]    6.956710   30.778409  282.024539  527.727273  267.067395   12.380952
## [889]   29.531250    5.779221 2202.909091   37.504968    4.363636    8.687500
## [895]   28.606061   62.681818   40.526407    7.818182   15.909091    8.591631
```

```
##  [901]    7.316017    2.500000   67.454545    3.774892  882.820883   20.940837
##  [907]   65.454545   12.257440   18.000000    4.454545   13.399711    3.636364
##  [913]  184.090909    2.000000   21.250000    4.759019   12.383017    7.818182
##  [919]  297.090909    2.727273    3.375000    5.312500    3.000000  370.972583
##  [925]   43.272727   37.818182   24.272727   51.636364   12.090909    3.297872
##  [931]    8.320346   14.334776 1239.232323   13.464286   39.624820   12.864583
##  [937]  246.501124  477.760780  692.521174  926.254941 1059.686493 1179.456876
##  [943] 1313.792727 1544.960253 1662.811899 1789.897186  995.277595  201.060023
##  [949]   17.610390  250.121212  161.090909  412.635046   78.129870   28.753247
##  [955]   10.242424    6.459132  121.513986    9.102453    3.134199   13.086310
##  [961]    9.108225    3.425595    9.272727   74.272727    7.320346    2.502165
##  [967]    2.062500   87.562500    5.416893    8.727273  130.865801    4.272727
##  [973]    4.181818   11.375000    2.242424   23.818182    4.411255   25.294372
##  [979]    4.625000    8.125000  138.424242   24.047619    2.391017    4.000000
##  [985]    2.909091  239.562771   23.875000    2.922078    5.818182    6.937500
##  [991]    5.909091   15.543569   24.593750   22.645022   32.454545    2.421875
##  [997]   21.692641    8.062500  568.138528    6.727273  389.564214   67.000000
## [1003]   22.363636   25.696970    5.545455    7.363636    2.783550  160.305556
## [1009]    5.727273    2.046875    2.978355   77.062500    2.952381   92.489177
## [1015]   11.818182  130.386147   16.181818   52.017316    6.181818    3.636364
## [1021]   12.969697   18.454545    4.545455    5.506366  129.727273    6.125000
## [1027]   14.851371    4.818182    3.090909    7.272727    2.727273    2.727273
## [1033]   13.090909   78.891775    4.475810   10.000000    3.818182    7.636364
## [1039]  374.952860  732.732857  533.183333  982.126812  192.906250  129.961039
## [1045] 1391.065476   97.569986 -136.840885  -26.578697  288.611260   58.885192
## [1051]  151.112969  479.181818  112.636254   67.618182 1718.103030   21.861472
## [1057]   27.138528  107.090909   10.312500   40.138889    6.000000   12.435268
## [1063]  940.180148 1890.443723    8.489177    5.480519    9.735931   29.083333
## [1069]    8.277056   12.285714    5.250000    6.818182   21.437500   12.909091
## [1075]    7.778321  294.095238    4.047619  293.500000  116.750000    9.437500
## [1081]    4.062500   14.727273  250.277056   28.062500    2.937500    9.187500
## [1087]   42.229437    2.519792  104.545455  378.994337  625.054885  862.588506
## [1093]  773.028089  648.672573  515.216356  430.537634  805.276172 1173.365517
## [1099]  159.241379  550.683203  937.892524 1378.676042  477.375000  367.545340
## [1105]  311.477826  204.098428   94.593750  663.815808 1181.600063 1697.145831
## [1111] 2266.546875 1695.431926 1121.957601  602.728799   31.731602  995.183611
## [1117]   10.812500   12.712217   11.156250   76.527710   91.579900  102.763496
## [1123]  166.415988  182.662366  194.645833  295.312500    6.000000   15.181818
## [1129]    5.019231   22.909091    5.666667   37.090909   41.545455   31.181818
## [1135]    7.406926   27.000000   40.062500   49.090909   52.145089  473.212121
## [1141]    7.687500  548.597403    5.000000  551.363636  207.687500  373.414141
## [1147]  420.363636  305.452146  199.601732  151.687500  963.389610  680.937267
## [1153]  392.387429  628.351466  890.649621    6.562500  309.041244  647.886389
## [1159]  951.167655 1253.992597 1602.979167 1063.228605  536.213156   54.312500
## [1165]   86.291485   30.406926  140.687500    9.281385   15.812500   75.000000
## [1171]   39.062500   29.187500    7.000000    2.000000    2.000000   33.818182
## [1177]    6.272727    4.631366   19.744589    6.437500   31.250000   17.375000
## [1183]  639.125000   29.138528   84.090909  134.250000  471.277056   19.545455
## [1189]    9.242424   54.385281    4.178708   19.090909    4.687500    8.272727
## [1195]   31.750000  970.969697   15.238095  159.812500 1941.562771
```

