

Data Analysis using R Programming - BUS4028

Group 08

2025-03-28

Introduction

In this document, we will be working on Data Analysis Assignment for BUS4028. This report performs data analysis using R programming on a climate change dataset. The analysis includes data manipulation, statistical functions, and plotting.

Data Loading

Read CSV file `climate_change_indicators.csv`

```
df <- read.csv("climate_change_indicators.csv")
```

Data Exploration

Print structure of `df`

```
str(df)
```

```
## 'data.frame':   225 obs. of  72 variables:
## $ ObjectId      : int  1 2 3 4 5 6 7 8 9 10 ...
## $ Country       : chr  "Afghanistan, Islamic Rep. of" "Albania" "Algeria" "American Samoa" ...
## $ ISO2          : chr  "AF" "AL" "DZ" "AS" ...
## $ ISO3          : chr  "AFG" "ALB" "DZA" "ASM" ...
## $ Indicator     : chr  "Temperature change with respect to a baseline climatology, corresponding to the 1961-1990 average"
## $ Unit          : chr  "Degree Celsius" "Degree Celsius" "Degree Celsius" "Degree Celsius" ...
## $ Source        : chr  "Food and Agriculture Organization of the United Nations (FAO). 2022. FAO Climate Change Indicators"
## $ CTS_Code      : chr  "ECCS" "ECCS" "ECCS" "ECCS" ...
## $ CTS_Name      : chr  "Surface Temperature Change" "Surface Temperature Change" "Surface Temperature Change" ...
## $ CTS_Full_Descriptor: chr  "Environment, Climate Change, Climate Indicators, Surface Temperature Change"
## $ F1961         : num  -0.113 0.627 0.164 0.079 0.736 0.041 0.086 0.09 0.122 NA ...
## $ F1962         : num  -0.164 0.326 0.114 -0.042 0.112 -0.152 -0.024 0.031 -0.046 NA ...
## $ F1963         : num  0.847 0.075 0.077 0.169 -0.752 -0.19 0.234 0.288 0.162 NA ...
## $ F1964         : num  -0.764 -0.166 0.25 -0.14 0.308 -0.229 0.189 0.214 -0.343 NA ...
## $ F1965         : num  -0.244 -0.388 -0.1 -0.562 -0.49 -0.196 -0.365 -0.385 0.09 NA ...
## $ F1966         : num  0.226 0.559 0.433 0.181 0.415 0.175 -0.001 0.097 -0.163 NA ...
## $ F1967         : num  -0.371 -0.074 -0.026 -0.368 0.637 -0.081 -0.257 -0.192 0 NA ...
## $ F1968         : num  -0.423 0.081 -0.067 -0.187 0.018 -0.193 -0.2 -0.225 0.472 NA ...
```

```
## $ F1969      : num -0.539 -0.013 0.291 0.132 -0.137 0.188 0.317 0.271 0.292 NA ...
## $ F1970      : num 0.813 -0.106 0.116 -0.047 0.121 0.248 0.082 0.109 0.438 NA ...
## $ F1971      : num 0.619 -0.195 -0.385 -0.477 -0.326 -0.097 -0.269 -0.233 -0.26 NA ...
## $ F1972      : num -1.124 -0.069 -0.348 -0.067 -0.499 ...
## $ F1973      : num 0.232 -0.288 -0.015 0.33 0.025 0.475 0.17 0.164 -0.139 NA ...
## $ F1974      : num -0.489 -0.139 -0.503 -0.308 -0.371 -0.158 -0.37 -0.377 -0.106 NA ...
## $ F1975      : num -0.445 -0.211 -0.539 -0.118 0.246 -0.029 -0.334 -0.419 -0.021 NA ...
## $ F1976      : num -0.286 -0.683 -0.782 -0.177 -0.045 -0.313 -0.426 -0.467 -0.321 NA ...
## $ F1977      : num 0.513 0.545 0.504 0.156 -0.093 0.272 0.096 0.076 0.432 NA ...
## $ F1978      : num 0.129 -0.814 0.012 0.092 -0.163 0.037 0.13 0.161 0.362 NA ...
## $ F1979      : num 0.361 0.203 0.654 0.341 0.058 0.291 0.034 0.16 0.266 NA ...
## $ F1980      : num 0.6 -0.414 0.232 0.35 -0.188 0.279 0.698 0.646 0.373 NA ...
## $ F1981      : num 0.483 -0.351 0.215 0.179 0.178 -0.071 0.532 0.564 0.378 NA ...
## $ F1982      : num -0.346 0.173 0.399 0.28 1.044 ...
## $ F1983      : num 0.164 -0.128 0.56 0.313 0.859 0.487 0.524 0.489 0.046 NA ...
## $ F1984      : num 0.145 -0.27 -0.004 0.277 -0.157 0.631 0.105 0.009 -0.1 NA ...
## $ F1985      : num 0.283 -0.103 0.508 0.256 0.059 0.694 0.006 -0.051 0.308 NA ...
## $ F1986      : num -0.141 0.569 0.296 0.394 0.387 0.176 0.013 -0.023 0.46 NA ...
## $ F1987      : num 0.391 -0.106 0.975 0.354 0.397 0.689 0.569 0.649 0.446 NA ...
## $ F1988      : num 0.919 0.37 1.304 0.509 0.883 ...
## $ F1989      : num -0.205 -0.066 0.386 0.143 1.162 ...
## $ F1990      : num 0.73 0.795 1.266 0.497 1.736 ...
## $ F1991      : num -0.168 -0.269 0.031 0.641 0.231 0.341 0.441 0.459 0.261 NA ...
## $ F1992      : num -0.294 0.106 -0.312 0.344 0.386 0.466 0.365 0.445 -0.261 -1.31 ...
## $ F1993      : num 0.22 0.076 0.552 -0.069 0.174 0.256 0.535 0.528 0.086 -0.932 ...
## $ F1994      : num 0.43 1.33 0.732 0.189 1.508 ...
## $ F1995      : num 0.359 -0.172 0.595 0.755 1.279 ...
## $ F1996      : num -0.116 -0.038 0.846 0.784 0.57 0.37 0.35 0.377 0.512 0.47 ...
## $ F1997      : num 0.471 0.075 1.059 NA 1.788 ...
## $ F1998      : num 0.675 0.795 1.109 NA 1.018 ...
## $ F1999      : num 1.198 0.67 1.476 0.242 1.055 ...
## $ F2000      : num 0.993 1.065 0.82 0.626 1.05 ...
## $ F2001      : num 1.311 1.532 1.856 0.904 1.48 ...
## $ F2002      : num 1.365 0.492 1.258 1.152 0.835 ...
## $ F2003      : num 0.587 0.97 1.585 0.716 1.949 ...
## $ F2004      : num 1.373 0.444 0.988 0.191 0.936 ...
## $ F2005      : num 0.401 0.189 1.264 0.801 0.851 ...
## $ F2006      : num 1.72 0.345 1.395 0.403 1.485 ...
## $ F2007      : num 0.675 1.316 1.22 1.032 1.024 ...
## $ F2008      : num 0.704 0.978 1.185 0.67 0.946 ...
## $ F2009      : num 0.895 0.91 0.945 NA 1.413 ...
## $ F2010      : num 1.613 1.191 2.265 1.311 0.471 ...
## $ F2011      : num 1.397 1.055 1.398 0.854 1.677 ...
## $ F2012      : num 0.223 1.487 1.147 0.924 1.265 ...
## $ F2013      : num 1.281 1.333 1.192 1.257 0.831 ...
## $ F2014      : num 0.456 1.198 1.69 1.17 1.946 ...
## $ F2015      : num 1.09 1.57 1.12 1.01 1.69 ...
## $ F2016      : num 1.55 1.46 1.76 1.54 1.99 ...
## $ F2017      : num 1.54 1.12 1.51 1.44 1.92 ...
## $ F2018      : num 1.54 2.03 1.21 1.19 1.92 ...
## $ F2019      : num 0.91 1.68 1.11 1.54 1.96 ...
## $ F2020      : num 0.498 1.498 1.926 1.43 2.562 ...
## $ F2021      : num 1.33 1.54 2.33 1.27 1.53 ...
## $ F2022      : num 2.01 1.52 1.69 1.26 3.24 ...
```

List variables in dataset

```
ls(df)
```

```
## [1] "Country"          "CTS_Code"          "CTS_Full_Descriptor"
## [4] "CTS_Name"         "F1961"             "F1962"
## [7] "F1963"            "F1964"             "F1965"
## [10] "F1966"            "F1967"             "F1968"
## [13] "F1969"            "F1970"             "F1971"
## [16] "F1972"            "F1973"             "F1974"
## [19] "F1975"            "F1976"             "F1977"
## [22] "F1978"            "F1979"             "F1980"
## [25] "F1981"            "F1982"             "F1983"
## [28] "F1984"            "F1985"             "F1986"
## [31] "F1987"            "F1988"             "F1989"
## [34] "F1990"            "F1991"             "F1992"
## [37] "F1993"            "F1994"             "F1995"
## [40] "F1996"            "F1997"             "F1998"
## [43] "F1999"            "F2000"             "F2001"
## [46] "F2002"            "F2003"             "F2004"
## [49] "F2005"            "F2006"             "F2007"
## [52] "F2008"            "F2009"             "F2010"
## [55] "F2011"            "F2012"             "F2013"
## [58] "F2014"            "F2015"             "F2016"
## [61] "F2017"            "F2018"             "F2019"
## [64] "F2020"            "F2021"             "F2022"
## [67] "Indicator"         "IS02"              "IS03"
## [70] "ObjectId"          "Source"            "Unit"
```

Print Top 15 Rows of Dataset

```
head(df, 15)
```

```
##      ObjectId      Country IS02 IS03
## 1          1 Afghanistan, Islamic Rep. of AF AFG
## 2          2      Albania AL ALB
## 3          3      Algeria DZ DZA
## 4          4      American Samoa AS ASM
## 5          5 Andorra, Principality of AD AND
## 6          6      Angola AO AGO
## 7          7      Anguilla AI AIA
## 8          8      Antigua and Barbuda AG ATG
## 9          9      Argentina AR ARG
## 10         10      Armenia, Rep. of AM ARM
## 11         11 Aruba, Kingdom of the Netherlands AW ABW
## 12         12      Australia AU AUS
## 13         13      Austria AT AUT
## 14         14      Azerbaijan, Rep. of AZ AZE
## 15         15      Bahamas, The BS BHS
##
```

Indicator


```

## 7      ECCS Surface Temperature Change
## 8      ECCS Surface Temperature Change
## 9      ECCS Surface Temperature Change
## 10     ECCS Surface Temperature Change
## 11     ECCS Surface Temperature Change
## 12     ECCS Surface Temperature Change
## 13     ECCS Surface Temperature Change
## 14     ECCS Surface Temperature Change
## 15     ECCS Surface Temperature Change
##
##                                     CTS_Full_Descriptor
## 1 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 2 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 3 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 4 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 5 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 6 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 7 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 8 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 9 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 10 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 11 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 12 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 13 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 14 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 15 Environment, Climate Change, Climate Indicators, Surface Temperature Change
##      F1961 F1962 F1963 F1964 F1965 F1966 F1967 F1968 F1969 F1970 F1971
## 1 -0.113 -0.164 0.847 -0.764 -0.244 0.226 -0.371 -0.423 -0.539 0.813 0.619
## 2 0.627 0.326 0.075 -0.166 -0.388 0.559 -0.074 0.081 -0.013 -0.106 -0.195
## 3 0.164 0.114 0.077 0.250 -0.100 0.433 -0.026 -0.067 0.291 0.116 -0.385
## 4 0.079 -0.042 0.169 -0.140 -0.562 0.181 -0.368 -0.187 0.132 -0.047 -0.477
## 5 0.736 0.112 -0.752 0.308 -0.490 0.415 0.637 0.018 -0.137 0.121 -0.326
## 6 0.041 -0.152 -0.190 -0.229 -0.196 0.175 -0.081 -0.193 0.188 0.248 -0.097
## 7 0.086 -0.024 0.234 0.189 -0.365 -0.001 -0.257 -0.200 0.317 0.082 -0.269
## 8 0.090 0.031 0.288 0.214 -0.385 0.097 -0.192 -0.225 0.271 0.109 -0.233
## 9 0.122 -0.046 0.162 -0.343 0.090 -0.163 0.000 0.472 0.292 0.438 -0.260
## 10 NA NA NA NA NA NA NA NA NA NA NA
## 11 -0.100 0.138 0.084 0.271 -0.180 0.122 -0.258 0.055 0.476 0.354 -0.349
## 12 0.157 0.126 -0.096 -0.012 0.140 -0.230 -0.093 -0.203 0.103 -0.007 -0.044
## 13 1.031 -0.621 -0.727 -0.371 -0.883 0.602 0.676 0.211 -0.126 -0.550 -0.060
## 14 NA NA NA NA NA NA NA NA NA NA NA
## 15 0.073 -0.062 -0.097 0.192 0.054 -0.172 -0.146 -0.324 -0.065 -0.469 -0.055
##      F1972 F1973 F1974 F1975 F1976 F1977 F1978 F1979 F1980 F1981 F1982
## 1 -1.124 0.232 -0.489 -0.445 -0.286 0.513 0.129 0.361 0.600 0.483 -0.346
## 2 -0.069 -0.288 -0.139 -0.211 -0.683 0.545 -0.814 0.203 -0.414 -0.351 0.173
## 3 -0.348 -0.015 -0.503 -0.539 -0.782 0.504 0.012 0.654 0.232 0.215 0.399
## 4 -0.067 0.330 -0.308 -0.118 -0.177 0.156 0.092 0.341 0.350 0.179 0.280
## 5 -0.499 0.025 -0.371 0.246 -0.045 -0.093 -0.163 0.058 -0.188 0.178 1.044
## 6 -0.035 0.475 -0.158 -0.029 -0.313 0.272 0.037 0.291 0.279 -0.071 0.164
## 7 -0.179 0.170 -0.370 -0.334 -0.426 0.096 0.130 0.034 0.698 0.532 0.097
## 8 -0.214 0.164 -0.377 -0.419 -0.467 0.076 0.161 0.160 0.646 0.564 0.162
## 9 -0.008 -0.139 -0.106 -0.021 -0.321 0.432 0.362 0.266 0.373 0.378 0.359
## 10 NA NA NA NA NA NA NA NA NA NA NA
## 11 -0.020 0.149 -0.448 -0.253 -0.518 0.182 NA NA 0.452 0.469 0.309
## 12 0.091 0.831 -0.354 0.048 -0.522 0.176 0.062 0.375 0.887 0.495 0.186

```

```

## 13  0.103 -0.033  0.314  0.860  0.216  0.499 -0.476 -0.112 -0.274  0.277  0.384
## 14    NA     NA     NA     NA     NA     NA     NA     NA     NA     NA     NA
## 15  0.301  0.166 -0.058  0.334 -0.241 -0.040  0.040  0.133  0.377 -0.030  0.531
##      F1983 F1984 F1985 F1986 F1987 F1988 F1989 F1990 F1991 F1992 F1993
## 1   0.164  0.145  0.283 -0.141  0.391  0.919 -0.205  0.730 -0.168 -0.294  0.220
## 2  -0.128 -0.270 -0.103  0.569 -0.106  0.370 -0.066  0.795 -0.269  0.106  0.076
## 3   0.560 -0.004  0.508  0.296  0.975  1.304  0.386  1.266  0.031 -0.312  0.552
## 4   0.313  0.277  0.256  0.394  0.354  0.509  0.143  0.497  0.641  0.344 -0.069
## 5   0.859 -0.157  0.059  0.387  0.397  0.883  1.162  1.736  0.231  0.386  0.174
## 6   0.487  0.631  0.694  0.176  0.689  0.572 -0.055  0.687  0.341  0.466  0.256
## 7   0.524  0.105  0.006  0.013  0.569  0.457 -0.002  0.432  0.441  0.365  0.535
## 8   0.489  0.009 -0.051 -0.023  0.649  0.395 -0.077  0.417  0.459  0.445  0.528
## 9   0.046 -0.100  0.308  0.460  0.446 -0.192  0.611  0.436  0.261 -0.261  0.086
## 10    NA     NA     NA     NA     NA     NA     NA     NA     NA     NA -1.310 -0.932
## 11  0.602 -0.020 -0.076  0.040  0.806  0.388 -0.066  0.279  0.331     NA     NA
## 12  0.633 -0.157  0.349  0.388  0.363  0.960  0.153  0.549  0.820  0.281  0.484
## 13  1.062 -0.249 -0.568  0.319 -0.263  0.820  1.104  1.262  0.125  1.248  0.527
## 14    NA     NA     NA     NA     NA     NA     NA     NA     NA     NA -0.839 -1.009
## 15  0.155  0.020  0.242  0.230  0.466  0.426  0.672  0.764  0.788  0.286  0.378
##      F1994 F1995 F1996 F1997 F1998 F1999 F2000 F2001 F2002 F2003 F2004 F2005
## 1   0.430  0.359 -0.116  0.471  0.675  1.198  0.993  1.311  1.365  0.587  1.373  0.401
## 2   1.330 -0.172 -0.038  0.075  0.795  0.670  1.065  1.532  0.492  0.970  0.444  0.189
## 3   0.732  0.595  0.846  1.059  1.109  1.476  0.820  1.856  1.258  1.585  0.988  1.264
## 4   0.189  0.755  0.784     NA     NA  0.242  0.626  0.904  1.152  0.716  0.191  0.801
## 5   1.508  1.279  0.570  1.788  1.018  1.055  1.050  1.480  0.835  1.949  0.936  0.851
## 6   0.212  0.753  0.370  0.107  1.064  0.417  0.169  0.295  0.735  0.889  0.414  1.021
## 7   0.575  0.651  0.350  0.459  1.060  0.532  0.264  0.587  0.706  0.816  0.521  0.828
## 8   0.493  0.677  0.377  0.455  1.046  0.541  0.335     NA  0.634  0.783  0.501  0.843
## 9   0.487  0.259  0.512  0.759  0.351  0.160 -0.186  0.425  0.278  0.635  0.470  0.281
## 10  0.481  0.697  0.470  0.599  1.316  1.488  1.031  1.395  1.194  0.141  1.162  0.480
## 11  0.528  0.802     NA     NA     NA     NA     NA     NA     NA  1.067  0.661  0.836
## 12  0.221  0.413  0.604  0.383  1.092  0.580  0.148  0.336  0.736  0.835  0.723  1.211
## 13  1.958  0.939 -0.203  0.514  1.343  0.986  1.769  1.501  1.531  1.464  0.829  0.628
## 14  0.098  1.012  0.244  0.582  1.184  1.224  1.098  1.401  1.432 -0.147  1.303  0.814
## 15  0.801  0.671  0.008  0.787  0.924  0.619  0.163  0.135  0.856  0.989  0.311  0.455
##      F2006 F2007 F2008 F2009 F2010 F2011 F2012 F2013 F2014 F2015 F2016 F2017
## 1   1.720  0.675  0.704  0.895  1.613  1.397  0.223  1.281  0.456  1.093  1.555  1.540
## 2   0.345  1.316  0.978  0.910  1.191  1.055  1.487  1.333  1.198  1.569  1.464  1.121
## 3   1.395  1.220  1.185  0.945  2.265  1.398  1.147  1.192  1.690  1.121  1.757  1.512
## 4   0.403  1.032  0.670     NA  1.311  0.854  0.924  1.257  1.170  1.009  1.539  1.435
## 5   1.485  1.024  0.946  1.413  0.471  1.677  1.265  0.831  1.946  1.690  1.990  1.925
## 6   0.561  0.885  0.501  0.708  1.194  0.880  0.552  1.044  0.828  1.331  1.609  0.870
## 7   0.691  0.957  0.411  0.566  1.090  0.489  0.640  0.770  0.814  1.051  1.125  0.960
## 8   0.659  0.934  0.394  0.498  1.153  0.586  0.696  0.783  0.744  1.035  1.097  0.958
## 9   0.596 -0.169  0.601  0.857  0.135  0.386  0.798  0.442  0.951  0.957  0.488  1.095
## 10  1.621  0.706  0.861  0.706  2.775  0.650  1.247  1.407  1.283  1.931  1.356  0.889
## 11  0.510  0.935     NA     NA  1.309  0.509  0.580  1.094  0.986  1.149     NA  1.303
## 12  0.721  0.929  0.625  1.030  0.673  0.208  0.308  1.499  1.198  1.087  1.172  1.141
## 13  0.907  2.137  1.582  1.544  0.656  1.373  1.783  1.098  2.409  2.167  2.096  1.741
## 14  1.488  0.958  0.883  0.780  2.327  0.766  1.474  1.574  1.252  1.672  1.530  1.308
## 15  0.385  0.937  0.842  0.410  0.314  0.363  0.344  0.565  0.883  1.114  1.042  1.331
##      F2018 F2019 F2020 F2021 F2022
## 1   1.544  0.910  0.498  1.327  2.012
## 2   2.028  1.675  1.498  1.536  1.518

```

```
## 3  1.210 1.115 1.926 2.330 1.688
## 4  1.189 1.539 1.430 1.268 1.256
## 5  1.919 1.964 2.562 1.533 3.243
## 6  1.395 1.752 1.162 1.553 1.212
## 7  0.664 0.843 1.224 0.893 0.839
## 8  0.627 0.797 1.131 0.862 0.770
## 9  0.878 0.760 1.123 1.031 0.643
## 10 2.772 1.859 1.954 2.087 1.707
## 11 0.698 1.007 1.281    NA    NA
## 12 1.129 1.422 1.416 0.629 0.754
## 13 2.524 2.370 2.315 1.395 2.498
## 14 2.240 1.997 2.015 2.061 2.080
## 15 1.023 1.443 1.611 0.879 1.480
```

User-Defined Function

Create a User Defined Function

```
celsius_to_fahreheit <- function(temp) { return ((temp * 9/5) + 32)}
df$F2022_Fahrenheit <- celsius_to_fahreheit(df$F2022)
print(df$F2022_Fahrenheit)
```

```
## [1] 35.6216 34.7324 35.0384 34.2608 37.8374 34.1816 33.5102 33.3860 33.1574
## [10] 35.0726    NA 33.3572 36.4964 35.7440 34.6640 35.6306 34.1888    NA
## [19] 35.4596 37.0526 33.8558 33.5912 34.7414 33.1592 35.7638 29.6510 33.6668
## [28] 33.5750 34.6028 35.2958 33.4436    NA 35.3354 33.7064 33.8792 34.2824
## [37] 33.7532 33.8576 33.3284 32.7326 34.5776 34.5776 35.4308 33.5732 32.9378
## [46] 34.6640 34.2410 32.8622    NA 35.9762 34.5866 34.2266 36.3092 35.9942
## [55] 34.7846 33.2384 33.7676 33.3248 33.1790 33.1844 34.2446 32.9540 35.5298
## [64] 34.4678 34.6190    NA 34.5128 34.4228 35.7116 37.2722 32.6462 33.7892
## [73] 34.3814 34.7180 36.6728 33.7928 36.0104 33.8720 34.5434 33.2564 33.3914
## [82] 33.6488 34.1510 34.3310 33.9188 33.9710 35.6504 33.3014 35.8556 34.1618
## [91] 33.4220 33.9530 36.2660 35.8646 35.1752 35.3120 33.9422 35.8430 34.0520
## [100] 34.4030 34.4444 36.8816 34.3040    NA 34.8980 34.9862 36.0950 36.7142
## [109] 34.0016 35.5154 34.3220 34.4696 34.8008 33.0062 36.5612 35.5280 37.2668
## [118] 33.5480 33.4688 34.4606 33.4112 33.5966 35.5190 32.0126 33.2312 35.0798
## [127] 33.0710 33.2204 34.2482 33.1286 35.8574 36.9266 35.9546 35.3570 33.3860
## [136] 36.1454 33.5012 34.5848 32.4302    NA 34.0376 36.6818 36.3578 34.3742
## [145] 33.5156 32.7704 33.4238    NA 34.2050 34.5272 35.4524 33.8990 34.5002
## [154] 35.0096 33.3104 34.1978 33.1682 33.5804 34.5290    NA 35.7008 36.1724
## [163] 33.5264 35.3390 35.5082 36.0698    NA 35.0348 35.4992 34.0808 35.8070
## [172] 34.3778 35.1410 34.5290 35.4884 33.5696 34.3904 34.3598 35.6324 36.3830
## [181] 33.8684 34.6082 33.9692 33.7694 36.4802 33.8072 33.3860 33.2402 33.2564
## [190] 33.3914 34.3328 35.7980 37.0364 34.7630 34.4894 35.7332 33.6398 33.8252
## [199] 34.3670 33.7550    NA 33.5228 33.2852 36.1238 36.5504 33.6992 33.1934
## [208] 34.5488 35.4758 34.6676 35.4398 34.1906 33.6092 32.6876 36.6926 34.6622
## [217] 32.9594 33.8594 33.7118 33.9332 35.5460 34.5092    NA 33.2348 31.1180
```

Data Manipulation

Filtering Rows using `subset()` where `Country = Canada`

```
canada_df <- subset(df, IS03 == "CAN")
head(canada_df)
```

```
##      ObjectId Country IS02 IS03
## 36          36  Canada  CA  CAN
##
##                                     Indicator
## 36 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
##          Unit
## 36 Degree Celsius
##
## 36 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
##      CTS_Code          CTS_Name
## 36      ECCS Surface Temperature Change
##
##                                     CTS_Full_Descriptor
## 36 Environment, Climate Change, Climate Indicators, Surface Temperature Change
##      F1961 F1962 F1963 F1964 F1965 F1966 F1967 F1968 F1969 F1970 F1971
## 36 0.057 -0.118 0.335 -0.299 -0.867 -0.152 -0.452 0.476 -0.003 0.426 -0.023
##      F1972 F1973 F1974 F1975 F1976 F1977 F1978 F1979 F1980 F1981 F1982 F1983
## 36 -1.796 0.306 -0.846 0.225 0.083 1.079 -0.605 -0.214 0.917 1.562 -0.673 0.488
##      F1984 F1985 F1986 F1987 F1988 F1989 F1990 F1991 F1992 F1993 F1994 F1995
## 36 0.337 -0.311 0.011 1.34 1.204 0.017 0.078 0.336 0.1 0.342 0.467 0.938
##      F1996 F1997 F1998 F1999 F2000 F2001 F2002 F2003 F2004 F2005 F2006 F2007
## 36 -0.125 0.426 2.47 1.694 1.291 1.421 0.54 1.24 0.485 1.282 2.343 1.333
##      F2008 F2009 F2010 F2011 F2012 F2013 F2014 F2015 F2016 F2017 F2018 F2019
## 36 0.851 0.539 2.915 1.438 2.144 1.182 0.288 1.231 2.373 1.48 0.477 1.311
##      F2020 F2021 F2022 F2022_Fahrenheit
## 36 1.128 2.515 1.268          34.2824
```

Identify dependent and Independent Variables and Reshape the data

```
#selected two columns for reshaping i.e. Country and F2022
selected_data <- df[, c("Country", "F2022")]
library(reshape2)
melted_data <- melt(selected_data, id.vars = "Country",
                    variable.name = "Year", value.name = "TemperatureChange")
print(melted_data)
```

```
##          Country Year TemperatureChange
## 1  Afghanistan, Islamic Rep. of F2022      2.012
## 2          Albania F2022      1.518
## 3          Algeria F2022      1.688
## 4    American Samoa F2022      1.256
## 5  Andorra, Principality of F2022      3.243
## 6          Angola F2022      1.212
## 7        Anguilla F2022      0.839
## 8  Antigua and Barbuda F2022      0.770
```


## 9	Argentina F2022	0.643
## 10	Armenia, Rep. of F2022	1.707
## 11	Aruba, Kingdom of the Netherlands F2022	NA
## 12	Australia F2022	0.754
## 13	Austria F2022	2.498
## 14	Azerbaijan, Rep. of F2022	2.080
## 15	Bahamas, The F2022	1.480
## 16	Bahrain, Kingdom of F2022	2.017
## 17	Bangladesh F2022	1.216
## 18	Barbados F2022	NA
## 19	Belarus, Rep. of F2022	1.922
## 20	Belgium F2022	2.807
## 21	Belize F2022	1.031
## 22	Benin F2022	0.884
## 23	Bhutan F2022	1.523
## 24	Bolivia F2022	0.644
## 25	Bosnia and Herzegovina F2022	2.091
## 26	Botswana F2022	-1.305
## 27	Brazil F2022	0.926
## 28	British Virgin Islands F2022	0.875
## 29	Brunei Darussalam F2022	1.446
## 30	Bulgaria F2022	1.831
## 31	Burkina Faso F2022	0.802
## 32	Burundi F2022	NA
## 33	Cabo Verde F2022	1.853
## 34	Cambodia F2022	0.948
## 35	Cameroon F2022	1.044
## 36	Canada F2022	1.268
## 37	Cayman Islands F2022	0.974
## 38	Central African Rep. F2022	1.032
## 39	Chad F2022	0.738
## 40	Chile F2022	0.407
## 41	China, P.R.: Hong Kong F2022	1.432
## 42	China, P.R.: Macao F2022	1.432
## 43	China, P.R.: Mainland F2022	1.906
## 44	Colombia F2022	0.874
## 45	Comoros, Union of the F2022	0.521
## 46	Congo, Dem. Rep. of the F2022	1.480
## 47	Congo, Rep. of F2022	1.245
## 48	Cook Islands F2022	0.479
## 49	Costa Rica F2022	NA
## 50	Croatia, Rep. of F2022	2.209
## 51	Cuba F2022	1.437
## 52	Cyprus F2022	1.237
## 53	Czech Rep. F2022	2.394
## 54	Denmark F2022	2.219
## 55	Djibouti F2022	1.547
## 56	Dominica F2022	0.688
## 57	Dominican Rep. F2022	0.982
## 58	Ecuador F2022	0.736
## 59	Egypt, Arab Rep. of F2022	0.655
## 60	El Salvador F2022	0.658
## 61	Equatorial Guinea, Rep. of F2022	1.247
## 62	Eritrea, The State of F2022	0.530

## 63	Estonia, Rep. of F2022	1.961
## 64	Eswatini, Kingdom of F2022	1.371
## 65	Ethiopia, The Federal Dem. Rep. of F2022	1.455
## 66	Falkland Islands (Malvinas) F2022	NA
## 67	Faroe Islands F2022	1.396
## 68	Fiji, Rep. of F2022	1.346
## 69	Finland F2022	2.062
## 70	France F2022	2.929
## 71	French Polynesia F2022	0.359
## 72	Gabon F2022	0.994
## 73	Gambia, The F2022	1.323
## 74	Georgia F2022	1.510
## 75	Germany F2022	2.596
## 76	Ghana F2022	0.996
## 77	Gibraltar F2022	2.228
## 78	Greece F2022	1.040
## 79	Greenland F2022	1.413
## 80	Grenada F2022	0.698
## 81	Guadeloupe F2022	0.773
## 82	Guatemala F2022	0.916
## 83	Guinea F2022	1.195
## 84	Guinea-Bissau F2022	1.295
## 85	Guyana F2022	1.066
## 86	Haiti F2022	1.095
## 87	Holy See F2022	2.028
## 88	Honduras F2022	0.723
## 89	Hungary F2022	2.142
## 90	Iceland F2022	1.201
## 91	India F2022	0.790
## 92	Indonesia F2022	1.085
## 93	Iran, Islamic Rep. of F2022	2.370
## 94	Iraq F2022	2.147
## 95	Ireland F2022	1.764
## 96	Isle of Man F2022	1.840
## 97	Israel F2022	1.079
## 98	Italy F2022	2.135
## 99	Jamaica F2022	1.140
## 100	Japan F2022	1.335
## 101	Jordan F2022	1.358
## 102	Kazakhstan, Rep. of F2022	2.712
## 103	Kenya F2022	1.280
## 104	Kiribati F2022	NA
## 105	Korea, Dem. People's Rep. of F2022	1.610
## 106	Korea, Rep. of F2022	1.659
## 107	Kuwait F2022	2.275
## 108	Kyrgyz Rep. F2022	2.619
## 109	Lao People's Dem. Rep. F2022	1.112
## 110	Latvia F2022	1.953
## 111	Lebanon F2022	1.290
## 112	Lesotho, Kingdom of F2022	1.372
## 113	Liberia F2022	1.556
## 114	Libya F2022	0.559
## 115	Liechtenstein F2022	2.534
## 116	Lithuania F2022	1.960

## 117	Luxembourg F2022	2.926
## 118	Madagascar, Rep. of F2022	0.860
## 119	Malawi F2022	0.816
## 120	Malaysia F2022	1.367
## 121	Maldives F2022	0.784
## 122	Mali F2022	0.887
## 123	Malta F2022	1.955
## 124	Marshall Islands, Rep. of the F2022	0.007
## 125	Martinique F2022	0.684
## 126	Mauritania, Islamic Rep. of F2022	1.711
## 127	Mauritius F2022	0.595
## 128	Mayotte F2022	0.678
## 129	Mexico F2022	1.249
## 130	Micronesia, Federated States of F2022	0.627
## 131	Moldova, Rep. of F2022	2.143
## 132	Monaco F2022	2.737
## 133	Mongolia F2022	2.197
## 134	Montenegro F2022	1.865
## 135	Montserrat F2022	0.770
## 136	Morocco F2022	2.303
## 137	Mozambique, Rep. of F2022	0.834
## 138	Myanmar F2022	1.436
## 139	Namibia F2022	0.239
## 140	Nauru, Rep. of F2022	NA
## 141	Nepal F2022	1.132
## 142	Netherlands, The F2022	2.601
## 143	New Caledonia F2022	2.421
## 144	New Zealand F2022	1.319
## 145	Nicaragua F2022	0.842
## 146	Niger F2022	0.428
## 147	Nigeria F2022	0.791
## 148	Niue F2022	NA
## 149	Norfolk Island F2022	1.225
## 150	North Macedonia, Republic of F2022	1.404
## 151	Norway F2022	1.918
## 152	Oman F2022	1.055
## 153	Pakistan F2022	1.389
## 154	Palau, Rep. of F2022	1.672
## 155	Panama F2022	0.728
## 156	Papua New Guinea F2022	1.221
## 157	Paraguay F2022	0.649
## 158	Peru F2022	0.878
## 159	Philippines F2022	1.405
## 160	Pitcairn Islands F2022	NA
## 161	Poland, Rep. of F2022	2.056
## 162	Portugal F2022	2.318
## 163	Puerto Rico F2022	0.848
## 164	Qatar F2022	1.855
## 165	Romania F2022	1.949
## 166	Russian Federation F2022	2.261
## 167	Rwanda F2022	NA
## 168	Saint Helena F2022	1.686
## 169	Saint Pierre and Miquelon F2022	1.944
## 170	Samoa F2022	1.156

## 171	San Marino, Rep. of F2022	2.115
## 172	São Tomé and Príncipe, Dem. Rep. of F2022	1.321
## 173	Saudi Arabia F2022	1.745
## 174	Senegal F2022	1.405
## 175	Serbia, Rep. of F2022	1.938
## 176	Seychelles F2022	0.872
## 177	Sierra Leone F2022	1.328
## 178	Singapore F2022	1.311
## 179	Slovak Rep. F2022	2.018
## 180	Slovenia, Rep. of F2022	2.435
## 181	Solomon Islands F2022	1.038
## 182	Somalia F2022	1.449
## 183	South Africa F2022	1.094
## 184	South Sudan, Rep. of F2022	0.983
## 185	Spain F2022	2.489
## 186	Sri Lanka F2022	1.004
## 187	St. Kitts and Nevis F2022	0.770
## 188	St. Lucia F2022	0.689
## 189	St. Vincent and the Grenadines F2022	0.698
## 190	Sudan F2022	0.773
## 191	Suriname F2022	1.296
## 192	Sweden F2022	2.110
## 193	Switzerland F2022	2.798
## 194	Syrian Arab Rep. F2022	1.535
## 195	Taiwan Province of China F2022	1.383
## 196	Tajikistan, Rep. of F2022	2.074
## 197	Tanzania, United Rep. of F2022	0.911
## 198	Thailand F2022	1.014
## 199	Timor-Leste, Dem. Rep. of F2022	1.315
## 200	Togo F2022	0.975
## 201	Tokelau F2022	NA
## 202	Tonga F2022	0.846
## 203	Trinidad and Tobago F2022	0.714
## 204	Tunisia F2022	2.291
## 205	Turkmenistan F2022	2.528
## 206	Turks and Caicos Islands F2022	0.944
## 207	Tuvalu F2022	0.663
## 208	Uganda F2022	1.416
## 209	Ukraine F2022	1.931
## 210	United Arab Emirates F2022	1.482
## 211	United Kingdom F2022	1.911
## 212	United States F2022	1.217
## 213	United States Virgin Islands F2022	0.894
## 214	Uruguay F2022	0.382
## 215	Uzbekistan, Rep. of F2022	2.607
## 216	Vanuatu F2022	1.479
## 217	Venezuela, Rep. Bolivariana de F2022	0.533
## 218	Vietnam F2022	1.033
## 219	Wallis and Futuna Islands F2022	0.951
## 220	West Bank and Gaza F2022	1.074
## 221	Western Sahara F2022	1.970
## 222	World F2022	1.394
## 223	Yemen, Rep. of F2022	NA
## 224	Zambia F2022	0.686

225

Zimbabwe F2022

-0.490

Remove Missing Values from Data Frame

```
df <- na.omit(df)
```

Identify and Remove Duplicated Data

```
#identify duplicate rows
duplicate_rows <- duplicated(df)
print("Duplicate Rows:")
```

[1] "Duplicate Rows:"

```
print(duplicate_rows)
```

```
## [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [49] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [61] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [73] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [85] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [97] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [109] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [121] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [133] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [145] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [157] FALSE
```

```
#Remove duplicate rows
unique_df <- unique(df)
print("DataFrame after removing duplicates:")
```

[1] "DataFrame after removing duplicates:"

```
print(unique_df)
```

```
##      ObjectId      Country ISO2 ISO3
## 1           1 Afghanistan, Islamic Rep. of AF AFG
## 2           2      Albania AL ALB
## 3           3      Algeria DZ DZA
## 5           5 Andorra, Principality of AD AND
## 6           6      Angola AO AGO
## 7           7    Anguilla AI AIA
## 9           9    Argentina AR ARG
```

## 12	12	Australia	AU	AUS
## 13	13	Austria	AT	AUT
## 15	15	Bahamas, The	BS	BHS
## 16	16	Bahrain, Kingdom of	BH	BHR
## 17	17	Bangladesh	BD	BGD
## 21	21	Belize	BZ	BLZ
## 22	22	Benin	BJ	BEN
## 23	23	Bhutan	BT	BTN
## 24	24	Bolivia	BO	BOL
## 26	26	Botswana	BW	BWA
## 27	27	Brazil	BR	BRA
## 28	28	British Virgin Islands	VG	VGB
## 29	29	Brunei Darussalam	BN	BRN
## 30	30	Bulgaria	BG	BGR
## 31	31	Burkina Faso	BF	BFA
## 34	34	Cambodia	KH	KHM
## 35	35	Cameroon	CM	CMR
## 36	36	Canada	CA	CAN
## 38	38	Central African Rep.	CF	CAF
## 39	39	Chad	TD	TCD
## 40	40	Chile	CL	CHL
## 41	41	China, P.R.: Hong Kong	HK	HKG
## 42	42	China, P.R.: Macao	MO	MAC
## 43	43	China, P.R.: Mainland	CN	CHN
## 44	44	Colombia	CO	COL
## 46	46	Congo, Dem. Rep. of the	CD	COD
## 48	48	Cook Islands	CK	COK
## 51	51	Cuba	CU	CUB
## 52	52	Cyprus	CY	CYP
## 54	54	Denmark	DK	DNK
## 56	56	Dominica	DM	DMA
## 57	57	Dominican Rep.	DO	DOM
## 58	58	Ecuador	EC	ECU
## 59	59	Egypt, Arab Rep. of	EG	EGY
## 60	60	El Salvador	SV	SLV
## 64	64	Eswatini, Kingdom of	SZ	SWZ
## 67	67	Faroe Islands	FO	FRO
## 68	68	Fiji, Rep. of	FJ	FJI
## 69	69	Finland	FI	FIN
## 70	70	France	FR	FRA
## 71	71	French Polynesia	PF	PYF
## 72	72	Gabon	GA	GAB
## 73	73	Gambia, The	GM	GMB
## 75	75	Germany	DE	DEU
## 76	76	Ghana	GH	GHA
## 77	77	Gibraltar	GI	GIB
## 78	78	Greece	GR	GRC
## 79	79	Greenland	GL	GRL
## 80	80	Grenada	GD	GRD
## 81	81	Guadeloupe	GP	GLP
## 82	82	Guatemala	GT	GTM
## 83	83	Guinea	GN	GIN
## 84	84	Guinea-Bissau	GW	GNB
## 85	85	Guyana	GY	GUY

## 86	86	Haiti	HT	HTI
## 87	87	Holy See	VA	VAT
## 88	88	Honduras	HN	HND
## 89	89	Hungary	HU	HUN
## 90	90	Iceland	IS	ISL
## 91	91	India	IN	IND
## 92	92	Indonesia	ID	IDN
## 93	93	Iran, Islamic Rep. of	IR	IRN
## 94	94	Iraq	IQ	IRQ
## 95	95	Ireland	IE	IRL
## 96	96	Isle of Man	IM	IMN
## 97	97	Israel	IL	ISR
## 98	98	Italy	IT	ITA
## 100	100	Japan	JP	JPN
## 101	101	Jordan	JO	JOR
## 103	103	Kenya	KE	KEN
## 105	105	Korea, Dem. People's Rep. of	KP	PRK
## 106	106	Korea, Rep. of	KR	KOR
## 107	107	Kuwait	KW	KWT
## 109	109	Lao People's Dem. Rep.	LA	LAO
## 111	111	Lebanon	LB	LBN
## 112	112	Lesotho, Kingdom of	LS	LSO
## 113	113	Liberia	LR	LBR
## 114	114	Libya	LY	LBY
## 115	115	Liechtenstein	LI	LIE
## 118	118	Madagascar, Rep. of	MG	MDG
## 119	119	Malawi	MW	MWI
## 120	120	Malaysia	MY	MYS
## 122	122	Mali	ML	MLI
## 123	123	Malta	MT	MLT
## 125	125	Martinique	MQ	MTQ
## 126	126	Mauritania, Islamic Rep. of	MR	MRT
## 127	127	Mauritius	MU	MUS
## 129	129	Mexico	MX	MEX
## 132	132	Monaco	MC	MCO
## 133	133	Mongolia	MN	MNG
## 136	136	Morocco	MA	MAR
## 137	137	Mozambique, Rep. of	MZ	MOZ
## 138	138	Myanmar	MM	MMR
## 141	141	Nepal	NP	NPL
## 142	142	Netherlands, The	NL	NLD
## 143	143	New Caledonia	NC	NCL
## 144	144	New Zealand	NZ	NZL
## 145	145	Nicaragua	NI	NIC
## 146	146	Niger	NE	NER
## 147	147	Nigeria	NG	NGA
## 151	151	Norway	NO	NOR
## 152	152	Oman	OM	OMN
## 153	153	Pakistan	PK	PAK
## 156	156	Papua New Guinea	PG	PNG
## 157	157	Paraguay	PY	PRY
## 158	158	Peru	PE	PER
## 159	159	Philippines	PH	PHL
## 161	161	Poland, Rep. of	PL	POL

```

## 162      162      Portugal      PT      PRT
## 163      163      Puerto Rico    PR      PRI
## 164      164      Qatar          QA      QAT
## 165      165      Romania        RO      ROU
## 168      168      Saint Helena   SH      SHN
## 169      169      Saint Pierre and Miquelon PM      SPM
## 171      171      San Marino, Rep. of SM      SMR
## 173      173      Saudi Arabia   SA      SAU
## 174      174      Senegal        SN      SEN
## 176      176      Seychelles     SC      SYC
## 182      182      Somalia        SO      SOM
## 183      183      South Africa    ZA      ZAF
## 185      185      Spain          ES      ESP
## 186      186      Sri Lanka       LK      LKA
## 188      188      St. Lucia       LC      LCA
## 189      189      St. Vincent and the Grenadines VC      VCT
## 191      191      Suriname        SR      SUR
## 192      192      Sweden          SE      SWE
## 193      193      Switzerland     CH      CHE
## 194      194      Syrian Arab Rep. SY      SYR
## 195      195      Taiwan Province of China TW      TWN
## 197      197      Tanzania, United Rep. of TZ      TZA
## 198      198      Thailand        TH      THA
## 200      200      Togo            TG      TGO
## 202      202      Tonga           TO      TON
## 203      203      Trinidad and Tobago TT      TTO
## 204      204      Tunisia         TN      TUN
## 208      208      Uganda          UG      UGA
## 210      210      United Arab Emirates AE      ARE
## 211      211      United Kingdom   GB      GBR
## 212      212      United States    US      USA
## 213      213      United States Virgin Islands VI      VIR
## 214      214      Uruguay         UY      URY
## 216      216      Vanuatu         VU      VUT
## 217      217      Venezuela, Rep. Bolivariana de VE      VEN
## 218      218      Vietnam         VN      VNM
## 219      219      Wallis and Futuna Islands WF      WLF
## 220      220      West Bank and Gaza PS      PSE
## 221      221      Western Sahara   EH      ESH
## 222      222      World            WLD
## 224      224      Zambia          ZM      ZMB
## 225      225      Zimbabwe        ZW      ZWE

```

```

##
## 1      Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 2      Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 3      Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 5      Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 6      Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 7      Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 9      Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 12     Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 13     Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 15     Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 16     Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980