```
owt_df02_gb09_sboo_wkly02_tb02 %>%
  plot_stl_diagnostics(date_sample,
                       ENTERO,
```

```
                        .frequency = "auto",
                        .trend = "auto")
```

```
## frequency = 13 observations per 1 quarter
```

```
## trend = 53 observations per 1 year
```

Modeling

Linear Regression Modeling

```
# PLOO All - Training partition (01/18/1999-01/04/2021)
print(head(owt_df02_gb09_ploo_wkly03_train_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO  FECAL    PH SALIN~1  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl>  <dbl> <dbl>   <dbl> <dbl> <dbl>
##  1 1999-01-18         4.22    25.2  6.88  19.2   95.6   7.97    33.6  13.5  87.8
##  2 1999-01-25        NA       NA   NA      3.08   2.58 NA       NA    14.1  75.6
##  3 1999-02-01        NA       NA   NA     44.4   17.1  NA       NA    13.5  85.6
##  4 1999-02-08        NA       NA   NA      6.17   2.42 NA       NA    13.4  83.7
##  5 1999-02-15        NA       NA   NA     24.8    8.65 NA       NA    13.0  82.2
##  6 1999-02-22        NA       NA   NA      7.58  28.5  NA       NA    12.4  73.9
##  7 1999-03-01         3.22    25.8  5.94  48.3  324.    7.81    33.8  11.3  82.5
##  8 1999-03-08        NA       NA   NA      2      2.25 NA       NA    12.6  79.9
##  9 1999-03-15        NA       NA   NA      3.89   4.35 NA       NA    12.4  81.4
## 10 1999-03-22         4.78    25.7  6.64  43.4  331.    7.87    33.7  11.7  85.5
## # ... with abbreviated variable name 1: SALINITY
```

```
# PLOO All - Test partition (01/11/2021-01/03/2022)
print(head(owt_df02_gb09_ploo_wkly03_test_tb02, 10))
```

```
## # A tibble: 10 x 10
##    date_sample CHLOROPHYLL DENSITY    DO ENTERO  FECAL    PH SALIN~1  TEMP   XMS
##    <date>            <dbl>   <dbl> <dbl>  <dbl>  <dbl> <dbl>   <dbl> <dbl> <dbl>
##  1 2021-01-11         1.08    25.1  6.61   3.17   4     7.98    33.6  13.9  72.3
##  2 2021-01-18         1.54    25.2  6.63   3.44   7.81  8.00    33.6  13.6  84.0
##  3 2021-01-25         1.62    25.0  7.32   2.12   3.21  8.05    33.6  14.4  73.8
##  4 2021-02-01         1.06    25.0  7.41   4.75   4.31  8.15    33.6  14.4  72.7
##  5 2021-02-08         1.95    24.9  7.59   3      3.17  8.15    33.5  14.4  78.8
##  6 2021-02-15         1.92    25.0  7.30   3.88   5.88  8.11    33.5  14.1  80.5
##  7 2021-02-22         2.08    25.1  7.30   2.12   2.67  8.06    33.6  14.0  73.6
##  8 2021-03-01         1.03    25.5  5.72  25.5    6.54  7.93    33.7  12.2  82.5
##  9 2021-03-08         1.51    25.1  7.37   2.25   3.5   8.08    33.6  14.0  82.2
## 10 2021-03-15         2.36    24.9  7.97   7.88 171.    8.14    33.5  14.6  74.1
## # ... with abbreviated variable name 1: SALINITY
```

```
print(lubridate:::isoweek(ymd("1999-01-18")))
```

```
## [1] 3
```

```
gb09_ploo_wkly03_train_ts01_ent01 <- ts(owt_df02_gb09_ploo_wkly03_train_tb02$ENTERO,
                                        start = c(1999, 3),
                                        freq = 52)
```

```
gb09_ploo_wkly03_train_ts01_ent01
```

```
## Time Series:
## Start = c(1999, 3)
## End = c(2021, 5)
## Frequency = 52
##    [1]   19.188034    3.083333   44.361111    6.166667   24.842593    7.583333
##    [7]   48.348291    2.000000    3.888889   43.449875    6.597222    2.518519
##   [13]    5.629630    5.129630   11.397271    5.111111    2.111111    6.518519
##   [19]   19.939092    6.493827    2.111111    2.037037    8.666667   19.493090
##   [25]    2.493827   16.049383   12.024691   37.906199    8.111111          NA
##   [31]    4.537037   12.098371    4.777778    4.469136   14.888889    9.277778
##   [37]   12.469774    2.037037    4.839506    3.777778    6.562951   11.666667
##   [43]    3.185185          NA   26.140941    4.071429    8.790123    2.296296
##   [49]   21.766945    4.333333    2.518519    5.555556   10.296296   28.012346
##   [55]   16.327838    5.135802    8.444444   35.282676   12.962963   74.888889
##   [61]   64.000000    6.074074   13.979211    3.703704   32.740741    2.518519
##   [67]   61.561332    2.000000    3.111111    7.000000    6.235364    5.407407
##   [73]    4.172840    2.148148   13.318519   11.222222    2.740741    4.666667
##   [79]   34.073118   27.111111    7.314815    2.000000    3.851852   21.595341
##   [85]    2.370370    8.361111    2.888889   15.543513    5.055556    7.259259
##   [91]  673.074074    7.694444   92.105376   11.283951    4.888889    3.703704
##   [97]    8.740741   15.702748    5.925926   37.039745    5.037037    4.444444
##  [103]    2.296296    2.925926   27.725846   30.166667   41.111111   10.493827
##  [109]          NA   20.530864   29.211310   16.024691    4.148148    5.370370
##  [115]   16.754918    4.666667    8.498084   18.000000   35.908602          NA
##  [121]    4.395062    3.444444    2.222222   15.114815    3.234568    3.185185
##  [127]    2.166667   11.476416    2.000000    2.666667    3.296296   11.308387
##  [133]    4.222222    2.814815    5.222222    3.148148    9.157407   12.123457
##  [139]    7.111111    8.555556   20.553763    2.888889    6.740741    6.185185
##  [145]   11.742413    2.000000    3.111111    2.740741   12.933931   11.555556
##  [151]    2.962963    3.148148    2.074074   29.027479   12.111111    7.629630
##  [157]    8.000000   31.738590    2.888889    5.407407    3.629630   37.026683
##  [163]    3.296296    6.333333    3.407407   29.286659    3.472222          NA
##  [169]    2.074074    3.456790   18.002230    5.370370    3.012346   69.288172
##  [175]    4.111111    5.814815    2.703704   99.313740    2.444444    2.888889
##  [181]    5.753086    2.740741    2.444444   23.728459    3.370370   14.419753
##  [187]    3.111111   72.784707    3.277778    5.259259    6.277778    7.091613
##  [193]   10.888889    2.000000    2.185185    2.148148   25.330824    5.500000
##  [199]    4.222222    2.000000   43.864038    2.000000    2.814815    3.037037
##  [205]   19.253047   30.074074          NA    3.827160    2.666667   11.956193
##  [211]    4.037037    3.555556    2.148148  220.880015    2.370370   23.098765
##  [217]    3.555556 1702.444444  207.135305    5.250000    2.037037   37.159538
##  [223]    3.901235   10.592593    3.432099          NA    6.995619    3.370370
##  [229]    3.185185    2.592593   49.694444    3.148148    2.444444    5.520000
##  [235]   47.229885    7.555556    3.222222    3.296296    2.481481    7.657143
##  [241]    2.250000    5.250000    2.400000    3.907407    3.750000    5.777778
##  [247]    3.496914   29.350397   30.537037   10.171296    2.524691    7.032407
##  [253]   39.370370    4.453704   10.750000   59.037037    5.500000    5.046296
##  [259]   12.069444    3.638889    8.524691   39.731667    4.194444          NA
##  [265]    4.601852    2.222222    8.467593   78.995370    4.696429    2.925926
##  [271]    4.111111    4.524691   17.509259    8.375000   28.382222    5.606481
##  [277]    2.592593    2.666667          NA    2.444444    2.000000    2.000000
```