```



```
## 24 Degree Celsius
## 26 Degree Celsius
## 27 Degree Celsius
## 28 Degree Celsius
## 29 Degree Celsius
## 30 Degree Celsius
## 31 Degree Celsius
## 34 Degree Celsius
## 35 Degree Celsius
## 36 Degree Celsius
## 38 Degree Celsius
## 39 Degree Celsius
## 40 Degree Celsius
## 41 Degree Celsius
## 42 Degree Celsius
## 43 Degree Celsius
## 44 Degree Celsius
## 46 Degree Celsius
## 48 Degree Celsius
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## 1 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 2 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
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##      F1961 F1962 F1963 F1964 F1965 F1966 F1967 F1968 F1969 F1970
## 1  -0.113 -0.164 0.847 -0.764 -0.244 0.226 -0.371 -0.423 -0.539 0.813
## 2   0.627 0.326 0.075 -0.166 -0.388 0.559 -0.074 0.081 -0.013 -0.106
## 3   0.164 0.114 0.077 0.250 -0.100 0.433 -0.026 -0.067 0.291 0.116
## 5   0.736 0.112 -0.752 0.308 -0.490 0.415 0.637 0.018 -0.137 0.121
## 6   0.041 -0.152 -0.190 -0.229 -0.196 0.175 -0.081 -0.193 0.188 0.248
## 7   0.086 -0.024 0.234 0.189 -0.365 -0.001 -0.257 -0.200 0.317 0.082
## 9   0.122 -0.046 0.162 -0.343 0.090 -0.163 0.000 0.472 0.292 0.438
## 12  0.157 0.126 -0.096 -0.012 0.140 -0.230 -0.093 -0.203 0.103 -0.007
## 13  1.031 -0.621 -0.727 -0.371 -0.883 0.602 0.676 0.211 -0.126 -0.550
## 15  0.073 -0.062 -0.097 0.192 0.054 -0.172 -0.146 -0.324 -0.065 -0.469
## 16 -0.471 0.397 0.635 -0.561 0.234 0.535 -0.362 -0.446 0.567 0.247
## 17  0.152 -0.265 -0.090 0.107 -0.195 0.308 -0.226 -0.236 -0.007 -0.021
## 21 -0.001 -0.137 -0.060 -0.055 -0.105 -0.195 -0.297 -0.205 0.260 -0.210
## 22 -0.137 -0.240 0.152 -0.218 -0.094 -0.007 -0.252 -0.129 0.303 0.305
## 23  0.213 -0.292 -0.220 0.065 -0.565 0.140 -0.378 -0.478 0.102 -0.027
## 24  0.247 0.012 0.409 -0.123 0.220 -0.083 0.332 -0.162 0.522 0.173
## 26  0.151 0.262 -0.472 -0.057 0.098 0.436 -0.458 -0.195 0.197 0.598
## 27  0.167 -0.184 0.158 -0.213 -0.075 0.044 0.073 -0.409 0.331 0.130
## 28  0.093 -0.072 0.189 0.184 -0.338 -0.110 -0.321 -0.145 0.356 0.051
## 29  0.062 -0.017 -0.165 0.054 -0.235 0.183 -0.093 -0.177 0.227 0.086
## 30  0.903 0.488 -0.248 -0.528 -0.456 1.151 0.027 0.421 -0.485 0.205
## 31 -0.285 -0.208 0.168 -0.218 -0.141 -0.147 -0.174 -0.209 0.543 0.359
## 34 -0.035 -0.134 -0.309 0.156 -0.196 0.433 -0.089 -0.124 0.478 0.069
## 35 -0.117 -0.218 0.126 -0.157 -0.110 -0.010 -0.107 -0.122 0.225 0.175
## 36  0.057 -0.118 0.335 -0.299 -0.867 -0.152 -0.452 0.476 -0.003 0.426
## 38 -0.003 -0.306 0.037 -0.136 -0.050 0.064 -0.229 -0.168 0.143 0.245
## 39 -0.409 -0.260 0.291 -0.176 -0.092 -0.007 -0.377 -0.155 0.553 0.163
## 40 -0.301 0.249 0.054 -0.220 0.115 -0.169 -0.142 0.366 0.155 0.205
## 41  0.055 -0.056 0.330 0.117 0.151 0.652 0.044 -0.654 -0.009 -0.398
## 42  0.055 -0.056 0.330 0.117 0.151 0.652 0.044 -0.654 -0.009 -0.398
## 43  0.259 -0.141 0.289 -0.026 0.078 0.181 -0.282 -0.408 -0.211 -0.300
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## 44  0.090 -0.133 -0.058  0.117 -0.217  0.117 -0.274 -0.238  0.363  0.052
## 46 -0.030 -0.172 -0.038 -0.112 -0.193  0.109 -0.119 -0.158  0.139  0.218
## 48  0.148 -0.064 -0.099  0.163 -0.373  0.035 -0.352 -0.387 -0.009  0.249
## 51 -0.084 -0.070 -0.127  0.102  0.023 -0.325 -0.234 -0.339  0.024 -0.349
## 52  0.039  0.789  0.691 -0.612 -0.208  0.637 -0.774 -0.031  0.165  0.495
## 54  1.117 -0.641 -1.019 -0.274 -0.603 -0.500  0.831  0.277 -0.135 -1.204
## 56 -0.033  0.146  0.256  0.081 -0.297  0.104 -0.230 -0.222  0.382  0.181
## 57 -0.009 -0.070 -0.017  0.167 -0.314 -0.028 -0.202 -0.154  0.310 -0.052
## 58 -0.108 -0.218 -0.062 -0.239  0.111  0.042 -0.422 -0.346  0.442 -0.131
## 59 -0.241  0.640  0.628 -0.373 -0.104  0.447 -0.678 -0.126  0.451 -0.114
## 60 -0.073 -0.248 -0.157 -0.026 -0.074  0.115 -0.423 -0.319  0.280 -0.031
## 64  0.268  0.433 -0.210  0.022 -0.224  0.295 -0.274 -0.431  0.346  0.500
## 67  0.630 -0.480 -0.056  0.478 -0.354 -0.393 -0.120 -0.250 -0.344 -0.510
## 68  0.219 -0.083 -0.046  0.185 -0.643 -0.293 -0.286 -0.103 -0.075  0.118
## 69  1.892 -0.339 -0.401  0.338 -0.263 -1.801  1.088 -1.634 -0.478 -0.629
## 70  0.827 -0.301 -0.955  0.025 -0.625  0.421  0.494 -0.073  0.024 -0.092
## 71  0.207 -0.046  0.037 -0.137 -0.083  0.081 -0.274 -0.516  0.301  0.182
## 72 -0.139 -0.063  0.232 -0.148 -0.164  0.140 -0.127 -0.138  0.110  0.142
## 73 -0.138 -0.047  0.130 -0.192 -0.463 -0.086 -0.381 -0.547  0.832  0.399
## 75  0.990 -0.750 -1.084 -0.328 -0.814  0.407  0.868  0.204 -0.111 -0.832
## 76 -0.070 -0.154  0.141 -0.233 -0.170  0.068 -0.232 -0.170  0.266  0.302
## 77  0.595  0.536  0.022  0.483 -0.087  0.228 -0.125  0.016 -0.310 -0.048
## 78  0.479  0.619  0.305 -0.301 -0.322  0.790 -0.194  0.182 -0.090  0.269
## 79 -0.295  0.842  0.308  0.257  0.800 -0.212 -0.371 -0.260 -0.252 -0.224
## 80  0.114  0.053  0.309 -0.052 -0.196  0.065 -0.233 -0.139  0.504  0.299
## 81  0.041  0.048  0.249  0.150 -0.341  0.051 -0.238 -0.211  0.337  0.123
## 82 -0.045 -0.131 -0.096 -0.052 -0.066 -0.057 -0.366 -0.337  0.413 -0.106
## 83 -0.145 -0.137  0.160 -0.180 -0.095 -0.003 -0.237 -0.151  0.459  0.345
## 84 -0.130 -0.071  0.157 -0.227 -0.383 -0.046 -0.269 -0.432  0.723  0.345
## 85  0.043 -0.009 -0.188  0.320 -0.065  0.212 -0.083 -0.274  0.439  0.489
## 86 -0.012 -0.049 -0.111  0.223 -0.310 -0.025 -0.209 -0.272  0.174 -0.123
## 87  0.735  0.079 -0.137  0.199 -0.415  0.264  0.169  0.036  0.002 -0.130
## 88 -0.058 -0.162 -0.229 -0.029 -0.055  0.006 -0.286 -0.319  0.243 -0.124
## 89  1.176 -0.419 -0.463 -0.877 -0.883  0.755  0.594  0.383 -0.276 -0.508
## 90  0.547 -0.270 -0.091  1.097 -0.131 -0.498 -0.597 -0.635 -0.900 -0.617
## 91 -0.208 -0.479 -0.030 -0.030 -0.072  0.290 -0.210 -0.234  0.303  0.033
## 92 -0.096 -0.030 -0.134 -0.036 -0.257  0.025 -0.163 -0.069  0.151  0.129
## 93 -0.068  0.263  0.755 -0.667 -0.280  0.748 -0.271 -0.246 -0.342  0.978
## 94 -0.189  0.885  0.433 -0.810 -0.134  0.964 -0.843 -0.275  0.241  0.661
## 95  0.264 -0.688 -0.773  0.158 -0.554 -0.033 -0.009  0.072 -0.265  0.060
## 96  0.358 -0.746 -0.820  0.095 -0.579 -0.100  0.105  0.035 -0.287  0.049
## 97 -0.106  0.826  0.842 -0.622 -0.031  0.610 -0.928 -0.118  0.238  0.184
## 98  0.805  0.025 -0.365  0.131 -0.431  0.307  0.301  0.011 -0.107 -0.153
## 100 0.668  0.125 -0.053  0.266 -0.519  0.019  0.034 -0.498 -0.049 -0.381
## 101 -0.189  0.983  0.784 -0.655 -0.005  0.742 -1.048 -0.129  0.383  0.196
## 103 0.258 -0.242 -0.191 -0.442 -0.299  0.062 -0.064 -0.641  0.086  0.181
## 105 0.495 -0.055 -0.105  0.238 -0.208 -0.065  0.165 -0.467 -0.455 -0.379
## 106 0.637 -0.094 -0.472  0.608 -0.178  0.099  0.170 -0.678 -0.288 -0.491
## 107 -0.225  0.800  0.485 -0.781  0.051  0.776 -0.621 -0.253  0.375  0.514
## 109 0.049 -0.271 -0.412 -0.077 -0.176  0.453 -0.123 -0.128  0.514 -0.021
## 111 0.002  0.852  0.749 -0.719 -0.090  0.683 -0.944 -0.089  0.223  0.389
## 112 0.371  0.272  0.026  0.007 -0.078  0.237 -0.106 -0.366  0.505  0.502
## 113 -0.095 -0.074  0.154 -0.133 -0.259  0.050 -0.149 -0.076  0.147  0.272
## 114 -0.473  0.208  0.230 -0.051 -0.077  0.251 -0.557  0.008  0.815 -0.223
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## 115  1.052 -0.483 -0.775  0.058 -0.840  0.407  0.545  0.013 -0.015 -0.553
## 118  0.522 -0.117 -0.310 -0.397 -0.588 -0.060  0.308 -0.418  0.406  0.228
## 119  0.314 -0.149 -0.427 -0.267 -0.572  0.149  0.090 -0.271  0.290  0.164
## 120 -0.070 -0.085 -0.107  0.036 -0.231  0.131 -0.134 -0.108  0.225  0.115
## 122 -0.301 -0.145  0.213 -0.130 -0.299  0.005 -0.124 -0.287  0.665  0.365
## 123  0.551  0.350 -0.204  0.260 -0.218  0.149  0.131 -0.033 -0.129 -0.144
## 125 -0.040  0.151  0.243  0.062 -0.283  0.067 -0.246 -0.213  0.403  0.186
## 126 -0.047  0.140  0.103  0.057 -0.530  0.112 -0.248 -0.481  0.612  0.701
## 127  0.524 -0.111 -0.155 -0.246 -0.208 -0.019  0.120 -0.213  0.296  0.333
## 129 -0.145  0.190  0.230 -0.284 -0.057 -0.238 -0.098 -0.414  0.179 -0.300
## 132  0.739 -0.048 -0.631  0.408 -0.464  0.210  0.432  0.013 -0.228 -0.017
## 133  0.170 -0.106  1.202 -0.174  0.857  0.371 -0.458 -0.813 -0.861 -0.306
## 136  0.570  0.401  0.179  0.486 -0.286  0.433 -0.032 -0.151  0.030  0.108
## 137  0.391  0.031 -0.435 -0.180 -0.596  0.143  0.120 -0.373  0.289  0.228
## 138 -0.024 -0.112 -0.169  0.036 -0.315  0.377 -0.058 -0.170  0.187 -0.044
## 141  0.130 -0.448 -0.184  0.177 -0.356  0.247 -0.254 -0.394  0.119  0.128
## 142  0.852 -0.908 -1.270 -0.337 -0.728  0.273  0.757  0.156 -0.007 -0.590
## 143 -0.248  0.081 -0.211  0.164 -0.806 -0.638  0.032 -0.429 -0.167  0.454
## 144 -0.282  0.581 -0.356 -0.455 -0.451 -0.233 -0.184 -0.086 -0.374  0.596
## 145 -0.089 -0.329 -0.203 -0.107  0.041  0.185 -0.269 -0.235  0.291 -0.206
## 146 -0.694 -0.135  0.434 -0.261 -0.007 -0.092 -0.364  0.080  0.766  0.051
## 147 -0.241 -0.247  0.271 -0.257 -0.037 -0.063 -0.317 -0.035  0.393  0.218
## 151  1.239 -0.776 -0.130  0.373 -0.264 -1.642  0.558 -0.937 -0.173 -0.695
## 152 -0.274  0.338  0.393 -0.478 -0.315  0.180  0.034 -0.614  0.247  0.855
## 153 -0.272 -0.242  0.422 -0.379 -0.279 -0.142 -0.319 -0.470  0.247  0.556
## 156 -0.162  0.241  0.009  0.105 -0.493 -0.070 -0.220 -0.037  0.123  0.201
## 157  0.563 -0.663  0.903 -0.238 -0.079 -0.088  0.481 -0.041  0.384  0.261
## 158  0.001 -0.116  0.085 -0.203  0.200  0.095 -0.250 -0.312  0.509  0.002
## 159 -0.143 -0.113 -0.357 -0.040 -0.290  0.165 -0.148 -0.115  0.132  0.203
## 161  1.397 -0.515 -0.885 -0.720 -1.064  0.554  1.134  0.458 -0.493 -1.288
## 162  0.815  0.524 -0.086  0.519 -0.230  0.280 -0.041  0.033 -0.342  0.071
## 163 -0.011 -0.098  0.129  0.106 -0.384 -0.044 -0.241 -0.252  0.383  0.021
## 164 -0.542  0.518  0.449 -0.400  0.386  0.439 -0.252 -0.536  0.668  0.267
## 165  1.075  0.169 -0.301 -0.791 -0.674  1.053  0.284  0.432 -0.589 -0.053
## 168  0.144 -0.070  0.040 -0.026 -0.145  0.055 -0.306  0.195  0.045 -0.258
## 169 -0.040 -0.121 -0.190 -0.529 -0.510  0.099  0.183  0.053  0.562  0.953
## 171  0.925 -0.116 -0.388 -0.098 -0.406  0.403  0.385 -0.028 -0.103 -0.096
## 173 -0.157  0.688  0.488 -0.470  0.160  0.650 -0.690 -0.391  0.529  0.363
## 174 -0.185 -0.023  0.082 -0.212 -0.449 -0.079 -0.433 -0.520  0.763  0.557
## 176  0.317  0.088 -0.077 -0.164 -0.531  0.070  0.032 -0.148  0.209  0.320
## 182  0.333 -0.028 -0.211  0.027 -0.388  0.173 -0.090 -0.591  0.018  0.079
## 183  0.251  0.215  0.185 -0.072 -0.025  0.246 -0.073 -0.376  0.287  0.365
## 185  0.728  0.411 -0.233  0.486 -0.200  0.392  0.146  0.093 -0.285  0.131
## 186 -0.105 -0.092 -0.029  0.070 -0.145  0.213 -0.082 -0.066  0.229  0.125
## 188  0.049  0.111  0.258  0.003 -0.245  0.025 -0.249 -0.201  0.436  0.216
## 189  0.108  0.063  0.307 -0.051 -0.197  0.062 -0.238 -0.139  0.504  0.297
## 191 -0.067 -0.046 -0.055  0.047  0.001  0.242 -0.092 -0.277  0.507  0.220
## 192  1.563 -0.690 -0.458  0.393 -0.223 -1.672  0.830 -0.929 -0.207 -1.098
## 193  0.988 -0.357 -0.870  0.137 -0.791  0.466  0.554 -0.062 -0.079 -0.486
## 194 -0.025  0.998  0.543 -0.709 -0.183  0.923 -1.028 -0.187  0.154  0.637
## 195  0.158 -0.160 -0.211  0.251 -0.144  0.288  0.088 -0.935  0.010 -0.336
## 197  0.334 -0.260 -0.270 -0.397 -0.242  0.050  0.027 -0.474  0.350  0.193
## 198 -0.176 -0.164 -0.328 -0.041 -0.228  0.406 -0.058 -0.128  0.464  0.015
## 200 -0.066 -0.156  0.101 -0.145 -0.074  0.121 -0.231 -0.142  0.261  0.305
```

```
## 202 0.333 -0.183 -0.283 0.239 -0.606 -0.411 -0.210 0.007 -0.203 0.409
## 203 0.188 -0.139 0.299 -0.068 -0.151 0.151 -0.107 -0.171 0.508 0.339
## 204 0.274 0.152 -0.075 0.347 -0.127 0.535 0.023 0.078 0.058 -0.200
## 208 -0.032 -0.295 -0.183 -0.236 -0.117 -0.007 -0.090 -0.268 0.122 0.037
## 210 -0.285 0.538 0.369 -0.287 0.211 0.276 -0.057 -0.616 0.574 0.422
## 211 0.491 -0.734 -0.868 0.025 -0.575 -0.137 0.220 -0.070 -0.213 -0.076
## 212 0.003 -0.026 0.418 -0.282 -0.362 -0.214 0.076 -0.073 -0.267 -0.030
## 213 0.069 -0.082 0.172 0.154 -0.352 -0.089 -0.307 -0.191 0.369 0.051
## 214 0.398 -0.473 0.330 -0.762 0.180 -0.421 0.019 0.385 0.149 0.374
## 216 0.168 0.092 -0.165 0.220 -0.569 -0.270 -0.144 -0.288 0.013 0.299
## 217 0.072 -0.113 -0.012 0.097 -0.096 0.189 -0.199 -0.173 0.514 0.217
## 218 0.014 -0.240 -0.302 0.082 -0.017 0.488 -0.129 -0.304 0.535 -0.062
## 219 0.323 -0.051 0.125 0.187 -0.410 0.048 -0.255 -0.096 -0.210 0.053
## 220 -0.110 0.822 0.848 -0.626 -0.031 0.604 -0.934 -0.110 0.230 0.187
## 221 0.632 0.576 0.333 0.819 -0.337 0.284 -0.026 -0.368 0.383 0.543
## 222 0.211 0.038 0.168 -0.246 -0.223 0.201 -0.117 -0.126 -0.092 0.150
## 224 0.228 -0.168 -0.390 -0.279 -0.418 0.300 -0.014 -0.130 0.243 0.351
## 225 0.267 0.237 -0.458 -0.097 -0.480 0.215 -0.043 0.093 0.215 0.421
##      F1971 F1972 F1973 F1974 F1975 F1976 F1977 F1978 F1979 F1980
## 1      0.619 -1.124 0.232 -0.489 -0.445 -0.286 0.513 0.129 0.361 0.600
## 2     -0.195 -0.069 -0.288 -0.139 -0.211 -0.683 0.545 -0.814 0.203 -0.414
## 3     -0.385 -0.348 -0.015 -0.503 -0.539 -0.782 0.504 0.012 0.654 0.232
## 5     -0.326 -0.499 0.025 -0.371 0.246 -0.045 -0.093 -0.163 0.058 -0.188
## 6     -0.097 -0.035 0.475 -0.158 -0.029 -0.313 0.272 0.037 0.291 0.279
## 7     -0.269 -0.179 0.170 -0.370 -0.334 -0.426 0.096 0.130 0.034 0.698
## 9     -0.260 -0.008 -0.139 -0.106 -0.021 -0.321 0.432 0.362 0.266 0.373
## 12    -0.044 0.091 0.831 -0.354 0.048 -0.522 0.176 0.062 0.375 0.887
## 13    -0.060 0.103 -0.033 0.314 0.860 0.216 0.499 -0.476 -0.112 -0.274
## 15    -0.055 0.301 0.166 -0.058 0.334 -0.241 -0.040 0.040 0.133 0.377
## 16    -0.248 -0.613 -0.273 -0.256 -0.217 -0.501 0.332 0.099 0.856 0.351
## 17    -0.579 -0.012 0.168 -0.125 -0.102 -0.104 -0.275 -0.216 0.495 0.128
## 21    -0.275 0.442 0.347 0.101 -0.059 -0.416 0.134 -0.025 0.524 0.576
## 22    -0.183 0.080 0.627 0.089 -0.274 -0.194 0.357 -0.045 0.499 0.425
## 23    -0.227 -0.014 0.310 0.188 0.103 -0.042 -0.059 -0.213 0.414 0.081
## 24    -0.583 0.130 0.227 -0.154 -0.087 -0.249 0.276 0.270 0.181 0.176
## 26    -0.126 -0.475 0.602 -0.746 -0.225 -0.717 0.300 -0.065 0.543 -0.038
## 27    -0.134 0.114 0.443 -0.179 -0.140 -0.185 0.252 0.030 0.017 0.313
## 28    -0.274 -0.136 0.214 -0.353 -0.218 -0.368 0.123 0.109 -0.050 0.750
## 29    -0.248 0.018 0.255 -0.151 0.004 -0.337 -0.075 0.123 0.275 0.185
## 30    -0.139 0.136 -0.426 -0.198 0.390 -0.838 0.563 -0.710 0.165 -0.448
## 31    -0.019 0.135 0.671 -0.056 -0.311 -0.316 0.267 0.212 0.434 0.805
## 34    -0.468 0.007 0.360 -0.343 -0.019 -0.485 0.104 0.290 0.479 0.417
## 35    -0.132 0.055 0.566 -0.076 -0.207 -0.163 0.304 0.056 0.400 0.350
## 36    -0.023 -1.796 0.306 -0.846 0.225 0.083 1.079 -0.605 -0.214 0.917
## 38    -0.055 0.064 0.545 -0.058 -0.049 -0.117 0.203 0.044 0.380 0.439
## 39    -0.241 0.206 0.719 -0.032 -0.172 0.232 -0.048 -0.132 0.459 0.337
## 40    -0.364 -0.130 -0.058 -0.180 -0.127 -0.262 0.370 0.366 0.286 0.342
## 41    -0.187 -0.141 0.426 -0.342 0.161 -0.769 0.167 0.016 0.029 0.244
## 42    -0.187 -0.141 0.426 -0.342 0.161 -0.769 0.167 0.016 0.029 0.244
## 43     0.038 0.012 0.412 -0.008 0.278 -0.396 -0.057 0.242 0.299 0.251
## 44    -0.431 -0.022 0.349 -0.306 -0.304 -0.240 0.214 0.109 0.191 0.446
## 46    -0.141 0.074 0.458 -0.077 -0.103 -0.185 0.259 0.141 0.400 0.311
## 48    -0.079 -0.030 0.508 -0.129 -0.167 -0.269 0.057 -0.006 -0.050 0.138
## 51     0.067 0.433 0.403 0.087 0.528 -0.194 0.131 0.034 0.349 0.490
```

```
## 52 -0.256 -0.625 -0.379 -0.177 -0.225 -0.713 0.150 -0.028 0.607 -0.295
## 54 0.261 0.289 0.670 0.580 1.335 0.301 -0.014 0.145 -1.191 -0.441
## 56 -0.218 -0.083 0.163 -0.396 -0.392 -0.434 0.045 0.086 0.163 0.430
## 57 -0.318 -0.103 0.364 -0.438 -0.026 -0.337 0.405 0.330 0.181 0.692
## 58 -0.569 0.550 0.124 -0.246 -0.314 0.320 0.341 0.237 0.514 0.496
## 59 -0.257 -0.049 -0.304 -0.120 -0.482 -0.299 -0.119 -0.273 0.585 -0.080
## 60 -0.270 0.395 0.402 -0.311 0.057 -0.212 0.451 0.157 0.462 0.395
## 64 -0.002 -0.395 0.112 -0.233 -0.353 -0.436 0.305 0.188 0.234 -0.130
## 67 0.245 0.672 -0.049 0.501 -0.024 0.508 -0.311 -0.110 -0.873 0.041
## 68 0.157 -0.208 0.446 0.221 0.227 -0.004 -0.079 -0.002 0.154 0.195
## 69 -0.452 0.933 1.138 1.121 1.893 -0.877 -0.227 -0.526 -0.755 -0.380
## 70 -0.161 -0.325 0.059 -0.081 0.483 0.368 0.015 -0.216 -0.187 -0.217
## 71 -0.342 0.119 0.325 -0.342 -0.247 -0.250 0.243 -0.074 0.105 0.225
## 72 -0.053 -0.064 0.468 -0.084 -0.126 -0.335 0.185 0.069 0.385 0.307
## 73 -0.054 0.311 0.685 -0.212 -0.164 -0.057 0.489 0.422 0.630 0.820
## 75 0.032 -0.014 0.188 0.318 1.099 0.470 0.283 -0.173 -0.640 -0.186
## 76 -0.145 0.024 0.564 0.011 -0.228 -0.353 0.296 0.067 0.561 0.446
## 77 -0.810 -0.865 -0.157 -0.369 -0.177 -0.469 -0.144 0.213 0.396 0.312
## 78 -0.222 -0.177 -0.357 -0.193 -0.250 -0.916 0.330 -0.555 0.179 -0.379
## 79 -0.784 -0.841 -0.987 0.306 -1.093 -0.259 0.760 -0.682 0.498 0.919
## 80 -0.303 -0.117 0.073 -0.447 -0.396 -0.240 -0.127 0.067 0.274 0.212
## 81 -0.245 -0.147 0.167 -0.381 -0.366 -0.434 0.074 0.117 0.099 0.590
## 82 -0.141 0.429 0.458 -0.281 0.137 -0.392 0.225 0.128 0.332 0.432
## 83 -0.131 0.203 0.579 -0.063 -0.248 -0.242 0.203 0.192 0.491 0.636
## 84 -0.059 0.263 0.579 -0.150 -0.195 -0.109 0.358 0.294 0.487 0.645
## 85 -0.486 -0.024 0.084 -0.462 -0.301 -0.354 0.083 -0.028 0.341 0.322
## 86 -0.170 0.015 0.356 -0.342 0.220 -0.431 0.353 0.191 0.219 0.637
## 87 -0.258 -0.165 0.020 -0.213 -0.133 -0.412 0.317 -0.585 0.115 -0.530
## 88 -0.161 0.269 0.507 -0.327 0.068 -0.248 0.337 0.250 0.407 0.434
## 89 -0.063 0.390 -0.033 0.263 0.857 -0.274 0.549 -0.871 0.047 -0.620
## 90 -0.005 0.777 -0.099 0.522 -0.420 0.377 -0.258 0.054 -1.239 0.407
## 91 -0.519 0.012 0.332 0.034 -0.308 0.003 0.155 -0.150 0.305 0.401
## 92 -0.150 -0.054 0.264 -0.111 -0.131 -0.012 0.118 0.176 0.235 0.290
## 93 0.097 -0.959 -0.199 -0.677 -0.218 -0.555 0.394 0.274 0.684 0.540
## 94 -0.178 -0.731 -0.245 -0.434 -0.239 -0.777 0.313 0.162 1.264 0.058
## 95 0.342 -0.268 0.362 -0.211 0.701 0.561 -0.279 0.257 -0.687 -0.057
## 96 0.316 -0.190 0.297 -0.200 0.697 0.661 -0.339 0.209 -0.777 -0.031
## 97 -0.353 -0.513 -0.481 -0.260 -0.414 -0.577 0.005 -0.079 0.607 -0.202
## 98 -0.149 -0.132 0.034 -0.115 0.075 -0.320 0.283 -0.537 0.022 -0.421
## 100 -0.334 0.227 0.325 -0.488 0.041 -0.506 -0.154 0.232 0.458 -0.206
## 101 -0.405 -0.626 -0.491 -0.334 -0.507 -0.726 -0.001 -0.005 0.770 -0.113
## 103 -0.272 0.216 0.535 -0.069 -0.067 0.229 0.216 -0.023 0.055 0.561
## 105 -0.282 -0.171 0.614 -0.486 0.909 -0.343 0.168 0.665 0.619 0.004
## 106 -0.193 -0.080 0.516 -0.808 0.571 -0.493 0.121 0.788 0.596 -0.465
## 107 -0.178 -0.766 -0.274 -0.341 -0.254 -0.649 0.366 0.036 1.291 0.497
## 109 -0.442 -0.002 0.480 -0.405 0.265 -0.490 0.018 0.193 0.538 0.512
## 111 -0.306 -0.675 -0.535 -0.226 -0.253 -0.667 0.094 0.019 0.693 -0.229
## 112 -0.015 -0.110 0.119 -0.108 -0.153 -0.422 0.295 0.125 0.326 0.190
## 113 -0.131 0.025 0.504 0.023 -0.121 -0.193 0.237 0.246 0.550 0.417
## 114 -0.195 0.179 -0.188 -0.132 -0.449 -0.550 0.246 -0.260 0.302 -0.051
## 115 -0.078 0.077 -0.024 0.177 0.680 0.293 0.272 -0.354 -0.081 -0.159
## 118 -0.244 -0.064 0.161 -0.291 -0.249 0.004 0.356 0.515 0.260 0.319
## 119 -0.270 -0.008 0.300 -0.325 -0.147 -0.085 0.504 0.265 0.131 0.231
## 120 -0.243 0.049 0.262 -0.193 -0.029 -0.239 0.073 0.249 0.379 0.292
```

```
## 122 -0.007  0.278  0.508 -0.435 -0.471 -0.374  0.362  0.360  0.646  0.970
## 123 -0.272 -0.294 -0.003 -0.251 -0.383 -0.706  0.304 -0.602  0.036 -0.504
## 125 -0.193 -0.047  0.158 -0.395 -0.394 -0.415  0.020  0.082  0.166  0.401
## 126 -0.311 -0.052  0.496 -0.679 -0.314 -0.556  0.654  0.569  0.987  0.911
## 127 -0.320  0.133 -0.075 -0.686 -0.105  0.018  0.556  0.345  0.369  0.411
## 129 -0.066  0.304 -0.167 -0.088 -0.332 -0.495 -0.012  0.166 -0.080  0.380
## 132  0.002 -0.114  0.288 -0.086  0.195  0.044 -0.039 -0.403 -0.018 -0.353
## 133 -0.038  0.234  0.689  0.193  0.490 -0.200  0.065  0.908  0.951  0.473
## 136 -0.775 -1.303  0.062 -0.402 -0.221 -0.819  0.041  0.316  0.438  0.548
## 137 -0.142 -0.222  0.262 -0.295 -0.163 -0.142  0.468  0.364  0.129  0.093
## 138 -0.414 -0.013  0.263 -0.252  0.183 -0.391 -0.117  0.076  0.516  0.298
## 141 -0.561  0.024  0.161  0.150 -0.128 -0.035 -0.022 -0.410  0.318  0.121
## 142  0.045 -0.116  0.290  0.230  1.035  0.709  0.159 -0.068 -0.902  0.010
## 143  0.128 -0.207  0.799  0.293  0.230  0.155  0.159  0.292  0.208  0.421
## 144  0.684  0.119  0.196  0.363  0.588 -0.510 -0.388  0.387  0.316  0.007
## 145 -0.293  0.163  0.434 -0.252  0.061 -0.072  0.269  0.205  0.177  0.511
## 146 -0.092  0.334  0.445  0.008 -0.409  0.288 -0.357  0.192  0.714  0.518
## 147 -0.053  0.074  0.791  0.135 -0.278  0.038  0.286  0.004  0.508  0.375
## 151 -0.079  0.931  0.918  0.969  1.058 -0.041 -0.552 -0.101 -1.070 -0.313
## 152  0.080 -0.100 -0.172 -0.137 -0.225  0.221  0.575  0.138  0.138 -0.020
## 153  0.198 -0.476  0.117 -0.176 -0.584 -0.271  0.352 -0.006 -0.005  0.485
## 156  0.005 -0.344  0.153  0.022  0.016 -0.296 -0.086  0.212  0.117  0.207
## 157 -0.385  0.420  0.094 -0.265 -0.121 -0.435  0.700  0.658  0.096  0.187
## 158 -0.454  0.190  0.128 -0.281 -0.280 -0.111  0.282  0.075  0.241  0.361
## 159 -0.324  0.026  0.319 -0.050  0.083 -0.141  0.288  0.181  0.355  0.136
## 161  0.133  0.477  0.419  0.488  1.485 -0.295  0.424 -0.233 -0.774 -0.760
## 162 -0.870 -0.906 -0.063 -0.439 -0.090 -0.357 -0.272  0.167  0.169  0.282
## 163 -0.325 -0.071  0.255 -0.367 -0.177 -0.391  0.202  0.306  0.092  0.582
## 164 -0.152 -0.731 -0.255 -0.336 -0.281 -0.556  0.274  0.149  0.765  0.389
## 165 -0.021  0.382 -0.220 -0.097  0.806 -0.806  0.536 -0.828  0.156 -0.639
## 168 -0.206  0.546 -0.143  0.249  0.379  0.353 -0.046  0.093  0.032  0.279
## 169  0.268 -1.278 -0.809 -0.982 -0.731 -0.149 -0.148 -0.343  0.429 -0.236
## 171 -0.132 -0.043  0.003 -0.038  0.254 -0.425  0.337 -0.585  0.028 -0.454
## 173 -0.428 -0.559 -0.234 -0.241 -0.316 -0.405  0.139 -0.220  0.873  0.047
## 174 -0.036  0.380  0.713 -0.432 -0.235 -0.063  0.552  0.506  0.809  0.943
## 176 -0.435 -0.372  0.181 -0.471 -0.274 -0.205  0.236  0.355  0.226  0.258
## 182 -0.245  0.298  0.571 -0.027  0.128  0.264  0.493  0.249  0.070  0.651
## 183 -0.153  0.106  0.350 -0.245 -0.132 -0.504  0.171  0.059  0.317  0.237
## 185 -0.741 -0.825 -0.164 -0.434 -0.091 -0.367 -0.160  0.101  0.276  0.186
## 186 -0.334 -0.103  0.413 -0.245 -0.183 -0.117  0.038  0.091  0.327  0.419
## 188 -0.225 -0.058  0.104 -0.408 -0.417 -0.344 -0.055  0.096  0.194  0.329
## 189 -0.301 -0.117  0.072 -0.451 -0.397 -0.239 -0.130  0.066  0.276  0.211
## 191 -0.429 -0.077  0.120 -0.348 -0.364 -0.050  0.128  0.073  0.299  0.280
## 192  0.030  0.791  1.145  0.935  1.574 -0.110 -0.466 -0.075 -1.091 -0.569
## 193 -0.069 -0.061 -0.056  0.089  0.622  0.367  0.172 -0.362 -0.063 -0.194
## 194 -0.182 -0.928 -0.410 -0.180 -0.182 -0.845  0.191  0.170  0.921 -0.174
## 195 -0.235 -0.164  0.484 -0.364  0.231 -0.549  0.223  0.029  0.059  0.222
## 197 -0.286  0.024  0.335 -0.122 -0.040  0.015  0.352  0.118 -0.090  0.410
## 198 -0.469  0.043  0.361 -0.453  0.095 -0.501  0.109  0.306  0.617  0.536
## 200 -0.193  0.118  0.541 -0.027 -0.260 -0.295  0.387 -0.040  0.447  0.418
## 202  0.202  0.012  0.451  0.108  0.085 -0.161  0.053  0.221  0.271  0.238
## 203 -0.343 -0.155  0.078 -0.376 -0.387 -0.266 -0.065  0.099  0.249  0.248
## 204 -0.225 -0.340 -0.122 -0.332 -0.350 -0.731  0.598 -0.392  0.426 -0.197
## 208 -0.158  0.093  0.374 -0.109 -0.036  0.070  0.215  0.156  0.330  0.626
```

```
## 210 -0.151 -0.801 -0.329 -0.460 -0.332 -0.562 0.391 0.037 0.445 0.372
## 211 0.254 -0.055 0.203 -0.062 0.604 0.729 -0.323 0.070 -0.781 -0.022
## 212 -0.415 -0.252 -0.013 0.081 -0.389 -0.124 0.397 0.035 -0.306 0.412
## 213 -0.307 -0.130 0.189 -0.362 -0.240 -0.387 0.129 0.137 -0.062 0.718
## 214 -0.345 0.250 -0.124 -0.048 0.031 -0.334 0.502 0.116 0.128 0.571
## 216 0.016 -0.321 0.558 0.378 0.239 0.041 -0.047 0.114 0.103 0.147
## 217 -0.365 -0.029 0.313 -0.295 -0.300 -0.409 0.168 0.095 0.202 0.346
## 218 -0.438 -0.008 0.468 -0.387 0.199 -0.551 -0.029 0.112 0.416 0.368
## 219 -0.042 -0.117 0.363 0.127 -0.022 -0.119 -0.140 -0.043 0.117 0.194
## 220 -0.351 -0.505 -0.479 -0.256 -0.409 -0.573 0.003 -0.077 0.606 -0.204
## 221 -0.637 -1.096 -0.014 -0.589 -0.266 -0.959 0.119 0.403 0.537 0.497
## 222 -0.093 -0.199 0.269 -0.181 0.088 -0.314 0.269 0.001 0.226 0.332
## 224 -0.249 -0.139 0.383 -0.405 -0.127 -0.314 0.510 0.087 0.249 0.138
## 225 -0.052 -0.397 0.601 -0.485 -0.262 -0.436 0.433 -0.016 0.189 -0.024
##      F1981 F1982 F1983 F1984 F1985 F1986 F1987 F1988 F1989 F1990
## 1      0.483 -0.346 0.164 0.145 0.283 -0.141 0.391 0.919 -0.205 0.730
## 2     -0.351 0.173 -0.128 -0.270 -0.103 0.569 -0.106 0.370 -0.066 0.795
## 3      0.215 0.399 0.560 -0.004 0.508 0.296 0.975 1.304 0.386 1.266
## 5      0.178 1.044 0.859 -0.157 0.059 0.387 0.397 0.883 1.162 1.736
## 6     -0.071 0.164 0.487 0.631 0.694 0.176 0.689 0.572 -0.055 0.687
## 7      0.532 0.097 0.524 0.105 0.006 0.013 0.569 0.457 -0.002 0.432
## 9      0.378 0.359 0.046 -0.100 0.308 0.460 0.446 -0.192 0.611 0.436
## 12     0.495 0.186 0.633 -0.157 0.349 0.388 0.363 0.960 0.153 0.549
## 13     0.277 0.384 1.062 -0.249 -0.568 0.319 -0.263 0.820 1.104 1.262
## 15    -0.030 0.531 0.155 0.020 0.242 0.230 0.466 0.426 0.672 0.764
## 16     0.408 -0.086 -0.834 0.039 0.367 0.668 0.548 0.633 0.047 0.455
## 17    -0.170 -0.041 -0.132 -0.322 0.050 0.026 0.341 0.341 0.064 -0.149
## 21    -0.068 0.526 0.685 0.254 0.455 0.135 0.350 0.460 0.173 0.339
## 22     0.161 0.211 0.548 0.542 0.411 0.307 0.977 0.631 -0.052 0.580
## 23     0.212 -0.111 -0.286 -0.055 0.113 -0.068 0.256 0.567 0.220 -0.087
## 24     0.167 0.324 0.537 0.289 0.330 0.437 0.692 0.334 0.129 0.183
## 26    -0.441 0.310 1.012 0.442 0.293 0.278 1.270 0.287 -0.306 0.738
## 27     0.191 0.277 0.471 0.294 0.092 0.285 0.722 0.461 0.130 0.435
## 28     0.512 0.099 0.533 0.211 0.088 0.040 0.514 0.512 0.054 0.446
## 29     0.122 0.186 0.563 0.021 0.181 0.156 0.498 0.471 0.057 0.381
## 30    -0.043 -0.130 0.389 -0.022 -0.605 0.360 -0.484 0.128 0.405 0.797
## 31     0.282 0.180 0.724 0.799 0.472 0.356 1.011 0.593 0.009 0.603
## 34     0.389 0.150 0.537 0.194 0.348 0.128 0.694 0.415 0.324 0.674
## 35     0.045 0.061 0.164 0.196 0.025 0.084 0.487 0.290 -0.384 0.651
## 36     1.562 -0.673 0.488 0.337 -0.311 0.011 1.340 1.204 0.017 0.078
## 38     0.003 0.229 0.425 0.125 0.156 0.478 0.504 0.265 -0.148 0.347
## 39     0.037 0.306 -0.047 0.508 0.172 0.630 0.344 0.133 -0.271 0.416
## 40     0.373 0.397 0.574 -0.122 0.328 0.080 0.616 0.080 0.327 0.214
## 41     0.370 0.057 -0.193 -0.528 -0.294 0.012 0.831 -0.139 0.257 0.271
## 42     0.370 0.057 -0.193 -0.528 -0.294 0.012 0.831 -0.139 0.257 0.271
## 43     0.219 0.379 0.122 -0.148 -0.127 -0.043 0.430 0.398 0.428 0.852
## 44     0.129 0.192 0.636 -0.233 -0.015 0.017 0.573 0.312 -0.091 0.310
## 46     0.150 0.143 0.506 0.282 0.159 0.307 0.600 0.488 -0.144 0.082
## 48     0.036 -0.061 0.060 -0.043 0.050 0.264 -0.021 0.340 0.130 0.190
## 51    -0.016 0.591 0.303 0.287 0.235 0.357 0.736 0.603 0.680 0.836
## 52     0.088 -0.337 -0.805 0.013 -0.068 0.249 -0.260 0.044 0.085 0.069
## 54     0.300 0.002 1.060 0.379 -1.004 -0.444 -0.985 0.925 1.803 1.843
## 56     0.438 0.080 0.457 -0.039 -0.062 0.015 0.596 0.394 -0.056 0.436
## 57     0.499 0.419 0.631 0.265 0.099 0.255 0.737 0.603 0.251 0.554
```

```
## 58  0.028  0.595  1.176  0.024 -0.070  0.194  1.074  0.425 -0.003  0.503
## 59 -0.259 -0.413 -1.123 -0.228  0.243  0.118 -0.317  0.211 -0.216 -0.082
## 60  0.046  0.372  0.716  0.062  0.158  0.222  0.627  0.596  0.237  0.492
## 64 -0.429  0.170  0.915 -0.040  0.571  0.321  0.567  0.608  0.142  0.281
## 67 -0.364  0.223 -0.266  0.489 -0.118 -0.119  0.221  0.303  0.530  0.801
## 68  0.161  0.151  0.111  0.358  0.317 -0.103  0.206  0.846  0.247  0.348
## 69 -0.240 -0.155  0.964  0.757 -1.177 -0.181 -1.652  0.579  2.179  1.249
## 70  0.097  0.812  0.721 -0.082 -0.338 -0.003  0.001  0.773  1.278  1.591
## 71  0.132  0.323  0.189  0.412  0.154  0.278  0.478  0.356  0.159  0.397
## 72 -0.176 -0.374  0.174  0.204 -0.219 -0.126  0.272  0.232 -0.023  0.124
## 73  0.622  0.326  1.131  0.636  0.384  0.665  1.068  0.829  0.609  1.139
## 75  0.296  0.439  1.071 -0.110 -0.800 -0.007 -0.561  0.893  1.491  1.571
## 76  0.181  0.177  0.691  0.665  0.357  0.294  0.985  0.645  0.237  0.526
## 77  0.358  0.481  0.382 -0.150  0.592  0.227  0.497  0.782  0.908  1.202
## 78 -0.191 -0.243 -0.493 -0.123 -0.063  0.312 -0.395  0.129 -0.204  0.368
## 79 -0.360 -0.642 -2.062 -1.455  0.891  0.381 -0.121  0.513 -1.537 -0.348
## 80  0.331  0.085  0.360 -0.048 -0.429 -0.192  0.442  0.446 -0.169  0.203
## 81  0.500  0.099  0.494  0.038 -0.026  0.010  0.589  0.426 -0.032  0.432
## 82 -0.016  0.457  0.649  0.116  0.164  0.125  0.310  0.481  0.132  0.309
## 83  0.337  0.215  0.635  0.380  0.382  0.077  0.810  0.610  0.116  0.653
## 84  0.473  0.282  0.902  0.516  0.361  0.495  0.828  0.669  0.441  0.960
## 85  0.185  0.410  0.539 -0.351 -0.329  0.015  0.495  0.400 -0.044  0.527
## 86  0.444  0.571  0.622  0.305  0.163  0.282  0.842  0.721  0.396  0.694
## 87 -0.446  0.594  0.274 -0.571  0.286  0.550  0.195  0.755  0.148  1.125
## 88  0.108  0.449  0.581  0.073  0.140  0.138  0.391  0.621  0.191  0.258
## 89  0.146  0.105  0.997 -0.129 -1.068  0.356 -0.547  0.385  0.864  1.070
## 90 -0.909 -0.258 -0.863  0.204  0.164 -0.077  0.685 -0.088 -0.174  0.169
## 91  0.072 -0.017 -0.135 -0.107  0.211  0.190  0.578  0.504 -0.018 -0.081
## 92  0.200  0.036  0.405 -0.110  0.151  0.138  0.514  0.437  0.130  0.089
## 93  0.677 -0.120 -0.111  0.151  0.243  0.207  0.536  0.706  0.220  0.727
## 94  0.257 -0.406 -0.802  0.036  0.021  0.370  0.368  0.106  0.176  0.356
## 95  0.377  0.154  0.408  0.336 -0.439 -0.726 -0.143  0.246  1.054  0.829
## 96  0.292  0.076  0.381  0.356 -0.489 -0.684 -0.222  0.270  1.105  0.913
## 97 -0.213 -0.564 -1.066 -0.209  0.010  0.056 -0.283  0.037 -0.174 -0.112
## 98 -0.279  0.511  0.384 -0.468  0.117  0.436  0.192  0.842  0.417  1.132
## 100 -0.631 -0.041  0.107 -0.605  0.130 -0.686  0.326 -0.154  0.556  1.132
## 101 -0.158 -0.682 -1.071 -0.227 -0.009  0.069 -0.122  0.030 -0.065 -0.030
## 103  0.183  0.297  0.609  0.173 -0.057  0.133  0.730  0.589 -0.208 -0.050
## 105 -0.597  0.911  0.598 -0.145  0.152 -0.702  0.231  0.562  1.235  1.329
## 106 -0.767  0.420  0.456 -0.282  0.262 -0.765  0.374  0.255  0.780  1.229
## 107  0.418 -0.142 -0.622  0.256  0.003  0.467  0.723  0.449  0.141  0.396
## 109  0.486  0.217  0.321  0.129  0.321  0.079  0.982  0.361  0.299  0.487
## 111  0.017 -0.496 -0.958 -0.081 -0.015  0.233 -0.229  0.019  0.129  0.059
## 112 -0.262  0.300  1.007  0.351  0.812  0.513  0.606  0.484  0.017  0.358
## 113  0.171  0.249  0.536  0.388  0.282  0.173  0.951  0.824  0.364  0.581
## 114  0.022  0.136 -0.332 -0.076  0.099  0.236  0.060  1.051 -0.006  0.557
## 115  0.045  0.544  0.942 -0.371 -0.336  0.383 -0.045  0.929  1.089  1.308
## 118  0.117  0.293  0.430 -0.100  0.088 -0.041  0.534  0.572  0.061  0.108
## 119 -0.191  0.000  1.038  0.363  0.016  0.162  0.679  0.693  0.174  0.616
## 120  0.256  0.270  0.689  0.052  0.244  0.281  0.590  0.525  0.181  0.548
## 122  0.395  0.264  0.830  0.609  0.512  0.304  1.081  0.784  0.107  0.903
## 123 -0.344  0.623  0.037 -0.267  0.426  0.400  0.525  1.194  0.206  1.235
## 125  0.406  0.074  0.433 -0.029 -0.060  0.017  0.591  0.404 -0.001  0.424
## 126  0.910  0.593  1.623  0.571  0.592  0.293  1.562  0.875  0.737  1.481
```

```
## 127 0.199 0.316 0.286 -0.210 -0.060 0.181 0.656 0.443 0.063 0.220
## 129 0.162 0.573 0.024 -0.102 0.097 0.298 -0.119 0.174 0.493 0.274
## 132 -0.083 0.550 0.494 -0.603 -0.106 0.433 0.196 0.758 0.908 1.284
## 133 0.217 1.135 0.601 -0.353 -0.444 0.361 0.166 0.630 1.334 1.530
## 136 0.414 0.431 0.724 0.208 0.797 0.190 0.993 0.837 0.665 1.409
## 137 -0.188 -0.040 0.918 0.263 -0.008 0.103 0.679 0.588 0.092 0.368
## 138 0.299 0.080 0.156 0.086 0.190 0.091 0.569 0.408 0.338 0.215
## 141 -0.087 -0.164 -0.423 -0.079 0.324 -0.063 0.349 0.595 0.079 -0.035
## 142 0.339 0.470 0.870 0.062 -0.851 -0.197 -0.503 0.796 1.541 1.567
## 143 0.377 0.194 0.692 0.328 0.509 0.366 0.069 1.050 0.479 0.764
## 144 0.427 -0.062 -0.294 0.174 0.398 0.382 0.397 0.488 0.736 0.572
## 145 0.255 0.659 0.786 0.040 0.107 0.171 0.422 0.505 0.158 0.350
## 146 0.040 0.371 0.029 0.607 0.284 0.733 0.655 0.587 -0.384 0.480
## 147 0.155 0.360 0.238 0.794 0.389 0.544 0.823 0.501 -0.412 0.582
## 151 -0.494 -0.054 0.633 0.532 -0.594 -0.430 -0.830 0.476 1.741 1.517
## 152 0.223 -0.418 -0.698 -0.706 -0.104 -0.042 0.070 0.201 -0.347 0.061
## 153 0.310 -0.370 -0.399 -0.206 0.221 -0.288 0.161 0.720 -0.313 0.339
## 156 0.293 -0.091 0.367 0.307 0.222 0.341 0.380 0.666 0.424 0.413
## 157 0.387 0.356 -0.312 0.482 0.370 0.835 0.173 -0.073 -0.109 0.016
## 158 0.059 0.183 1.303 0.228 0.115 0.154 0.884 0.511 0.056 0.359
## 159 0.228 0.154 0.602 0.148 0.345 0.266 0.563 0.799 0.281 0.412
## 161 0.436 0.324 1.452 0.238 -1.046 0.015 -1.081 0.681 1.695 1.709
## 162 0.546 0.560 0.286 -0.120 0.528 0.094 0.752 0.637 1.117 1.401
## 163 0.568 0.155 0.543 0.146 -0.049 0.105 0.597 0.528 0.081 0.522
## 164 0.417 -0.130 -0.826 0.039 0.357 0.510 0.385 0.494 -0.069 0.406
## 165 0.043 -0.058 0.837 -0.129 -1.193 0.431 -0.724 0.092 0.752 1.100
## 168 0.105 0.107 0.454 0.678 0.398 0.789 0.327 0.527 0.200 0.752
## 169 0.971 -0.502 0.743 0.119 -1.048 -0.735 -0.073 0.197 -0.408 -0.739
## 171 -0.328 0.407 0.426 -0.580 0.178 0.338 0.103 0.771 0.278 1.001
## 173 0.077 -0.397 -0.847 -0.309 -0.019 0.190 0.532 0.452 -0.112 0.095
## 174 0.767 0.339 1.250 0.661 0.526 0.483 1.022 0.874 0.575 1.193
## 176 0.170 0.433 0.503 -0.294 -0.114 0.250 0.505 0.418 -0.112 0.239
## 182 0.121 0.336 0.454 -0.001 0.007 0.097 0.869 0.719 -0.101 0.108
## 183 -0.328 0.212 0.707 0.535 0.663 0.463 0.743 0.338 -0.034 0.324
## 185 0.344 0.709 0.550 -0.163 0.484 0.259 0.724 0.796 1.039 1.446
## 186 0.151 0.137 0.637 -0.020 0.077 0.158 0.685 0.704 0.219 0.569
## 188 0.354 0.089 0.379 -0.039 -0.228 -0.076 0.525 0.424 -0.025 0.318
## 189 0.331 0.087 0.364 -0.047 -0.426 -0.185 0.444 0.453 -0.164 0.204
## 191 0.219 0.228 0.453 -0.252 0.001 0.126 0.734 0.561 0.069 0.310
## 192 -0.228 -0.134 0.911 0.583 -1.036 -0.493 -1.201 0.726 1.998 1.692
## 193 -0.016 0.579 0.869 -0.330 -0.328 0.242 -0.010 0.916 1.142 1.417
## 194 0.146 -0.536 -0.851 0.004 -0.028 0.402 -0.174 -0.203 0.366 0.181
## 195 0.118 -0.139 0.259 -0.553 -0.059 -0.233 0.352 0.299 0.062 0.349
## 197 0.387 0.437 0.724 0.125 0.094 0.174 0.598 0.657 -0.083 0.190
## 198 0.346 0.182 0.495 0.158 0.359 0.137 0.815 0.354 0.384 0.592
## 200 0.164 0.173 0.677 0.550 0.369 0.212 0.964 0.608 0.080 0.597
## 202 0.186 0.238 0.142 0.376 0.290 0.082 0.049 0.857 0.487 0.419
## 203 0.325 0.082 0.292 -0.101 -0.534 -0.336 0.422 0.303 -0.263 0.167
## 204 0.094 0.821 0.226 -0.112 0.407 0.447 0.610 1.336 0.481 1.418
## 208 0.448 0.385 0.664 0.279 0.098 0.237 0.605 0.433 -0.103 0.264
## 210 0.225 -0.325 -0.697 -0.187 0.138 0.191 0.162 0.191 -0.310 0.241
## 211 0.176 0.118 0.348 0.337 -0.522 -0.594 -0.283 0.307 1.145 1.016
## 212 0.871 -0.343 0.540 -0.233 -0.025 0.584 0.913 0.471 0.324 0.674
## 213 0.514 0.052 0.552 0.189 0.041 0.057 0.506 0.523 0.073 0.461
```

```
## 214 0.500 0.574 -0.052 0.103 0.431 0.770 0.336 -0.504 0.740 0.575
## 216 0.099 0.072 0.215 0.034 0.603 -0.068 -0.166 0.689 0.122 0.357
## 217 0.134 0.116 0.469 -0.107 -0.295 -0.163 0.415 0.161 -0.098 0.356
## 218 0.490 0.196 0.082 -0.126 -0.028 0.088 1.048 0.181 0.034 0.402
## 219 0.153 0.131 0.109 0.077 0.158 0.110 0.264 0.600 0.203 0.315
## 220 -0.215 -0.562 -1.068 -0.201 0.017 0.055 -0.294 0.033 -0.173 -0.113
## 221 0.621 0.418 0.837 0.432 0.759 0.294 1.109 0.384 0.691 1.367
## 222 0.443 0.086 0.460 0.127 -0.031 0.242 0.403 0.558 0.331 0.639
## 224 -0.158 0.340 1.064 0.575 0.206 0.061 0.958 0.627 0.139 0.772
## 225 -0.360 0.170 1.223 0.483 0.027 0.025 1.070 0.447 0.181 0.567
##      F1991 F1992 F1993 F1994 F1995 F1996 F1997 F1998 F1999 F2000
## 1  -0.168 -0.294 0.220 0.430 0.359 -0.116 0.471 0.675 1.198 0.993
## 2  -0.269 0.106 0.076 1.330 -0.172 -0.038 0.075 0.795 0.670 1.065
## 3   0.031 -0.312 0.552 0.732 0.595 0.846 1.059 1.109 1.476 0.820
## 5   0.231 0.386 0.174 1.508 1.279 0.570 1.788 1.018 1.055 1.050
## 6   0.341 0.466 0.256 0.212 0.753 0.370 0.107 1.064 0.417 0.169
## 7   0.441 0.365 0.535 0.575 0.651 0.350 0.459 1.060 0.532 0.264
## 9   0.261 -0.261 0.086 0.487 0.259 0.512 0.759 0.351 0.160 -0.186
## 12  0.820 0.281 0.484 0.221 0.413 0.604 0.383 1.092 0.580 0.148
## 13  0.125 1.248 0.527 1.958 0.939 -0.203 0.514 1.343 0.986 1.769
## 15  0.788 0.286 0.378 0.801 0.671 0.008 0.787 0.924 0.619 0.163
## 16 -0.243 -0.544 0.127 0.998 0.251 0.695 0.376 1.435 2.055 1.119
## 17 -0.024 -0.146 -0.446 0.175 0.173 0.137 -0.173 0.504 0.780 0.226
## 21  0.542 0.311 0.447 0.756 0.759 0.210 0.866 0.904 0.422 0.175
## 22  0.302 -0.027 0.531 0.439 0.406 0.736 0.557 1.042 0.621 0.449
## 23  0.081 -0.229 -0.248 0.315 0.518 0.307 -0.300 0.825 1.022 0.214
## 24  0.603 0.031 0.404 0.883 0.770 0.290 0.825 0.926 0.337 0.403
## 26  0.062 0.813 0.512 -0.123 1.141 -0.319 -0.096 0.857 0.552 -0.718
## 27  0.468 0.403 0.495 0.608 0.799 0.504 0.671 1.234 0.523 0.495
## 28  0.439 0.333 0.541 0.666 0.613 0.337 0.459 1.091 0.525 0.192
## 29  0.384 0.326 0.228 0.453 0.471 0.429 0.671 1.296 0.575 0.485
## 30 -0.161 0.149 -0.322 1.583 0.221 -0.360 -0.336 0.775 0.696 1.184
## 31  0.527 0.004 0.725 0.311 0.401 0.917 0.621 1.006 0.548 0.537
## 34  0.597 0.556 0.425 0.496 0.738 0.357 0.393 1.414 0.409 0.296
## 35  0.563 -0.205 0.247 0.305 0.280 0.335 0.547 1.082 0.604 0.319
## 36  0.336 0.100 0.342 0.467 0.938 -0.125 0.426 2.470 1.694 1.291
## 38  0.612 -0.457 0.329 0.562 0.187 0.047 0.458 1.195 0.502 0.683
## 39  0.649 -0.279 0.275 0.381 0.175 0.586 0.485 0.841 0.569 0.281
## 40  0.108 -0.116 0.235 0.279 -0.004 0.276 0.716 0.721 0.251 -0.179
## 41  0.726 -0.232 0.300 0.338 -0.028 0.028 0.293 0.940 0.964 0.298
## 42  0.726 -0.232 0.300 0.338 -0.028 0.028 0.293 0.940 0.964 0.298
## 43  0.520 0.130 0.281 0.733 0.577 0.210 0.733 1.264 1.231 0.572
## 44  0.449 0.606 0.263 0.245 0.517 0.143 0.504 0.901 -0.010 -0.009
## 46  0.293 -0.213 0.100 0.293 0.387 -0.077 0.627 0.937 0.455 0.537
## 48  0.197 0.210 -0.069 0.186 0.455 0.247 -0.108 -0.258 0.625 0.303
## 51  0.899 0.608 0.639 1.016 1.222 0.627 1.031 1.191 0.806 0.508
## 52  0.379 -0.928 -0.421 1.047 0.058 0.253 0.008 0.961 1.079 0.618
## 54  0.616 1.452 0.235 0.967 1.304 -0.753 0.651 0.869 1.334 1.719
## 56  0.453 0.433 0.510 0.572 0.695 0.434 0.595 0.999 0.486 0.282
## 57  0.424 0.505 0.474 0.877 0.950 0.664 0.988 1.371 0.900 0.629
## 58  0.536 0.873 0.571 0.363 0.738 0.053 1.240 1.311 0.202 0.244
## 59  0.384 -0.611 0.014 0.611 0.151 0.381 0.009 0.744 0.828 0.054
## 60  0.584 0.583 0.331 0.641 0.556 0.078 0.752 0.847 0.301 0.318
## 64  0.530 1.147 0.733 -0.006 0.585 -0.042 0.235 0.991 0.505 -0.061
```



```
## 67  1.113  0.812 -0.053 -0.172 -0.310  0.202  0.755  0.553  0.469  0.188
## 68  0.090  0.039 -0.319 -0.133  0.385  0.445  0.152  0.765  0.538  0.706
## 69  1.138  1.165  0.937  0.146  1.701  0.137  0.783  0.071  1.159  2.024
## 70  0.257  0.659  0.325  1.547  1.326  0.188  1.240  0.947  1.199  1.175
## 71  0.341  0.352  0.141  0.543  0.582  0.188  0.335  0.633  0.456  0.329
## 72  0.081 -0.166  0.190  0.187  0.582  0.104  0.292  1.119  0.589  0.307
## 73  0.810  0.852  1.045  0.814  0.878  1.122  1.323  1.555  0.750  0.958
## 75  0.286  1.228  0.310  1.625  1.307 -0.699  0.558  1.153  1.367  1.764
## 76  0.394  0.153  0.473  0.564  0.695  0.657  0.502  1.140  0.564  0.430
## 77  0.111  0.176 -0.128  0.736  1.315  0.747  1.470  1.109  0.715  0.829
## 78 -0.197 -0.528 -0.328  1.060 -0.043 -0.161 -0.195  0.632  0.800  0.679
## 79 -0.291 -1.228 -1.355 -0.425 -0.328  0.667  0.391  1.269  0.522  0.839
## 80  0.398  0.388  0.431  0.456  0.710  0.471  0.630  1.187  0.617  0.462
## 81  0.448  0.401  0.524  0.564  0.671  0.386  0.510  1.035  0.515  0.279
## 82  0.624  0.445  0.346  0.592  0.595  0.090  0.710  0.867  0.558  0.310
## 83  0.679  0.330  0.702  0.471  0.486  0.791  0.785  1.194  0.512  0.651
## 84  0.786  0.710  0.893  0.744  0.798  0.955  1.129  1.560  0.746  0.996
## 85  0.286  0.131  0.178  0.482  0.988  0.610  0.884  1.287  0.405  0.658
## 86  0.775  0.590  0.450  1.198  1.188  0.685  1.099  1.244  1.147  0.858
## 87 -0.017  0.533  0.480  1.474  0.200  0.361  0.857  0.944  0.790  1.177
## 88  0.493  0.481  0.203  0.774  0.876  0.075  0.797  1.018  0.384  0.128
## 89 -0.058  0.911  0.069  1.755  0.631 -0.340 -0.148  1.081  0.603  1.733
## 90  0.766  0.231  0.225 -0.108 -0.330  0.562  0.436  0.238  0.471  0.274
## 91  0.190  0.035  0.223  0.107  0.238  0.339 -0.064  0.614  0.468  0.350
## 92  0.273  0.341  0.289  0.343  0.382  0.428  0.463  1.050  0.282  0.275
## 93  0.389 -0.757 -0.017  0.802  0.698  0.239  0.644  1.165  1.658  1.215
## 94  0.608 -1.169 -0.469  1.009  0.366  0.798  0.305  1.295  1.917  0.995
## 95  0.199  0.446  0.064  0.282  1.198 -0.006  0.977  0.937  1.077  0.577
## 96  0.178  0.462 -0.037  0.269  1.164 -0.112  0.924  0.928  1.112  0.636
## 97  0.393 -1.037 -0.368  0.796 -0.153  0.342 -0.118  0.892  0.894  0.250
## 98  0.029  0.542  0.527  1.513  0.418  0.233  0.931  0.969  0.918  1.243
## 100 0.726  0.333  0.012  0.965  0.348 -0.127  0.454  1.199  0.948  0.636
## 101 0.521 -1.110 -0.503  0.941 -0.047  0.487 -0.176  1.023  1.052  0.375
## 103 0.258  0.406  0.048  0.488  0.356  0.366  0.415  0.250  0.240  0.521
## 105 0.604  0.778  0.577  1.355  0.694  0.276  0.991  1.776  1.382  0.594
## 106 0.280  0.621  0.040  1.249  0.418 -0.019  0.737  1.470  1.032  0.414
## 107 0.535 -0.523 -0.095  0.993  0.217  0.929  0.528  1.346  2.064  1.280
## 109 0.757  0.259  0.338  0.464  0.692  0.198  0.384  1.485  0.721  0.094
## 111 0.411 -1.017 -0.433  1.048  0.044  0.390 -0.103  1.001  1.100  0.544
## 112 0.538  0.988  1.042  0.114  0.732 -0.212  0.243  0.930  1.243  0.326
## 113 0.520  0.246  0.529  0.533  0.653  0.587  0.972  1.297  0.781  0.560
## 114 0.231 -0.404  0.306  0.470  0.344  0.541  0.472  0.760  1.248  0.306
## 115 0.184  1.090  0.635  1.925  0.900 -0.033  0.942  1.208  0.979  1.464
## 118 0.384  0.386  0.380  0.319  0.405  0.198  0.653  0.821  0.440  0.451
## 119 0.150  0.749  0.153  0.270  0.794  0.189  0.626  1.031  0.349  0.797
## 120 0.464  0.429  0.278  0.420  0.544  0.481  0.690  1.279  0.483  0.449
## 122 0.685  0.194  1.026  0.206  0.570  1.161  0.870  1.214  0.375  0.647
## 123 0.147  0.275  0.625  1.421  0.461  0.639  1.054  0.876  1.268  1.055
## 125 0.445  0.405  0.487  0.565  0.670  0.433  0.591  1.003  0.477  0.262
## 126 0.870  0.890  0.990  0.673  1.222  1.555  1.321  1.801  0.539  1.200
## 127 0.492  0.157  0.179  0.466  0.314  0.042  0.585  0.827  0.211  0.173
## 129 0.268  0.086  0.327  0.711  0.810  0.567  0.500  0.736  0.642  0.634
## 132 0.107  0.651  0.461  1.302  0.672  0.211  1.297  0.922  0.924  1.112
## 133 1.080  0.810  0.454  1.329  1.268  0.410  1.933  2.117  1.764  0.980
```

```
## 136 0.133 0.246 0.222 1.019 1.174 0.936 1.271 1.483 0.976 0.845
## 137 0.125 0.759 0.299 0.087 0.555 0.111 0.209 0.949 0.288 0.375
## 138 0.509 0.101 0.126 0.494 0.654 0.439 0.272 1.192 0.926 0.223
## 141 0.075 -0.073 -0.177 0.158 0.305 0.208 -0.413 0.313 0.640 0.082
## 142 0.265 1.184 0.250 1.367 1.542 -0.779 0.611 1.068 1.574 1.595
## 143 0.350 0.467 0.270 0.228 1.010 1.204 0.549 2.002 1.229 0.759
## 144 -0.028 -0.716 -0.380 -0.077 0.108 0.244 -0.128 0.981 1.009 0.265
## 145 0.497 0.487 0.317 0.707 0.898 0.077 0.808 1.087 0.169 0.142
## 146 0.862 -0.286 0.403 0.205 0.373 1.054 0.688 0.652 0.549 0.677
## 147 0.621 -0.122 0.497 0.424 0.380 0.748 0.646 1.034 0.766 0.526
## 151 0.977 1.121 0.697 0.065 0.944 -0.060 0.761 0.383 1.257 1.427
## 152 -0.304 -0.550 0.247 0.126 -0.018 -0.114 -0.227 0.745 0.578 0.554
## 153 -0.306 -0.413 0.415 0.162 -0.116 -0.152 -0.386 0.436 0.823 0.668
## 156 0.281 0.542 0.364 0.356 0.654 0.551 0.079 1.012 0.311 0.377
## 157 0.648 -0.390 0.208 0.865 0.542 0.095 0.869 0.176 0.004 0.101
## 158 0.501 0.816 0.494 0.511 0.798 0.158 0.855 1.290 0.232 0.325
## 159 0.359 0.379 0.385 0.501 0.528 0.427 0.489 1.322 0.561 0.673
## 161 0.407 1.142 0.065 1.371 1.110 -0.787 0.011 0.947 1.203 1.887
## 162 0.440 0.434 -0.199 0.684 1.663 0.756 1.601 1.212 0.634 0.665
## 163 0.411 0.302 0.512 0.710 0.730 0.444 0.654 1.243 0.672 0.273
## 164 -0.151 -0.519 0.031 0.666 0.064 0.496 0.066 1.174 1.735 0.944
## 165 0.033 0.364 -0.428 1.720 0.409 -0.424 -0.422 0.785 0.620 1.338
## 168 0.643 0.245 0.736 0.986 0.658 0.451 0.895 1.220 1.390 1.465
## 169 -0.700 -1.344 -1.061 -0.297 -0.276 0.114 -0.370 0.736 1.663 1.095
## 171 -0.085 0.508 0.546 1.516 0.288 0.199 0.919 1.113 0.846 1.403
## 173 0.376 -0.985 -0.186 0.655 0.193 0.580 0.010 1.035 1.489 0.787
## 174 0.800 0.875 1.097 0.634 0.938 1.219 1.370 1.574 0.581 0.918
## 176 0.439 0.179 0.230 0.507 0.432 0.114 0.598 0.968 0.295 0.406
## 182 0.228 0.531 0.162 0.499 0.461 0.619 0.423 0.617 0.388 0.421
## 183 0.367 0.807 0.836 0.208 0.633 -0.150 0.219 0.825 1.096 0.271
## 185 0.209 0.305 -0.059 1.044 1.444 0.722 1.535 1.189 0.814 0.810
## 186 0.516 0.214 0.217 0.305 0.575 0.402 0.559 1.187 0.355 0.462
## 188 0.422 0.382 0.444 0.499 0.650 0.431 0.565 1.085 0.526 0.337
## 189 0.401 0.394 0.426 0.459 0.709 0.469 0.626 1.186 0.614 0.459
## 191 0.337 0.579 0.286 0.305 0.827 0.922 0.775 1.357 0.614 0.657
## 192 1.025 1.374 0.806 0.195 1.263 -0.164 0.981 0.561 1.362 1.721
## 193 0.328 0.969 0.562 1.859 1.001 0.029 1.063 1.111 0.980 1.420
## 194 0.481 -1.120 -0.568 1.274 0.153 0.443 -0.126 1.147 1.282 0.668
## 195 0.575 -0.077 0.363 0.398 0.190 0.015 0.142 1.200 0.727 0.427
## 197 0.332 0.338 0.029 0.428 0.347 0.217 0.586 0.499 -0.232 0.530
## 198 0.729 0.455 0.389 0.438 0.769 0.319 0.480 1.529 0.504 0.140
## 200 0.245 0.046 0.468 0.454 0.493 0.627 0.554 1.088 0.575 0.523
## 202 0.390 0.268 0.001 0.301 0.471 0.282 0.170 0.201 0.119 0.272
## 203 0.319 0.261 0.490 0.354 0.715 0.520 0.681 1.208 0.687 0.512
## 204 -0.041 0.000 0.635 1.328 0.659 0.633 1.252 0.987 1.747 1.014
## 208 0.207 0.248 0.176 0.269 0.431 0.299 0.542 0.411 0.072 0.273
## 210 -0.282 -0.667 -0.038 0.381 -0.198 0.306 -0.342 0.968 1.293 0.681
## 211 0.210 0.522 -0.015 0.413 1.119 -0.142 0.882 0.860 1.133 0.724
## 212 0.527 0.395 0.004 0.466 0.630 -0.011 0.384 1.272 0.758 1.000
## 213 0.422 0.286 0.535 0.666 0.642 0.342 0.493 1.101 0.548 0.202
## 214 0.309 0.146 0.280 0.450 0.277 0.478 1.099 0.102 0.065 0.333
## 216 0.066 0.055 -0.281 -0.074 0.439 0.474 0.245 0.757 0.883 0.777
## 217 0.460 0.454 0.525 0.320 0.770 0.545 0.609 1.039 0.339 0.298
## 218 0.616 0.101 0.332 0.329 0.377 0.001 0.310 1.307 0.740 0.129
```

```
## 219 0.075 -0.061 -0.307 -0.148 0.400 0.336 0.097 0.369 0.238 0.425
## 220 0.396 -1.045 -0.368 0.800 -0.166 0.338 -0.121 0.894 0.900 0.249
## 221 0.550 0.529 0.315 0.903 1.356 1.353 1.536 1.415 0.935 0.874
## 222 0.468 0.184 0.348 0.507 0.835 0.355 0.656 0.993 0.783 0.728
## 224 0.166 0.544 -0.117 0.362 0.761 0.393 0.339 0.876 0.064 -0.040
## 225 0.192 1.010 0.300 -0.085 0.685 -0.247 -0.025 0.801 0.030 -0.417
##      F2001 F2002 F2003 F2004 F2005 F2006 F2007 F2008 F2009 F2010 F2011
## 1      1.311 1.365 0.587 1.373 0.401 1.720 0.675 0.704 0.895 1.613 1.397
## 2      1.532 0.492 0.970 0.444 0.189 0.345 1.316 0.978 0.910 1.191 1.055
## 3      1.856 1.258 1.585 0.988 1.264 1.395 1.220 1.185 0.945 2.265 1.398
## 5      1.480 0.835 1.949 0.936 0.851 1.485 1.024 0.946 1.413 0.471 1.677
## 6      0.295 0.735 0.889 0.414 1.021 0.561 0.885 0.501 0.708 1.194 0.880
## 7      0.587 0.706 0.816 0.521 0.828 0.691 0.957 0.411 0.566 1.090 0.489
## 9      0.425 0.278 0.635 0.470 0.281 0.596 -0.169 0.601 0.857 0.135 0.386
## 12     0.336 0.736 0.835 0.723 1.211 0.721 0.929 0.625 1.030 0.673 0.208
## 13     1.501 1.531 1.464 0.829 0.628 0.907 2.137 1.582 1.544 0.656 1.373
## 15     0.135 0.856 0.989 0.311 0.455 0.385 0.937 0.842 0.410 0.314 0.363
## 16     1.216 1.552 1.256 1.385 1.065 1.823 1.080 1.329 1.224 2.286 1.431
## 17     0.316 0.398 0.239 0.269 0.592 0.814 0.266 0.093 0.844 0.768 0.144
## 21     0.445 0.733 0.948 0.701 0.849 0.655 0.850 0.579 0.922 0.843 0.724
## 22     0.517 0.721 0.936 0.706 1.105 1.035 0.806 0.632 0.950 1.230 0.949
## 23     0.720 0.492 0.498 0.476 0.745 0.955 0.978 0.555 1.394 1.202 0.534
## 24     0.653 1.016 0.641 0.846 0.764 0.935 0.537 0.396 0.658 0.680 1.165
## 26     -0.186 0.359 0.740 -0.133 1.039 -0.505 0.230 0.153 -0.319 0.936 -0.048
## 27     0.746 1.052 0.927 0.768 1.085 0.770 0.969 0.731 0.969 1.112 0.814
## 28     0.570 0.741 0.843 0.548 0.825 0.760 1.007 0.406 0.621 1.053 0.393
## 29     0.602 0.669 0.735 0.673 0.893 0.718 0.743 0.511 0.875 1.012 0.725
## 30     1.648 0.854 0.181 0.533 0.215 0.571 1.883 1.177 1.291 1.361 0.422
## 31     0.502 1.015 0.986 0.867 1.449 1.162 0.867 0.297 0.942 1.250 1.001
## 34     0.571 0.836 0.711 0.594 0.781 0.767 0.604 0.430 0.453 1.225 0.424
## 35     0.198 0.770 0.707 0.779 1.004 0.983 0.626 0.653 1.047 1.181 0.655
## 36     1.421 0.540 1.240 0.485 1.282 2.343 1.333 0.851 0.539 2.915 1.438
## 38     0.400 0.745 0.845 0.957 0.983 0.967 0.537 0.682 1.119 1.162 0.763
## 39     0.291 0.797 0.838 0.831 1.148 1.368 0.605 0.466 1.236 1.181 0.969
## 40     0.054 0.140 0.312 0.563 0.275 0.575 -0.219 0.502 0.520 -0.015 0.206
## 41     0.854 0.961 0.990 0.701 0.733 0.897 1.008 0.415 0.910 0.367 0.333
## 42     0.854 0.961 0.990 0.701 0.733 0.897 1.008 0.415 0.910 0.367 0.333
## 43     1.038 1.131 0.822 1.112 1.048 1.232 1.538 1.090 1.336 0.968 0.792
## 44     0.438 0.675 0.693 0.585 0.681 0.531 0.641 0.385 0.856 1.037 0.467
## 46     0.393 0.872 0.961 0.913 1.014 0.844 0.768 0.664 0.928 1.347 0.844
## 48     0.402 0.292 0.262 0.257 0.115 0.314 0.344 0.208 0.077 0.604 0.548
## 51     0.535 0.945 1.089 0.872 0.787 0.914 0.902 0.642 0.930 0.957 0.538
## 52     1.161 0.836 0.585 0.614 0.335 0.622 0.814 1.031 0.983 2.030 0.715
## 54     1.044 1.652 0.707 1.032 1.282 1.349 2.136 1.853 1.320 -0.199 0.677
## 56     0.518 0.684 0.782 0.491 0.819 0.718 0.871 0.401 0.539 1.193 0.591
## 57     0.909 0.960 1.235 0.806 0.967 1.003 1.260 0.667 0.710 1.222 0.543
## 58     0.478 0.777 0.830 0.835 0.837 0.808 0.818 0.702 0.961 1.087 0.783
## 59     0.656 0.827 0.730 0.647 0.511 0.726 0.602 0.937 0.921 2.325 0.629
## 60     0.572 0.690 0.878 0.639 0.513 0.495 0.430 0.199 0.788 0.496 0.508
## 64     0.517 0.601 0.715 0.525 1.153 0.365 1.133 0.640 0.383 1.287 0.897
## 67     0.461 1.034 1.604 1.019 0.487 1.136 0.952 0.890 1.441 0.260 1.055
## 68     0.728 0.720 0.581 0.526 0.698 0.636 1.032 0.584 0.409 0.978 0.898
## 69     1.365 1.171 0.713 1.233 2.201 1.204 1.946 2.130 1.695 0.242 1.354
## 70     1.391 1.054 1.800 0.969 1.020 1.306 1.407 0.992 1.212 0.395 1.534
```