```
## [283]   2.000000   2.370370   2.888889   6.370370   2.740741  25.451389
## [289]         NA   2.000000         NA   2.000000         NA   2.000000
## [295]   2.296296   2.000000   4.296296         NA   3.259259         NA
## [301] 201.307870  18.762346  37.028571   4.495370   9.574074  17.620370
## [307]  14.274339   2.228571 166.162037   6.571429   2.962963 690.910494
## [313] 118.669753  52.222222  45.310251   8.305556   4.740741   6.949074
## [319]   6.388889  48.004630   7.077160  59.976852   5.942857   9.856481
## [325]   4.013889   5.504630  21.226389   3.250000  35.750000   3.885714
## [331]   8.571429   4.712963   5.078704   3.976852   3.888889   2.824074
## [337]   4.053571   2.987654  33.368730  10.000000   3.257143   2.000000
## [343]   8.477160   3.250000   4.523148   2.742857   3.314286   3.828571
## [349]   5.900000   2.108025   2.000000  29.733333  11.941947  70.125000
## [355]  29.256173  12.844444   9.634259   3.523148   2.444444   4.438272
## [361]   4.109436  11.226852   7.500000   5.500000         NA   2.416667
## [367]   8.861728   5.489859   3.106481   3.986111   2.000000  10.995370
## [373]   6.366049  29.916667   2.162037   2.236111   9.662037   2.228571
## [379]  15.654938   3.435185   3.484568   6.571429   2.828704  10.726852
## [385]  38.987654   4.743827   4.287037   3.092593  10.487654   4.500000
## [391]  20.807778   3.875000   4.533951   3.787037   8.580247   4.875000
## [397]   3.157584   2.000000   3.168254   3.714286   2.680556   8.382716
## [403]   3.000000  16.070933   2.500000   5.750000   8.449074   2.886772
## [409]   5.524691  16.021605  48.750000   4.132716  17.819444  36.870370
## [415]  65.623457   3.000000  12.476852  27.866270  12.546032   2.593651
## [421]  11.052469   3.714286  19.731481   8.342857  13.844885   3.314286
## [427]   2.571429   4.971429   2.750000  46.074074  21.043323  32.475926
## [433]   5.013889   3.363316   7.439815   4.092593   3.370370   3.645503
## [439]   5.716049   5.375000 527.060185   3.407407  18.593651   2.824074
## [445]   3.810185   5.358025   2.623457   3.708333   3.245370   2.413580
## [451]  16.750000   2.500000  17.569444   2.296296   4.962963   2.162037
## [457]  19.053232   2.879630  16.162037   5.172840  10.273148   3.194444
## [463]  10.132716 462.509259   8.000000   2.528395   3.787037   6.458333
## [469]  99.037037  19.856184   3.000000   2.875000   6.679012  27.500000
## [475]  15.035354  45.399621   4.030303   2.833333   2.935606   4.000000
## [481]   2.867424   2.926829  14.926829  22.294797   6.000000   2.524390
## [487]   3.117424   3.000000   5.219512  11.030303   3.465909   2.166667
## [493]   3.500000   2.282828   6.049242  33.203986   4.250000   3.911616
## [499]   3.560976   2.428030   2.515152  20.765152   2.810606   3.830808
## [505]   5.678030   8.556818   3.727273   9.121212   7.687969  19.750000
## [511]   3.125000   5.000000   2.146341   4.847007   4.500000  19.789634
## [517]   6.030303  14.545455 255.136364  10.060606  19.750000   4.896465
## [523]   5.825758  18.954545   5.143939  19.371212   5.583909 327.707317
## [529]   4.419808   4.212121   2.734848   4.699495   3.375000   6.174242
## [535]   2.388889   2.424242   2.875000   3.159091  16.364349   7.810606
## [541]  31.595960  12.818182   4.435606   7.897727   4.034091 416.335859
## [547]   8.962121   5.250000   3.363636   9.250000  90.897727   9.539747
## [553]   6.262626  13.878788   5.000000   7.553030  38.243902   9.756098
## [559]   4.780488  14.682927 167.951220   7.560976   7.463415   4.170732
## [565]   8.667596   3.154040   5.272727   2.715909  19.738636  20.478197
## [571]  22.058081 885.000000   2.000000   2.121212   2.060606         NA
## [577]   9.333333         NA  91.060606   2.363636   2.545455   4.831818
## [583]   2.303030   3.030303  66.545455   6.242424         NA   2.181818
## [589]   2.121212   2.328283  15.726313   3.276515   2.405303   5.390152
## [595]   2.825758   2.416667   8.250000   2.143939   2.097561   2.840909
## [601]   2.250000   2.354167   9.003788   2.606061  11.000893   2.312500
```