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## 71 0.502 0.796 0.703 0.531 0.672 0.841 0.850 0.357 0.800 0.760 0.214
## 72 0.286 0.662 0.893 0.831 0.808 0.737 0.926 0.782 0.824 1.080 0.657
## 73 1.316 1.380 1.103 1.188 1.498 1.221 1.090 1.376 0.688 1.324 1.060
## 75 1.292 1.491 1.258 0.998 1.025 1.254 2.088 1.542 1.282 0.196 1.121
## 76 0.565 0.825 0.988 0.739 0.967 0.991 0.946 0.698 0.884 1.276 0.883
## 77 1.280 0.862 1.400 1.027 0.841 1.425 0.830 0.982 1.283 1.318 1.618
## 78 1.314 0.435 0.385 0.337 0.213 0.254 1.080 0.881 0.771 1.584 0.394
## 79 0.831 1.186 2.328 1.469 1.878 1.717 1.363 0.959 0.851 3.058 1.684
## 80 0.691 0.627 0.905 0.433 1.004 0.739 0.678 0.502 0.507 1.201 0.677
## 81 0.557 0.695 0.816 0.507 0.827 0.698 0.921 0.405 0.547 1.137 0.539
## 82 0.344 0.556 0.990 0.611 0.801 0.612 0.597 0.213 0.692 0.685 0.429
## 83 0.792 1.130 0.979 1.040 1.190 1.117 0.974 1.113 0.931 1.321 1.095
## 84 1.244 1.281 1.040 1.171 1.401 1.186 1.034 1.362 0.811 1.328 1.092
## 85 0.825 1.074 0.948 0.942 1.321 1.003 1.025 0.558 1.162 1.115 0.968
## 86 0.758 0.953 1.240 0.888 1.042 0.935 1.151 0.624 0.806 1.206 0.489
## 87 1.487 0.716 1.501 0.478 0.479 0.609 1.305 0.958 1.042 0.774 1.047
## 88 0.396 0.776 0.672 0.491 0.956 0.621 0.769 0.566 0.811 0.806 0.730
## 89 1.391 1.423 0.710 0.543 0.236 0.699 2.142 1.495 1.613 0.806 0.891
## 90 0.584 0.784 1.784 1.235 0.448 1.032 1.101 0.753 0.907 1.147 0.959
## 91 0.473 0.827 0.665 0.545 0.567 0.638 0.607 0.263 1.134 1.129 0.365
## 92 0.530 0.607 0.594 0.540 0.710 0.422 0.464 0.223 0.563 0.766 0.306
## 93 1.525 1.716 0.943 1.528 0.828 1.847 0.874 1.136 1.177 2.214 1.345
## 94 1.289 1.168 0.960 1.084 0.526 1.621 0.935 1.155 0.881 2.712 0.910
## 95 0.551 0.830 1.024 0.900 1.175 1.159 1.345 0.836 0.804 -0.104 0.559
## 96 0.516 0.891 1.049 0.952 1.165 1.229 1.321 0.829 0.874 -0.111 0.681
## 97 0.855 0.729 0.559 0.556 0.199 0.593 0.521 0.724 0.824 2.321 0.578
## 98 1.533 0.913 1.526 0.746 0.563 0.840 1.552 1.133 1.234 0.755 1.253
## 100 0.418 0.630 0.326 1.116 0.737 0.390 1.004 0.671 0.801 0.922 0.596
## 101 0.983 0.666 0.498 0.620 0.103 0.752 0.516 0.732 0.549 2.625 0.506
## 103 0.602 0.734 0.879 0.648 0.762 0.890 0.634 0.824 1.293 1.106 1.137
## 105 0.859 0.844 0.926 1.576 0.847 0.694 1.605 1.525 1.064 0.384 0.523
## 106 0.893 0.650 0.618 1.185 0.918 0.478 1.237 0.946 0.950 0.498 0.310
## 107 1.270 1.604 1.564 1.519 0.724 1.911 1.085 1.434 1.323 2.602 1.373
## 109 0.766 0.664 1.037 0.480 0.961 0.929 0.649 0.334 0.696 1.431 0.214
## 111 1.146 0.833 0.626 0.647 0.280 0.720 0.728 0.989 0.844 2.353 0.663
## 112 0.594 0.621 0.775 0.829 0.891 0.358 0.664 0.355 0.417 1.025 0.331
## 113 0.513 0.875 0.938 0.911 1.108 1.119 1.041 1.131 1.365 1.420 1.102
## 114 1.291 0.905 0.950 0.745 0.717 0.810 0.860 0.879 0.764 2.074 0.819
## 115 1.440 1.382 1.670 0.899 0.663 0.955 1.931 1.385 1.405 0.480 1.657
## 118 0.640 0.580 0.682 0.505 0.599 0.838 0.735 0.559 0.900 1.188 1.132
## 119 0.592 0.963 0.982 0.879 1.366 0.997 0.904 0.512 0.648 1.030 0.771
## 120 0.689 0.785 0.781 0.755 0.938 0.707 0.763 0.628 0.865 1.111 0.754
## 122 0.583 1.246 1.238 1.214 1.396 1.097 0.933 0.548 0.960 1.630 1.207
## 123 1.669 0.942 1.401 0.699 0.670 0.996 1.398 1.271 1.080 1.243 1.013
## 125 0.506 0.681 0.802 0.515 0.834 0.736 0.846 0.407 0.553 1.177 0.596
## 126 1.360 1.353 1.360 1.490 1.389 1.444 1.060 1.321 0.968 2.020 1.671
## 127 0.499 0.401 0.690 0.313 0.381 0.312 0.537 0.294 0.797 1.076 0.865
## 129 0.549 0.730 0.894 0.365 0.806 0.930 0.503 0.558 1.053 0.306 1.026
## 132 1.381 0.916 1.645 0.851 0.806 1.183 1.643 1.103 1.468 0.452 1.403
## 133 1.684 1.786 0.490 1.760 0.923 1.221 2.729 1.759 1.397 0.306 0.757
## 136 1.745 1.108 1.593 1.029 1.188 1.389 0.930 1.069 1.160 2.020 1.698
## 137 0.481 0.683 0.589 0.437 1.045 0.581 0.647 0.384 0.585 1.105 0.812
## 138 0.634 0.676 0.653 0.600 0.932 0.855 0.507 0.495 0.918 1.203 0.510
## 141 0.448 0.551 0.306 0.351 0.678 0.796 0.727 0.347 1.119 1.138 0.231
```

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## 142 1.266 1.526 1.207 1.160 1.252 1.507 2.074 1.432 1.223 0.100 1.071
## 143 1.027 1.030 0.788 0.913 0.762 0.683 1.146 1.129 0.909 1.254 1.022
## 144 0.572 0.420 0.238 0.033 0.443 0.391 0.237 0.564 0.059 0.598 0.673
## 145 0.502 0.790 0.738 0.576 0.841 0.707 0.844 0.567 0.821 0.868 0.695
## 146 0.165 0.542 0.778 0.545 1.169 1.179 0.872 0.283 1.313 1.557 0.956
## 147 0.225 0.776 0.776 0.698 1.182 1.204 0.816 0.585 1.301 1.426 0.852
## 151 0.613 1.386 1.089 1.300 1.759 1.504 1.702 1.619 1.393 -0.341 1.398
## 152 0.661 0.891 0.838 0.778 0.814 0.838 0.652 0.537 0.728 1.104 0.840
## 153 0.762 1.021 0.527 1.006 0.211 1.023 0.650 0.362 1.034 1.290 0.833
## 156 0.496 0.671 0.519 0.234 0.658 0.252 0.438 0.342 0.317 1.007 0.388
## 157 0.609 1.074 0.721 0.394 0.511 0.915 0.252 0.259 0.897 0.326 0.601
## 158 0.490 0.754 0.769 0.682 0.813 0.809 0.555 0.604 0.869 1.063 0.791
## 159 0.825 0.733 0.795 0.687 0.782 0.831 0.875 0.574 0.718 1.065 0.620
## 161 1.285 1.700 0.366 0.781 0.881 0.835 2.147 1.752 1.274 0.403 0.765
## 162 1.165 0.681 1.458 1.062 1.032 1.561 0.775 0.649 1.423 1.122 1.615
## 163 0.743 0.893 1.060 0.567 0.865 0.821 1.071 0.520 0.651 1.177 0.531
## 164 0.970 1.436 1.179 1.228 0.842 1.652 0.989 1.162 1.114 2.001 1.444
## 165 1.537 1.220 0.145 0.556 0.298 0.514 2.126 1.335 1.617 1.167 0.497
## 168 1.074 1.167 1.385 1.430 1.321 1.595 1.021 1.099 1.668 1.135 1.447
## 169 0.522 0.009 0.166 0.562 0.898 1.813 0.385 0.444 0.690 1.311 1.147
## 171 1.684 1.135 1.636 0.852 0.408 0.832 1.808 1.260 1.362 0.696 1.280
## 173 0.884 1.092 0.981 0.975 0.542 1.202 0.706 0.906 1.028 2.180 0.893
## 174 1.168 1.425 1.150 1.157 1.366 1.370 1.202 1.294 0.703 1.432 1.187
## 176 0.734 0.518 0.719 0.304 0.513 0.537 0.813 0.500 0.820 1.019 0.927
## 182 0.830 0.820 1.047 0.465 1.070 0.845 0.958 0.677 1.290 1.091 1.057
## 183 0.516 0.453 0.791 0.874 1.031 0.361 0.721 0.575 0.662 1.083 0.446
## 185 1.406 0.812 1.598 1.004 0.902 1.526 0.835 0.864 1.360 0.908 1.613
## 186 0.698 0.852 0.759 0.673 0.722 0.496 0.496 0.421 0.783 1.105 0.739
## 188 0.573 0.643 0.864 0.517 0.941 0.758 0.752 0.436 0.523 1.177 0.642
## 189 0.689 0.627 0.910 0.438 1.000 0.739 0.681 0.505 0.504 1.200 0.684
## 191 0.781 1.010 1.069 1.097 1.426 1.003 0.980 1.076 1.414 1.509 1.074
## 192 1.071 1.566 0.914 1.198 1.825 1.485 1.938 1.954 1.432 -0.279 1.267
## 193 1.450 1.258 1.848 0.974 0.808 1.091 1.804 1.195 1.371 0.459 1.667
## 194 1.163 0.872 0.542 0.644 0.226 1.017 0.786 1.033 0.635 2.475 0.656
## 195 0.784 0.922 0.871 0.442 0.662 0.720 0.790 0.593 0.789 0.535 0.086
## 197 0.433 0.646 1.010 0.899 1.035 0.836 0.770 0.462 0.892 1.013 0.723
## 198 0.733 0.734 0.869 0.625 0.974 0.773 0.638 0.496 0.605 1.405 0.360
## 200 0.641 0.732 0.973 0.703 0.932 0.968 0.847 0.711 0.876 1.249 0.866
## 202 0.564 0.780 0.455 0.632 0.769 0.550 0.821 0.292 0.356 0.869 0.602
## 203 0.715 0.603 0.818 0.379 1.145 0.731 0.627 0.463 0.573 1.247 0.577
## 204 1.992 1.250 1.697 0.916 1.047 1.271 1.388 1.374 0.865 1.752 1.038
## 208 0.183 0.675 0.908 0.681 1.232 0.967 0.455 0.774 1.295 1.425 1.099
## 210 0.560 1.123 1.052 1.052 0.725 1.255 0.802 0.777 0.896 1.482 1.121
## 211 0.631 1.011 1.194 1.035 1.116 1.250 1.332 0.838 0.948 -0.050 0.851
## 212 0.786 0.951 0.990 0.863 1.153 1.026 1.143 0.212 0.398 0.695 0.537
## 213 0.616 0.782 0.887 0.541 0.821 0.739 0.994 0.444 0.637 1.054 0.419
## 214 1.226 0.610 0.324 0.458 0.802 0.586 0.131 0.719 0.508 0.261 0.447
## 216 0.401 0.452 0.360 0.462 0.536 0.394 0.921 0.712 0.438 0.878 0.669
## 217 0.626 0.864 0.912 0.676 0.933 0.674 0.760 0.518 0.816 1.227 0.601
## 218 0.693 0.722 1.043 0.385 0.838 0.892 0.506 0.199 0.671 1.092 0.118
## 219 0.689 0.827 0.518 0.640 0.820 0.607 0.882 0.331 0.361 0.930 0.730
## 220 0.855 0.728 0.559 0.554 0.196 0.587 0.519 0.722 0.831 2.326 0.581
## 221 1.296 1.249 1.387 1.550 1.210 1.406 0.903 1.351 0.938 1.898 1.579
## 222 0.834 1.021 0.893 0.913 1.095 0.998 1.195 0.935 0.957 1.219 0.921
```

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## 224 0.263 0.711 0.871 0.606 0.948 0.623 0.780 0.438 0.306 1.210 0.956
## 225 0.004 0.487 0.355 -0.004 0.945 -0.260 0.127 0.078 -0.226 0.935 0.232
##      F2012 F2013 F2014 F2015 F2016 F2017 F2018 F2019 F2020 F2021 F2022
## 1 0.223 1.281 0.456 1.093 1.555 1.540 1.544 0.910 0.498 1.327 2.012
## 2 1.487 1.333 1.198 1.569 1.464 1.121 2.028 1.675 1.498 1.536 1.518
## 3 1.147 1.192 1.690 1.121 1.757 1.512 1.210 1.115 1.926 2.330 1.688
## 5 1.265 0.831 1.946 1.690 1.990 1.925 1.919 1.964 2.562 1.533 3.243
## 6 0.552 1.044 0.828 1.331 1.609 0.870 1.395 1.752 1.162 1.553 1.212
## 7 0.640 0.770 0.814 1.051 1.125 0.960 0.664 0.843 1.224 0.893 0.839
## 9 0.798 0.442 0.951 0.957 0.488 1.095 0.878 0.760 1.123 1.031 0.643
## 12 0.308 1.499 1.198 1.087 1.172 1.141 1.129 1.422 1.416 0.629 0.754
## 13 1.783 1.098 2.409 2.167 2.096 1.741 2.524 2.370 2.315 1.395 2.498
## 15 0.344 0.565 0.883 1.114 1.042 1.331 1.023 1.443 1.611 0.879 1.480
## 16 1.385 1.403 1.694 2.240 1.598 2.080 2.247 2.108 2.027 2.464 2.017
## 17 0.235 0.230 0.482 0.722 1.337 1.124 0.881 1.136 0.898 1.300 1.216
## 21 0.644 0.785 0.697 1.502 1.446 1.342 0.850 1.556 1.716 1.286 1.031
## 22 0.595 0.853 0.940 1.111 1.025 1.160 1.056 1.147 1.031 1.522 0.884
## 23 0.512 0.742 0.860 1.068 1.487 1.457 1.346 1.329 1.090 1.707 1.523
## 24 0.831 0.507 0.955 1.533 0.824 0.981 0.562 0.921 1.315 0.738 0.644
## 26 0.473 0.770 -0.092 1.546 1.469 0.017 0.734 1.525 0.493 -0.425 -1.305
## 27 1.023 0.922 1.153 1.516 1.457 1.363 1.148 1.517 1.477 1.154 0.926
## 28 0.610 0.782 0.878 1.065 1.204 0.971 0.703 0.915 1.317 0.956 0.875
## 29 0.912 1.195 1.028 1.281 1.740 1.468 1.410 1.624 1.783 1.458 1.446
## 30 1.678 1.476 1.196 1.438 1.899 0.954 2.192 2.112 2.037 1.629 1.831
## 31 0.492 0.849 0.888 1.111 1.075 1.212 1.156 1.065 1.044 1.624 0.802
## 34 0.875 1.005 0.614 1.081 1.473 1.095 0.787 1.552 1.401 0.912 0.948
## 35 0.416 0.707 0.882 1.160 1.213 1.165 1.156 1.450 1.281 1.470 1.044
## 36 2.144 1.182 0.288 1.231 2.373 1.480 0.477 1.311 1.128 2.515 1.268
## 38 0.491 0.865 0.697 0.983 1.222 1.224 1.145 1.264 1.140 1.268 1.032
## 39 0.553 1.013 0.856 1.294 0.939 1.026 1.527 1.306 1.192 1.146 0.738
## 40 0.699 0.434 0.488 0.848 1.022 0.873 0.538 0.683 0.947 0.877 0.407
## 41 0.530 0.763 0.703 1.175 0.770 1.338 1.183 1.776 1.882 2.017 1.432
## 42 0.530 0.763 0.703 1.175 0.770 1.338 1.183 1.776 1.882 2.017 1.432
## 43 0.626 1.073 1.062 1.297 1.319 1.573 1.361 1.422 1.620 1.701 1.906
## 44 0.668 0.834 0.854 1.249 1.080 0.820 1.137 1.397 1.583 1.073 0.874
## 46 0.523 1.003 0.976 1.053 1.546 1.320 1.450 1.483 1.692 1.658 1.480
## 48 0.258 0.455 0.158 -0.430 0.310 0.675 0.238 0.220 0.274 0.568 0.479
## 51 0.611 0.885 1.144 1.439 1.370 1.275 1.177 1.634 1.722 1.304 1.437
## 52 0.970 1.238 1.048 1.139 1.493 0.776 2.119 1.524 1.668 1.994 1.237
## 54 1.139 0.397 2.677 1.516 1.852 1.619 2.109 2.180 2.633 1.690 2.219
## 56 0.703 0.715 0.704 0.918 1.057 0.821 0.561 0.752 1.087 0.727 0.688
## 57 0.746 1.208 1.106 1.339 1.016 1.032 1.158 1.266 1.488 0.995 0.982
## 58 0.663 0.491 1.011 1.393 1.550 1.155 0.967 1.279 1.509 1.032 0.736
## 59 0.939 1.049 1.254 1.211 1.396 0.616 2.049 1.040 1.117 1.727 0.655
## 60 0.634 0.619 0.654 1.285 1.260 0.723 0.774 0.972 1.484 0.999 0.658
## 64 0.696 0.566 0.781 1.235 1.216 0.688 1.064 1.623 0.770 0.669 1.371
## 67 0.359 0.597 1.764 0.813 0.803 1.490 0.831 0.877 0.839 1.012 1.396
## 68 0.589 0.916 0.646 0.517 0.970 1.127 0.953 1.065 1.237 1.075 1.346
## 69 1.540 1.424 2.591 2.613 2.151 1.487 2.157 1.452 3.317 1.938 2.062
## 70 1.220 0.714 2.049 1.612 1.794 1.796 2.060 2.023 2.551 1.337 2.929
## 71 0.722 0.536 0.616 0.681 1.127 0.901 0.631 0.857 0.829 0.791 0.359
## 72 0.615 0.794 0.805 1.024 1.505 1.353 1.026 1.534 1.377 1.063 0.994
## 73 0.890 1.001 1.188 1.200 1.635 1.741 1.028 1.349 1.770 1.675 1.323
## 75 1.349 0.583 2.519 1.674 1.988 1.653 2.393 2.332 2.516 1.325 2.596
```

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## 76 0.614 0.841 0.887 1.132 1.217 1.292 1.081 1.320 1.284 1.494 0.996
## 77 0.924 0.869 1.417 1.382 1.726 2.005 0.739 1.300 1.923 1.504 2.228
## 78 1.235 1.317 1.060 0.904 1.561 0.642 1.905 1.381 1.307 1.655 1.040
## 79 1.625 1.381 1.447 0.205 2.381 1.210 0.934 2.206 1.274 2.482 1.413
## 80 0.584 0.776 0.641 0.837 0.945 0.920 0.543 1.169 1.235 0.767 0.698
## 81 0.671 0.750 0.763 0.998 1.095 0.907 0.620 0.803 1.160 0.826 0.773
## 82 0.520 0.624 0.638 1.143 1.425 1.069 0.884 1.418 1.728 1.406 0.916
## 83 0.556 1.068 0.857 1.155 1.167 1.522 1.188 1.408 1.260 1.559 1.195
## 84 0.795 1.055 1.168 1.192 1.572 1.674 1.125 1.419 1.663 1.660 1.295
## 85 0.958 0.894 1.071 1.352 1.506 1.149 1.137 1.178 1.400 0.875 1.066
## 86 0.759 1.133 1.306 1.384 1.164 1.061 1.277 1.507 1.537 0.883 1.095
## 87 1.492 0.866 1.370 1.518 1.598 1.318 1.837 1.591 1.734 1.546 2.028
## 88 0.639 0.915 0.666 1.126 1.368 1.034 0.804 1.233 1.813 1.098 0.723
## 89 1.727 1.159 2.229 2.067 1.890 1.336 2.524 2.353 1.990 1.430 2.142
## 90 0.667 0.687 1.660 0.419 1.411 1.694 0.820 1.339 0.786 0.921 1.201
## 91 0.516 0.451 0.530 0.711 1.088 0.966 0.874 0.802 0.520 0.733 0.790
## 92 0.459 0.799 0.812 0.841 1.488 1.055 0.973 1.118 1.322 1.110 1.085
## 93 1.090 1.642 1.079 1.856 1.669 1.737 2.044 1.597 1.346 2.176 2.370
## 94 1.293 1.263 1.175 1.940 1.672 1.572 2.406 1.626 1.857 2.644 2.147
## 95 0.705 0.568 1.357 0.449 1.040 1.264 0.783 1.201 1.075 1.019 1.764
## 96 0.610 0.428 1.515 0.441 1.118 1.367 0.881 1.175 1.199 1.020 1.840
## 97 1.035 1.108 0.871 1.331 1.607 0.735 2.003 1.212 1.451 1.786 1.079
## 98 1.543 1.006 1.638 1.704 1.716 1.606 1.834 1.698 1.902 1.569 2.135
## 100 0.395 0.628 0.560 0.833 1.323 0.796 0.926 1.272 1.437 1.270 1.335
## 101 1.067 1.002 0.787 1.429 1.641 0.920 1.972 1.281 1.617 1.923 1.358
## 103 1.026 0.930 1.024 1.164 1.237 1.500 0.675 1.624 1.344 1.421 1.280
## 105 0.419 0.304 1.518 1.217 1.419 1.593 0.863 1.826 1.864 1.857 1.610
## 106 0.402 0.519 0.987 0.944 1.637 1.459 0.966 1.485 1.551 1.762 1.659
## 107 1.562 1.349 1.451 2.104 1.695 1.962 2.358 1.895 1.975 2.676 2.275
## 109 1.048 1.220 0.837 1.497 1.519 1.243 0.955 2.200 1.719 1.287 1.112
## 111 1.045 1.260 1.051 1.383 1.629 1.023 2.154 1.412 1.623 2.039 1.290
## 112 0.660 0.867 1.091 1.529 2.015 1.215 1.101 1.668 0.791 1.204 1.372
## 113 0.869 0.983 0.934 1.288 1.412 1.539 1.306 1.494 1.593 1.474 1.556
## 114 0.770 1.240 1.237 0.711 1.587 0.525 1.737 0.920 1.174 1.924 0.559
## 115 1.611 0.927 2.232 2.046 2.028 1.795 2.260 2.079 2.367 1.232 2.534
## 118 0.880 0.749 0.777 1.134 1.147 1.379 0.983 1.438 1.137 1.194 0.860
## 119 0.925 0.676 1.129 1.141 1.361 1.016 1.022 1.220 1.306 0.762 0.816
## 120 0.901 1.121 1.199 1.372 1.836 1.419 1.443 1.700 1.688 1.473 1.367
## 122 0.426 0.969 0.787 1.017 1.089 1.347 1.040 1.089 1.010 1.687 0.887
## 123 1.440 1.343 1.507 1.403 1.748 1.224 1.441 1.290 1.643 2.123 1.955
## 125 0.699 0.714 0.674 0.892 1.034 0.800 0.540 0.752 1.092 0.716 0.684
## 126 0.942 1.588 1.480 1.563 1.825 2.141 1.086 1.435 1.919 1.855 1.711
## 127 0.665 0.797 0.905 1.158 1.084 1.319 1.051 1.462 1.109 0.987 0.595
## 129 0.948 0.798 0.911 1.141 1.346 1.629 1.240 1.378 1.726 1.163 1.249
## 132 1.396 0.724 1.811 1.902 1.773 1.962 1.940 1.919 2.200 1.500 2.737
## 133 0.230 1.024 1.879 2.131 1.391 2.493 2.207 1.847 2.353 1.994 2.197
## 136 1.299 1.233 1.603 1.115 1.840 2.131 0.597 1.466 2.107 1.798 2.303
## 137 0.746 0.479 0.716 1.034 1.262 0.837 0.810 1.209 1.026 0.687 0.834
## 138 0.915 0.986 0.902 1.245 1.443 1.328 1.064 1.726 1.669 1.656 1.436
## 141 0.402 0.189 0.337 0.654 1.169 1.071 0.627 0.854 0.229 0.632 1.132
## 142 1.149 0.427 2.564 1.290 1.936 1.731 2.135 2.142 2.483 1.316 2.601
## 143 0.870 1.026 1.005 1.215 2.026 1.768 1.384 1.303 1.764 1.689 2.421
## 144 0.125 0.999 0.544 0.568 1.214 0.627 1.173 1.118 0.912 0.982 1.319
## 145 0.683 1.201 0.802 1.018 1.315 1.025 0.900 1.161 1.526 1.026 0.842
```