```
## [607]    5.694444    3.666667    4.000000    2.000000    2.055556    7.250000
## [613]    7.083333   16.187500   53.916667    8.833333   12.533929    3.000000
## [619]    3.500000    6.491667    7.361111    3.500000    2.458333  849.650794
## [625]    8.125000   11.145833    3.500000    2.333333    5.500000    4.277778
## [631]    8.770455    2.750000    5.416667    2.781250    2.500000    4.375000
## [637]    2.343750    2.000000    4.250000   22.833333    3.958333    3.291667
## [643]    5.494545    2.500000    2.875000    2.000000    4.250000    4.750000
## [649]    2.312500    3.375000   11.500000    2.187500    3.125000    2.291667
## [655]    2.333333    2.333333    2.625000   10.354735    3.250000    4.250000
## [661]    2.500000    2.562500    2.666667    2.333333   17.000000    9.125000
## [667]    2.312500    4.781250    6.008095    5.875000    2.638889    8.750000
## [673]    2.666667    3.500000    2.000000    2.000000    2.500000    5.625000
## [679]    3.458333    3.305556    2.111111    2.125000   68.656250    3.000000
## [685]    6.759131    7.041667    2.000000    2.125000    4.125000    2.250000
## [691]    2.000000    2.416667    2.125000    2.083333    2.000000    2.387879
## [697]    2.000000    2.250000    2.031250    2.250000    2.187500    2.125000
## [703]    2.156250 1817.125000    2.000000    9.166667    2.125000    3.166667
## [709]    5.461315    4.166667    2.166667   33.194444   11.833333    2.125000
## [715]   31.410256    2.708333    2.458333   26.843750    8.166667    2.500000
## [721]    5.333333    3.333333    4.491017    6.000000    7.638889    3.416667
## [727]   13.861111    3.875000    6.500000    2.000000    9.000000    2.000000
## [733]    2.958333    3.833333    3.527778    7.083853    2.500000    2.000000
## [739]    5.250000    8.390625    3.500000    2.833333    2.083333    2.500000
## [745]    2.750000    3.083333    2.000000    2.125000    5.072195    2.187500
## [751]    2.875000    2.277778    2.125000    2.250000    3.694444    2.125000
## [757]    3.062500    3.281250  904.000000    2.083333    2.125000    2.750000
## [763]    3.875000    3.781692    4.750000    2.750000    3.500000    2.250000
## [769]    2.000000    5.875000    4.625000    2.000000    4.130208    5.333333
## [775]    3.828247    4.416667    7.000000    3.500000    3.250000    3.000000
## [781]    3.625000    7.250000    3.611111    2.000000    2.062500   35.000000
## [787]    2.000000    7.891775    2.593750   63.000000    2.305556    3.562500
## [793]    2.125000    7.833333    3.750000    3.250000    4.375000    4.333333
## [799]    2.194444    2.062500    2.666667    2.067727    2.791667    3.000000
## [805]    3.875000    6.000000    3.500000    5.388889    2.250000    2.611111
## [811]    2.250000   25.450000   15.125000    5.645671    2.125000   23.750000
## [817]    2.375000    4.281250    5.000000    3.187500    5.875000    7.875000
## [823]   26.541667   13.000000   23.027778   32.739729    2.416667    2.541667
## [829]    5.812500    4.444444   13.361111    8.479167    7.750000   11.250000
## [835]    2.611111   26.312500    4.166667    4.625000    6.208333    8.915530
## [841]    5.000000    6.833333   28.875000    2.916667   20.250000    2.861111
## [847]    3.083333    2.750000   10.875000    6.250000    2.250000    6.666667
## [853]   15.658081    2.194444    2.638889    3.625000    2.062500    3.166667
## [859]    3.500000   10.000000    2.250000    2.944444    8.625000    2.250000
## [865]    4.218750    7.941212    2.625000    3.416667    3.000000    4.000000
## [871]    3.888889    4.277778    3.875000  143.750000   44.055556    2.833333
## [877]  197.962500   11.212500    5.916667    2.375000  121.166667    2.583333
## [883]    9.625000    2.489583   46.666667   20.250000    9.437500   11.500000
## [889]    2.958333  122.593750   20.401061  261.472222   50.888889    2.388889
## [895]    2.427778   81.087500   10.631313   18.250000   23.666667    3.500000
## [901]    3.250000    2.375000    5.875000   33.515455    4.916667    2.041667
## [907]          NA    2.000000          NA    2.000000    2.031250    3.000000
## [913]    2.000000    2.000000    2.666667    2.166667    2.416667   10.138182
## [919]    3.000000    2.000000    2.093750    2.125000    2.375000    4.593750
## [925]   17.500000    3.000000    2.083333    4.875000    2.250000    3.069444
```