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## 146 0.588 0.809 0.987 0.832 0.933 0.843 1.065 0.943 0.776 1.425 0.428
## 147 0.526 0.922 1.012 1.187 1.168 1.170 1.093 1.229 1.127 1.559 0.791
## 151 1.063 0.791 2.412 1.781 1.718 1.551 1.485 1.208 2.389 1.499 1.918
## 152 0.754 0.473 0.485 1.213 0.933 1.421 1.121 0.890 0.496 1.329 1.055
## 153 0.263 0.778 0.358 0.529 1.233 1.252 1.359 0.566 0.394 1.121 1.389
## 156 0.295 0.800 0.393 0.160 1.129 0.790 0.662 0.695 1.082 1.180 1.221
## 157 0.825 0.327 1.119 1.493 0.250 1.150 0.539 1.276 1.369 0.696 0.649
## 158 0.808 0.647 0.883 1.256 1.454 0.978 0.734 1.048 1.778 1.287 0.878
## 159 0.912 1.057 0.960 1.155 1.603 1.300 1.329 1.407 1.560 1.431 1.405
## 161 1.383 0.651 2.380 2.013 2.056 1.475 2.434 2.652 2.677 1.466 2.056
## 162 0.797 0.941 1.349 1.405 1.682 2.109 0.906 1.291 1.990 1.251 2.318
## 163 0.762 0.774 0.869 1.093 1.203 0.967 0.848 0.950 1.349 0.922 0.848
## 164 1.376 1.212 1.541 1.971 1.515 1.893 2.004 1.840 1.734 2.165 1.855
## 165 1.828 1.370 1.552 1.799 1.876 1.153 2.266 2.241 2.256 1.447 1.949
## 168 1.255 1.218 1.322 1.902 1.647 1.370 1.609 1.645 1.407 1.747 1.686
## 169 1.992 1.292 0.375 0.106 0.854 0.360 0.682 0.050 0.742 2.320 1.944
## 171 1.687 0.992 1.607 1.833 1.768 1.700 1.971 1.822 1.995 1.529 2.115
## 173 1.241 1.204 1.249 1.867 1.533 1.780 1.887 1.690 1.488 2.203 1.745
## 174 0.834 1.180 1.105 1.212 1.542 1.744 0.964 1.396 1.665 1.782 1.405
## 176 0.922 0.749 0.863 1.169 1.100 1.184 0.917 1.377 1.434 1.032 0.872
## 182 0.976 1.089 1.121 1.467 1.267 1.623 0.709 1.528 1.724 1.532 1.449
## 183 0.508 0.655 0.838 1.300 1.562 1.103 1.016 1.811 0.890 0.809 1.094
## 185 1.043 0.906 1.603 1.533 1.714 2.036 1.149 1.534 2.083 1.431 2.489
## 186 0.977 0.862 0.997 1.006 1.369 1.095 0.823 1.275 1.315 1.034 1.004
## 188 0.625 0.744 0.619 0.861 0.999 0.844 0.532 0.967 1.161 0.732 0.689
## 189 0.581 0.773 0.642 0.839 0.949 0.911 0.539 1.169 1.229 0.761 0.698
## 191 0.986 1.118 1.136 1.309 1.790 1.439 1.250 1.530 1.682 1.277 1.296
## 192 1.313 0.857 2.704 2.069 1.841 1.588 1.844 1.568 2.943 1.846 2.110
## 193 1.512 0.782 2.169 1.972 1.859 1.837 2.343 2.096 2.514 1.181 2.798
## 194 1.044 1.383 1.213 1.319 1.796 1.142 2.389 1.562 1.868 2.238 1.535
## 195 0.376 0.685 0.704 0.718 1.010 1.351 1.108 1.304 1.728 1.898 1.383
## 197 0.820 0.885 0.935 1.102 0.995 1.450 1.055 1.399 1.091 1.126 0.911
## 198 1.023 1.234 0.845 1.392 1.659 1.202 0.954 1.857 1.596 1.112 1.014
## 200 0.571 0.754 0.923 1.096 1.125 1.243 1.123 1.273 1.134 1.554 0.975
## 202 0.671 0.807 0.713 0.759 1.284 1.077 1.021 1.599 1.398 1.190 0.846
## 203 0.626 0.792 0.692 0.824 0.925 1.177 0.667 1.191 1.395 0.952 0.714
## 204 1.607 1.470 1.879 1.192 1.896 1.377 1.507 1.340 2.015 2.555 2.291
## 208 1.117 1.060 1.136 1.159 1.262 1.735 1.102 1.616 1.236 1.499 1.416
## 210 1.086 0.739 0.909 1.556 1.059 1.632 1.498 1.204 1.210 1.699 1.482
## 211 0.576 0.364 1.718 0.614 1.161 1.424 0.998 1.231 1.373 0.929 1.911
## 212 1.448 0.614 0.501 1.531 2.224 1.433 1.276 1.034 1.324 1.144 1.217
## 213 0.619 0.755 0.882 1.071 1.162 0.964 0.722 0.898 1.320 0.922 0.894
## 214 0.836 0.149 1.162 1.048 0.301 1.546 1.196 0.766 0.890 0.790 0.382
## 216 0.402 0.706 0.585 0.573 1.146 1.131 0.613 0.897 1.226 1.147 1.479
## 217 0.513 0.941 0.865 1.094 1.098 0.726 0.843 1.235 1.350 0.734 0.533
## 218 0.736 0.895 0.540 1.222 1.191 1.121 0.817 1.811 1.477 1.114 1.033
## 219 0.701 0.773 0.686 0.724 1.267 1.062 0.920 1.379 1.274 1.029 0.951
## 220 1.043 1.114 0.863 1.326 1.615 0.735 2.007 1.204 1.455 1.787 1.074
## 221 1.344 1.423 1.401 1.510 1.732 2.204 0.942 1.477 2.069 1.593 1.970
## 222 1.074 1.016 1.053 1.412 1.660 1.429 1.290 1.444 1.711 1.447 1.394
## 224 0.972 0.790 0.917 1.450 1.401 0.105 0.648 0.855 0.891 0.822 0.686
## 225 0.334 0.118 0.025 0.970 1.270 0.088 0.453 0.925 0.389 -0.125 -0.490
##      F2022_Fahrenheit
## 1          35.6216
```