```
## [931]   10.441861    2.277778    4.750000    3.361111    2.375000    4.479167
## [937]  151.000000   20.166667    6.166667   24.776667    5.250000  168.717949
## [943]    8.506845    7.875000    2.083333    4.083333  783.478571   19.208333
## [949]    2.000000    3.972222    8.750000    5.875000    2.111111    2.472222
## [955]    4.375000    3.041667    2.125000    2.000000   14.777123    3.776786
## [961]    2.500000    2.027778    9.500000   10.375000    4.000000    2.750000
## [967]    3.250000    2.500000    2.000000   14.060155    2.875000   97.583333
## [973]  502.916667    2.000000    2.166667    4.625000    2.125000   29.638889
## [979]    5.625000    7.500000    2.166667    7.689889    7.625000    9.166667
## [985]    2.750000    2.937500    2.333333    2.125000    5.166667    3.166667
## [991]   13.156250  581.305556   10.666667    4.250000   18.166667    2.000000
## [997]    8.795238    2.083333   33.000000    2.083333   12.000000    2.000000
## [1003]   2.000000    2.000000    2.083333    4.666667    2.000000   16.320635
## [1009]   2.000000    2.000000    3.333333    2.000000    2.000000    2.000000
## [1015]   2.000000    2.000000    3.000000    2.000000    3.333333    2.166667
## [1021]   2.000000    2.000000    2.000000    2.000000    6.170274    2.000000
## [1027]   2.750000    9.416667    2.083333    2.000000    2.000000    2.166667
## [1033]   2.000000    2.750000    2.000000    6.588167    2.000000    2.000000
## [1039]   2.333333    4.250000    2.000000          NA   27.375000    2.166667
## [1045]   2.916667          NA    2.000000    3.333333    2.000000    8.500000
## [1051]   2.250000   12.030758   18.444444   11.875000    2.333333    2.625000
## [1057]   8.250000    2.250000    3.458333   15.000000   11.291364    2.125000
## [1063]   3.791667    2.000000    6.500000    2.000000    3.125000    2.000000
## [1069]   3.687500    2.000000  113.833333    3.687500    4.625000    5.851551
## [1075]   7.625000    5.375000    2.250000   22.777778    2.375000    2.875000
## [1081]   2.500000    2.250000    2.187500   49.250000    2.541667    4.916667
## [1087]  22.587045   38.000000   41.250000   22.000000  379.062500    8.250000
## [1093]   2.055556   64.750000    2.937500    8.375000    3.375000   16.805556
## [1099]   3.416667    2.062500    2.291667   10.232684    2.333333    2.875000
## [1105]   5.166667   79.444444    2.000000    2.625000    9.041667    9.916667
## [1111]   3.541667    4.791667    6.875000    3.750000    8.789141    2.375000
## [1117]   2.291667    2.583333    2.208333    3.041667    2.750000    2.250000
## [1123]   2.000000    3.500000    2.125000    3.250000    2.000000   17.929545
## [1129]   2.000000    5.041667    4.000000    3.875000    3.125000    3.708333
## [1135]   9.583333    5.000000    2.000000    3.125000    3.250000   19.273232
## [1141]   3.083333    2.125000    8.250000   15.125000    2.750000    2.111111
## [1147]   4.000000
```

```
gb09_ploo_wkly03_m1v1_fit <- tslm(gb09_ploo_wkly03_train_ts01_ent01 ~ trend + I(trend^2)
↪  + season)
gb09_ploo_wkly03_m1v1_prd <- forecast(gb09_ploo_wkly03_m1v1_fit, h = 52)

plot(owt_df02_gb09_ploo_wkly03_train_tb02[, c(1, 5)],
     type = "l",
     #xlim = c(),
     xlab = "Time",
     ylab = "Parameter Values",
     main = "Figure. Parameter Values Over Time")
lines(owt_df02_gb09_ploo_wkly03_test_tb02[, c(1, 5)], lwd = 2, col = "blue")
lines(gb09_ploo_wkly03_m1v1_prd$fitted, lwd = 2, col = "orange")
grid()
```

```
plot(gb09_ploo_wkly03_m1v1_prd,
     type = "l",
     #xlim = c(),
     xlab = "Time",
     ylab = "Parameter Values",
     main = "Figure. Parameter Values Over Time")
#lines(owt_df02_gb09_ploo_wkly03_test_tb02[, c(1, 5)], lwd = 2, col = "blue")
lines(gb09_ploo_wkly03_m1v1_prd$fitted, lwd = 2, col = "orange")
grid()
```

```
plot(filter_by_time(owt_df02_gb09_ploo_wkly03_tb02[, c(1, 5)],
                    date_sample,
                    .start_date = "2015",
```

```
                    .end_date = "2023"),
     type = "l",
     xlab = "Time",
     ylab = "Parameter Values",
     main = "Figure. Parameter Values Over Time")
lines(filter_by_time(owt_df02_gb09_ploo_wkly03_test_tb02[, c(1, 5)],
                    date_sample,
                    .start_date = "2019",
                    .end_date = "2023"), lwd = 2, col = "blue")
grid()
```

```
#ggplot(owt_df02_gb09_ploo_wkly03_tb02, aes(date_sample, ENTERO)) +
#  geom_line() +
#  labs(x = "Time",
#       y = "Weekly Sales",
#       title = "Figure 7.5.",
#       subtitle = "Walmart Store #1, Dept #72 Weekly Sales Over Time")
```