```
## 2      34.7324
## 3      35.0384
## 5      37.8374
## 6      34.1816
## 7      33.5102
## 9      33.1574
## 12     33.3572
## 13     36.4964
## 15     34.6640
## 16     35.6306
## 17     34.1888
## 21     33.8558
## 22     33.5912
## 23     34.7414
## 24     33.1592
## 26     29.6510
## 27     33.6668
## 28     33.5750
## 29     34.6028
## 30     35.2958
## 31     33.4436
## 34     33.7064
## 35     33.8792
## 36     34.2824
## 38     33.8576
## 39     33.3284
## 40     32.7326
## 41     34.5776
## 42     34.5776
## 43     35.4308
## 44     33.5732
## 46     34.6640
## 48     32.8622
## 51     34.5866
## 52     34.2266
## 54     35.9942
## 56     33.2384
## 57     33.7676
## 58     33.3248
## 59     33.1790
## 60     33.1844
## 64     34.4678
## 67     34.5128
## 68     34.4228
## 69     35.7116
## 70     37.2722
## 71     32.6462
## 72     33.7892
## 73     34.3814
## 75     36.6728
## 76     33.7928
## 77     36.0104
## 78     33.8720
## 79     34.5434
```

```
## 80      33.2564
## 81      33.3914
## 82      33.6488
## 83      34.1510
## 84      34.3310
## 85      33.9188
## 86      33.9710
## 87      35.6504
## 88      33.3014
## 89      35.8556
## 90      34.1618
## 91      33.4220
## 92      33.9530
## 93      36.2660
## 94      35.8646
## 95      35.1752
## 96      35.3120
## 97      33.9422
## 98      35.8430
## 100     34.4030
## 101     34.4444
## 103     34.3040
## 105     34.8980
## 106     34.9862
## 107     36.0950
## 109     34.0016
## 111     34.3220
## 112     34.4696
## 113     34.8008
## 114     33.0062
## 115     36.5612
## 118     33.5480
## 119     33.4688
## 120     34.4606
## 122     33.5966
## 123     35.5190
## 125     33.2312
## 126     35.0798
## 127     33.0710
## 129     34.2482
## 132     36.9266
## 133     35.9546
## 136     36.1454
## 137     33.5012
## 138     34.5848
## 141     34.0376
## 142     36.6818
## 143     36.3578
## 144     34.3742
## 145     33.5156
## 146     32.7704
## 147     33.4238
## 151     35.4524
## 152     33.8990
```

```
## 153      34.5002
## 156      34.1978
## 157      33.1682
## 158      33.5804
## 159      34.5290
## 161      35.7008
## 162      36.1724
## 163      33.5264
## 164      35.3390
## 165      35.5082
## 168      35.0348
## 169      35.4992
## 171      35.8070
## 173      35.1410
## 174      34.5290
## 176      33.5696
## 182      34.6082
## 183      33.9692
## 185      36.4802
## 186      33.8072
## 188      33.2402
## 189      33.2564
## 191      34.3328
## 192      35.7980
## 193      37.0364
## 194      34.7630
## 195      34.4894
## 197      33.6398
## 198      33.8252
## 200      33.7550
## 202      33.5228
## 203      33.2852
## 204      36.1238
## 208      34.5488
## 210      34.6676
## 211      35.4398
## 212      34.1906
## 213      33.6092
## 214      32.6876
## 216      34.6622
## 217      32.9594
## 218      33.8594
## 219      33.7118
## 220      33.9332
## 221      35.5460
## 222      34.5092
## 224      33.2348
## 225      31.1180
```

Reorder Multiple Rows in Descending Order

```
ordered_df <- df[order(df$Country, -df$F2022), ]
print("Ordered by Country, then F2022 (descending):")
```

```
## [1] "Ordered by Country, then F2022 (descending):"
```

```
head(ordered_df)
```

```
##      ObjectId      Country ISO2 ISO3
## 1          1 Afghanistan, Islamic Rep. of AF AFG
## 2          2      Albania AL ALB
## 3          3      Algeria DZ DZA
## 5          5 Andorra, Principality of AD AND
## 6          6      Angola AO AGO
## 7          7 Anguilla AI AIA
##
##                                     Indicator
## 1 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 2 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 3 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 5 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 6 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 7 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
##      Unit
## 1 Degree Celsius
## 2 Degree Celsius
## 3 Degree Celsius
## 5 Degree Celsius
## 6 Degree Celsius
## 7 Degree Celsius
##
## 1 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Climate
## 2 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Climate
## 3 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Climate
## 5 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Climate
## 6 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Climate
## 7 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Climate
##      CTS_Code      CTS_Name
## 1      ECCS Surface Temperature Change
## 2      ECCS Surface Temperature Change
## 3      ECCS Surface Temperature Change
## 5      ECCS Surface Temperature Change
## 6      ECCS Surface Temperature Change
## 7      ECCS Surface Temperature Change
##
##                                     CTS_Full_Descriptor
## 1 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 2 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 3 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 5 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 6 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 7 Environment, Climate Change, Climate Indicators, Surface Temperature Change
##      F1961 F1962 F1963 F1964 F1965 F1966 F1967 F1968 F1969 F1970 F1971
## 1 -0.113 -0.164 0.847 -0.764 -0.244 0.226 -0.371 -0.423 -0.539 0.813 0.619
## 2 0.627 0.326 0.075 -0.166 -0.388 0.559 -0.074 0.081 -0.013 -0.106 -0.195
```

```
## 3 0.164 0.114 0.077 0.250 -0.100 0.433 -0.026 -0.067 0.291 0.116 -0.385
## 5 0.736 0.112 -0.752 0.308 -0.490 0.415 0.637 0.018 -0.137 0.121 -0.326
## 6 0.041 -0.152 -0.190 -0.229 -0.196 0.175 -0.081 -0.193 0.188 0.248 -0.097
## 7 0.086 -0.024 0.234 0.189 -0.365 -0.001 -0.257 -0.200 0.317 0.082 -0.269
##      F1972 F1973 F1974 F1975 F1976 F1977 F1978 F1979 F1980 F1981 F1982
## 1 -1.124 0.232 -0.489 -0.445 -0.286 0.513 0.129 0.361 0.600 0.483 -0.346
## 2 -0.069 -0.288 -0.139 -0.211 -0.683 0.545 -0.814 0.203 -0.414 -0.351 0.173
## 3 -0.348 -0.015 -0.503 -0.539 -0.782 0.504 0.012 0.654 0.232 0.215 0.399
## 5 -0.499 0.025 -0.371 0.246 -0.045 -0.093 -0.163 0.058 -0.188 0.178 1.044
## 6 -0.035 0.475 -0.158 -0.029 -0.313 0.272 0.037 0.291 0.279 -0.071 0.164
## 7 -0.179 0.170 -0.370 -0.334 -0.426 0.096 0.130 0.034 0.698 0.532 0.097
##      F1983 F1984 F1985 F1986 F1987 F1988 F1989 F1990 F1991 F1992 F1993
## 1 0.164 0.145 0.283 -0.141 0.391 0.919 -0.205 0.730 -0.168 -0.294 0.220
## 2 -0.128 -0.270 -0.103 0.569 -0.106 0.370 -0.066 0.795 -0.269 0.106 0.076
## 3 0.560 -0.004 0.508 0.296 0.975 1.304 0.386 1.266 0.031 -0.312 0.552
## 5 0.859 -0.157 0.059 0.387 0.397 0.883 1.162 1.736 0.231 0.386 0.174
## 6 0.487 0.631 0.694 0.176 0.689 0.572 -0.055 0.687 0.341 0.466 0.256
## 7 0.524 0.105 0.006 0.013 0.569 0.457 -0.002 0.432 0.441 0.365 0.535
##      F1994 F1995 F1996 F1997 F1998 F1999 F2000 F2001 F2002 F2003 F2004 F2005
## 1 0.430 0.359 -0.116 0.471 0.675 1.198 0.993 1.311 1.365 0.587 1.373 0.401
## 2 1.330 -0.172 -0.038 0.075 0.795 0.670 1.065 1.532 0.492 0.970 0.444 0.189
## 3 0.732 0.595 0.846 1.059 1.109 1.476 0.820 1.856 1.258 1.585 0.988 1.264
## 5 1.508 1.279 0.570 1.788 1.018 1.055 1.050 1.480 0.835 1.949 0.936 0.851
## 6 0.212 0.753 0.370 0.107 1.064 0.417 0.169 0.295 0.735 0.889 0.414 1.021
## 7 0.575 0.651 0.350 0.459 1.060 0.532 0.264 0.587 0.706 0.816 0.521 0.828
##      F2006 F2007 F2008 F2009 F2010 F2011 F2012 F2013 F2014 F2015 F2016 F2017 F2018
## 1 1.720 0.675 0.704 0.895 1.613 1.397 0.223 1.281 0.456 1.093 1.555 1.540 1.544
## 2 0.345 1.316 0.978 0.910 1.191 1.055 1.487 1.333 1.198 1.569 1.464 1.121 2.028
## 3 1.395 1.220 1.185 0.945 2.265 1.398 1.147 1.192 1.690 1.121 1.757 1.512 1.210
## 5 1.485 1.024 0.946 1.413 0.471 1.677 1.265 0.831 1.946 1.690 1.990 1.925 1.919
## 6 0.561 0.885 0.501 0.708 1.194 0.880 0.552 1.044 0.828 1.331 1.609 0.870 1.395
## 7 0.691 0.957 0.411 0.566 1.090 0.489 0.640 0.770 0.814 1.051 1.125 0.960 0.664
##      F2019 F2020 F2021 F2022 F2022_Fahrenheit
## 1 0.910 0.498 1.327 2.012 35.6216
## 2 1.675 1.498 1.536 1.518 34.7324
## 3 1.115 1.926 2.330 1.688 35.0384
## 5 1.964 2.562 1.533 3.243 37.8374
## 6 1.752 1.162 1.553 1.212 34.1816
## 7 0.843 1.224 0.893 0.839 33.5102
```

Renaming Columns

```
colnames(df)[colnames(df) == "F2022"] <- "Temperature_2022"
colnames(df)[colnames(df) == "F2021"] <- "Temperature_2021"
ls(df)
```

```
## [1] "Country"          "CTS_Code"          "CTS_Full_Descriptor"
## [4] "CTS_Name"         "F1961"             "F1962"
## [7] "F1963"            "F1964"             "F1965"
## [10] "F1966"            "F1967"             "F1968"
## [13] "F1969"            "F1970"             "F1971"
## [16] "F1972"            "F1973"             "F1974"
```

```
## [19] "F1975"          "F1976"          "F1977"
## [22] "F1978"          "F1979"          "F1980"
## [25] "F1981"          "F1982"          "F1983"
## [28] "F1984"          "F1985"          "F1986"
## [31] "F1987"          "F1988"          "F1989"
## [34] "F1990"          "F1991"          "F1992"
## [37] "F1993"          "F1994"          "F1995"
## [40] "F1996"          "F1997"          "F1998"
## [43] "F1999"          "F2000"          "F2001"
## [46] "F2002"          "F2003"          "F2004"
## [49] "F2005"          "F2006"          "F2007"
## [52] "F2008"          "F2009"          "F2010"
## [55] "F2011"          "F2012"          "F2013"
## [58] "F2014"          "F2015"          "F2016"
## [61] "F2017"          "F2018"          "F2019"
## [64] "F2020"          "F2022_Fahrenheit" "Indicator"
## [67] "IS02"           "IS03"           "ObjectId"
## [70] "Source"         "Temperature_2021" "Temperature_2022"
## [73] "Unit"
```

Adding New Variables

```
#adding new column F2022_x_2 which is F2022 multiplied by 2
df$F2022_x_2 <- df$Temperature_2022 * 2
ls(df)
```

```
## [1] "Country"          "CTS_Code"          "CTS_Full_Descriptor"
## [4] "CTS_Name"         "F1961"             "F1962"
## [7] "F1963"            "F1964"             "F1965"
## [10] "F1966"            "F1967"             "F1968"
## [13] "F1969"            "F1970"             "F1971"
## [16] "F1972"            "F1973"             "F1974"
## [19] "F1975"            "F1976"             "F1977"
## [22] "F1978"            "F1979"             "F1980"
## [25] "F1981"            "F1982"             "F1983"
## [28] "F1984"            "F1985"             "F1986"
## [31] "F1987"            "F1988"             "F1989"
## [34] "F1990"            "F1991"             "F1992"
## [37] "F1993"            "F1994"             "F1995"
## [40] "F1996"            "F1997"             "F1998"
## [43] "F1999"            "F2000"             "F2001"
## [46] "F2002"            "F2003"             "F2004"
## [49] "F2005"            "F2006"             "F2007"
## [52] "F2008"            "F2009"             "F2010"
## [55] "F2011"            "F2012"             "F2013"
## [58] "F2014"            "F2015"             "F2016"
## [61] "F2017"            "F2018"             "F2019"
## [64] "F2020"            "F2022_Fahrenheit" "F2022_x_2"
## [67] "Indicator"         "IS02"              "IS03"
## [70] "ObjectId"          "Source"             "Temperature_2021"
## [73] "Temperature_2022"  "Unit"
```

Creating a Training Set

```
#setting seed for reproducibility
set.seed(123)
#creating a vector of random numbers
train_index <- sample(seq_len(nrow(df)), 0.8 * nrow(df))
#create training set
train_set <- df[train_index, ]
#display top 15 rows of train dataset
head(train_set, 15)
```

```
##      ObjectId      Country ISO2 ISO3
## 22      22      Benin      BJ  BEN
## 73      73  Gambia, The      GM  GMB
## 164     164      Qatar      QA  QAT
## 64      64  Eswatini, Kingdom of      SZ  SWZ
## 225     225      Zimbabwe      ZW  ZWE
## 222     222      World      WLD
## 122     122      Mali      ML  MLI
## 123     123      Malta      MT  MLT
## 217     217  Venezuela, Rep. Bolivariana de      VE  VEN
## 125     125      Martinique      MQ  MTQ
## 197     197  Tanzania, United Rep. of      TZ  TZA
## 137     137  Mozambique, Rep. of      MZ  MOZ
## 96      96      Isle of Man      IM  IMN
## 38      38  Central African Rep.      CF  CAF
## 9        9      Argentina      AR  ARG
##
##                                     Indicator
## 22  Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 73  Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 164 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 64  Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 225 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 222 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 122 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 123 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 217 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 125 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 197 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 137 Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 96  Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 38  Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
## 9   Temperature change with respect to a baseline climatology, corresponding to the period 1951-1980
##
##      Unit
## 22  Degree Celsius
## 73  Degree Celsius
## 164 Degree Celsius
## 64  Degree Celsius
## 225 Degree Celsius
## 222 Degree Celsius
## 122 Degree Celsius
## 123 Degree Celsius
## 217 Degree Celsius
```

```
## 125 Degree Celsius
## 197 Degree Celsius
## 137 Degree Celsius
## 96 Degree Celsius
## 38 Degree Celsius
## 9 Degree Celsius
##
## 22 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 73 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 164 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 64 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 225 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 222 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 122 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 123 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 217 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 125 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 197 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 137 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 96 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 38 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## 9 Food and Agriculture Organization of the United Nations (FAO). 2022. FAOSTAT Climate Change, Clim
## CTS_Code CTS_Name
## 22 ECCS Surface Temperature Change
## 73 ECCS Surface Temperature Change
## 164 ECCS Surface Temperature Change
## 64 ECCS Surface Temperature Change
## 225 ECCS Surface Temperature Change
## 222 ECCS Surface Temperature Change
## 122 ECCS Surface Temperature Change
## 123 ECCS Surface Temperature Change
## 217 ECCS Surface Temperature Change
## 125 ECCS Surface Temperature Change
## 197 ECCS Surface Temperature Change
## 137 ECCS Surface Temperature Change
## 96 ECCS Surface Temperature Change
## 38 ECCS Surface Temperature Change
## 9 ECCS Surface Temperature Change
## CTS_Full_Descriptor
## 22 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 73 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 164 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 64 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 225 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 222 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 122 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 123 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 217 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 125 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 197 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 137 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 96 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 38 Environment, Climate Change, Climate Indicators, Surface Temperature Change
## 9 Environment, Climate Change, Climate Indicators, Surface Temperature Change
```



```
##      F1961 F1962 F1963 F1964 F1965 F1966 F1967 F1968 F1969 F1970
## 22 -0.137 -0.240 0.152 -0.218 -0.094 -0.007 -0.252 -0.129 0.303 0.305
## 73 -0.138 -0.047 0.130 -0.192 -0.463 -0.086 -0.381 -0.547 0.832 0.399
## 164 -0.542 0.518 0.449 -0.400 0.386 0.439 -0.252 -0.536 0.668 0.267
## 64 0.268 0.433 -0.210 0.022 -0.224 0.295 -0.274 -0.431 0.346 0.500
## 225 0.267 0.237 -0.458 -0.097 -0.480 0.215 -0.043 0.093 0.215 0.421
## 222 0.211 0.038 0.168 -0.246 -0.223 0.201 -0.117 -0.126 -0.092 0.150
## 122 -0.301 -0.145 0.213 -0.130 -0.299 0.005 -0.124 -0.287 0.665 0.365
## 123 0.551 0.350 -0.204 0.260 -0.218 0.149 0.131 -0.033 -0.129 -0.144
## 217 0.072 -0.113 -0.012 0.097 -0.096 0.189 -0.199 -0.173 0.514 0.217
## 125 -0.040 0.151 0.243 0.062 -0.283 0.067 -0.246 -0.213 0.403 0.186
## 197 0.334 -0.260 -0.270 -0.397 -0.242 0.050 0.027 -0.474 0.350 0.193
## 137 0.391 0.031 -0.435 -0.180 -0.596 0.143 0.120 -0.373 0.289 0.228
## 96 0.358 -0.746 -0.820 0.095 -0.579 -0.100 0.105 0.035 -0.287 0.049
## 38 -0.003 -0.306 0.037 -0.136 -0.050 0.064 -0.229 -0.168 0.143 0.245
## 9 0.122 -0.046 0.162 -0.343 0.090 -0.163 0.000 0.472 0.292 0.438
##      F1971 F1972 F1973 F1974 F1975 F1976 F1977 F1978 F1979 F1980
## 22 -0.183 0.080 0.627 0.089 -0.274 -0.194 0.357 -0.045 0.499 0.425
## 73 -0.054 0.311 0.685 -0.212 -0.164 -0.057 0.489 0.422 0.630 0.820
## 164 -0.152 -0.731 -0.255 -0.336 -0.281 -0.556 0.274 0.149 0.765 0.389
## 64 -0.002 -0.395 0.112 -0.233 -0.353 -0.436 0.305 0.188 0.234 -0.130
## 225 -0.052 -0.397 0.601 -0.485 -0.262 -0.436 0.433 -0.016 0.189 -0.024
## 222 -0.093 -0.199 0.269 -0.181 0.088 -0.314 0.269 0.001 0.226 0.332
## 122 -0.007 0.278 0.508 -0.435 -0.471 -0.374 0.362 0.360 0.646 0.970
## 123 -0.272 -0.294 -0.003 -0.251 -0.383 -0.706 0.304 -0.602 0.036 -0.504
## 217 -0.365 -0.029 0.313 -0.295 -0.300 -0.409 0.168 0.095 0.202 0.346
## 125 -0.193 -0.047 0.158 -0.395 -0.394 -0.415 0.020 0.082 0.166 0.401
## 197 -0.286 0.024 0.335 -0.122 -0.040 0.015 0.352 0.118 -0.090 0.410
## 137 -0.142 -0.222 0.262 -0.295 -0.163 -0.142 0.468 0.364 0.129 0.093
## 96 0.316 -0.190 0.297 -0.200 0.697 0.661 -0.339 0.209 -0.777 -0.031
## 38 -0.055 0.064 0.545 -0.058 -0.049 -0.117 0.203 0.044 0.380 0.439
## 9 -0.260 -0.008 -0.139 -0.106 -0.021 -0.321 0.432 0.362 0.266 0.373
##      F1981 F1982 F1983 F1984 F1985 F1986 F1987 F1988 F1989 F1990 F1991
## 22 0.161 0.211 0.548 0.542 0.411 0.307 0.977 0.631 -0.052 0.580 0.302
## 73 0.622 0.326 1.131 0.636 0.384 0.665 1.068 0.829 0.609 1.139 0.810
## 164 0.417 -0.130 -0.826 0.039 0.357 0.510 0.385 0.494 -0.069 0.406 -0.151
## 64 -0.429 0.170 0.915 -0.040 0.571 0.321 0.567 0.608 0.142 0.281 0.530
## 225 -0.360 0.170 1.223 0.483 0.027 0.025 1.070 0.447 0.181 0.567 0.192
## 222 0.443 0.086 0.460 0.127 -0.031 0.242 0.403 0.558 0.331 0.639 0.468
## 122 0.395 0.264 0.830 0.609 0.512 0.304 1.081 0.784 0.107 0.903 0.685
## 123 -0.344 0.623 0.037 -0.267 0.426 0.400 0.525 1.194 0.206 1.235 0.147
## 217 0.134 0.116 0.469 -0.107 -0.295 -0.163 0.415 0.161 -0.098 0.356 0.460
## 125 0.406 0.074 0.433 -0.029 -0.060 0.017 0.591 0.404 -0.001 0.424 0.445
## 197 0.387 0.437 0.724 0.125 0.094 0.174 0.598 0.657 -0.083 0.190 0.332
## 137 -0.188 -0.040 0.918 0.263 -0.008 0.103 0.679 0.588 0.092 0.368 0.125
## 96 0.292 0.076 0.381 0.356 -0.489 -0.684 -0.222 0.270 1.105 0.913 0.178
## 38 0.003 0.229 0.425 0.125 0.156 0.478 0.504 0.265 -0.148 0.347 0.612
## 9 0.378 0.359 0.046 -0.100 0.308 0.460 0.446 -0.192 0.611 0.436 0.261
##      F1992 F1993 F1994 F1995 F1996 F1997 F1998 F1999 F2000 F2001 F2002
## 22 -0.027 0.531 0.439 0.406 0.736 0.557 1.042 0.621 0.449 0.517 0.721
## 73 0.852 1.045 0.814 0.878 1.122 1.323 1.555 0.750 0.958 1.316 1.380
## 164 -0.519 0.031 0.666 0.064 0.496 0.066 1.174 1.735 0.944 0.970 1.436
## 64 1.147 0.733 -0.006 0.585 -0.042 0.235 0.991 0.505 -0.061 0.517 0.601
## 225 1.010 0.300 -0.085 0.685 -0.247 -0.025 0.801 0.030 -0.417 0.004 0.487
```

```

## 222 0.184 0.348 0.507 0.835 0.355 0.656 0.993 0.783 0.728 0.834 1.021
## 122 0.194 1.026 0.206 0.570 1.161 0.870 1.214 0.375 0.647 0.583 1.246
## 123 0.275 0.625 1.421 0.461 0.639 1.054 0.876 1.268 1.055 1.669 0.942
## 217 0.454 0.525 0.320 0.770 0.545 0.609 1.039 0.339 0.298 0.626 0.864
## 125 0.405 0.487 0.565 0.670 0.433 0.591 1.003 0.477 0.262 0.506 0.681
## 197 0.338 0.029 0.428 0.347 0.217 0.586 0.499 -0.232 0.530 0.433 0.646
## 137 0.759 0.299 0.087 0.555 0.111 0.209 0.949 0.288 0.375 0.481 0.683
## 96 0.462 -0.037 0.269 1.164 -0.112 0.924 0.928 1.112 0.636 0.516 0.891
## 38 -0.457 0.329 0.562 0.187 0.047 0.458 1.195 0.502 0.683 0.400 0.745
## 9 -0.261 0.086 0.487 0.259 0.512 0.759 0.351 0.160 -0.186 0.425 0.278
##      F2003 F2004 F2005 F2006 F2007 F2008 F2009 F2010 F2011 F2012 F2013
## 22 0.936 0.706 1.105 1.035 0.806 0.632 0.950 1.230 0.949 0.595 0.853
## 73 1.103 1.188 1.498 1.221 1.090 1.376 0.688 1.324 1.060 0.890 1.001
## 164 1.179 1.228 0.842 1.652 0.989 1.162 1.114 2.001 1.444 1.376 1.212
## 64 0.715 0.525 1.153 0.365 1.133 0.640 0.383 1.287 0.897 0.696 0.566
## 225 0.355 -0.004 0.945 -0.260 0.127 0.078 -0.226 0.935 0.232 0.334 0.118
## 222 0.893 0.913 1.095 0.998 1.195 0.935 0.957 1.219 0.921 1.074 1.016
## 122 1.238 1.214 1.396 1.097 0.933 0.548 0.960 1.630 1.207 0.426 0.969
## 123 1.401 0.699 0.670 0.996 1.398 1.271 1.080 1.243 1.013 1.440 1.343
## 217 0.912 0.676 0.933 0.674 0.760 0.518 0.816 1.227 0.601 0.513 0.941
## 125 0.802 0.515 0.834 0.736 0.846 0.407 0.553 1.177 0.596 0.699 0.714
## 197 1.010 0.899 1.035 0.836 0.770 0.462 0.892 1.013 0.723 0.820 0.885
## 137 0.589 0.437 1.045 0.581 0.647 0.384 0.585 1.105 0.812 0.746 0.479
## 96 1.049 0.952 1.165 1.229 1.321 0.829 0.874 -0.111 0.681 0.610 0.428
## 38 0.845 0.957 0.983 0.967 0.537 0.682 1.119 1.162 0.763 0.491 0.865
## 9 0.635 0.470 0.281 0.596 -0.169 0.601 0.857 0.135 0.386 0.798 0.442
##      F2014 F2015 F2016 F2017 F2018 F2019 F2020 Temperature_2021 Temperature_2022
## 22 0.940 1.111 1.025 1.160 1.056 1.147 1.031 1.522 0.884
## 73 1.188 1.200 1.635 1.741 1.028 1.349 1.770 1.675 1.323
## 164 1.541 1.971 1.515 1.893 2.004 1.840 1.734 2.165 1.855
## 64 0.781 1.235 1.216 0.688 1.064 1.623 0.770 0.669 1.371
## 225 0.025 0.970 1.270 0.088 0.453 0.925 0.389 -0.125 -0.490
## 222 1.053 1.412 1.660 1.429 1.290 1.444 1.711 1.447 1.394
## 122 0.787 1.017 1.089 1.347 1.040 1.089 1.010 1.687 0.887
## 123 1.507 1.403 1.748 1.224 1.441 1.290 1.643 2.123 1.955
## 217 0.865 1.094 1.098 0.726 0.843 1.235 1.350 0.734 0.533
## 125 0.674 0.892 1.034 0.800 0.540 0.752 1.092 0.716 0.684
## 197 0.935 1.102 0.995 1.450 1.055 1.399 1.091 1.126 0.911
## 137 0.716 1.034 1.262 0.837 0.810 1.209 1.026 0.687 0.834
## 96 1.515 0.441 1.118 1.367 0.881 1.175 1.199 1.020 1.840
## 38 0.697 0.983 1.222 1.224 1.145 1.264 1.140 1.268 1.032
## 9 0.951 0.957 0.488 1.095 0.878 0.760 1.123 1.031 0.643
##      F2022_Fahrenheit F2022_x_2
## 22 33.5912 1.768
## 73 34.3814 2.646
## 164 35.3390 3.710
## 64 34.4678 2.742
## 225 31.1180 -0.980
## 222 34.5092 2.788
## 122 33.5966 1.774
## 123 35.5190 3.910
## 217 32.9594 1.066
## 125 33.2312 1.368
## 197 33.6398 1.822

```

```
## 137      33.5012      1.668
## 96       35.3120      3.680
## 38       33.8576      2.064
## 9        33.1574      1.286
```

Summary Statistics and Statistical Functions

Summary Statistics

```
print(summary(df))
```

```
##      ObjectId      Country      IS02      IS03
## Min.   : 1.0   Length:157   Length:157   Length:157
## 1st Qu.: 58.0   Class :character Class :character Class :character
## Median :106.0   Mode  :character Mode  :character Mode  :character
## Mean   :111.4
## 3rd Qu.:164.0
## Max.   :225.0
##      Indicator      Unit      Source      CTS_Code
## Length:157   Length:157   Length:157   Length:157
## Class :character Class :character Class :character Class :character
## Mode  :character Mode  :character Mode  :character Mode  :character
##
##
##      CTS_Name      CTS_Full_Descriptor      F1961      F1962
## Length:157   Length:157   Min.   :-0.6940   Min.   :-0.90800
## Class :character Class :character   1st Qu.: -0.0890   1st Qu.: -0.18300
## Mode  :character Mode  :character   Median : 0.0720   Median : -0.07000
##                                     Mean   : 0.1912   Mean   : -0.01311
##                                     3rd Qu.: 0.3580   3rd Qu.: 0.14000
##                                     Max.   : 1.8920   Max.   : 0.99800
##
##      F1963      F1964      F1965      F1966
## Min.   :-1.27000   Min.   :-0.87700   Min.   :-1.0640   Min.   :-1.8010
## 1st Qu.: -0.21100   1st Qu.: -0.25700   1st Qu.: -0.3880   1st Qu.: -0.0440
## Median : -0.03800   Median : -0.05200   Median : -0.2230   Median : 0.1170
## Mean   : -0.01506   Mean   : -0.07865   Mean   : -0.2391   Mean   : 0.1309
## 3rd Qu.: 0.23400   3rd Qu.: 0.13100   3rd Qu.: -0.0780   3rd Qu.: 0.3080
## Max.   : 1.20200   Max.   : 1.09700   Max.   : 0.8570   Max.   : 1.1510
##
##      F1967      F1968      F1969      F1970
## Min.   :-1.0480   Min.   :-1.6340   Min.   :-0.9000   Min.   :-1.28800
## 1st Qu.: -0.2710   1st Qu.: -0.3460   1st Qu.: -0.0650   1st Qu.: -0.09600
## Median : -0.1290   Median : -0.1730   Median : 0.1970   Median : 0.12800
## Mean   : -0.1027   Mean   : -0.2014   Mean   : 0.1499   Mean   : 0.07806
## 3rd Qu.: 0.0320   3rd Qu.: -0.0670   3rd Qu.: 0.3820   3rd Qu.: 0.29900
## Max.   : 1.1340   Max.   : 0.4760   Max.   : 0.8320   Max.   : 0.97800
##
##      F1971      F1972      F1973      F1974
## Min.   :-0.8700   Min.   :-1.79600   Min.   :-0.9870   Min.   :-0.9820
## 1st Qu.: -0.3200   1st Qu.: -0.19900   1st Qu.: -0.0140   1st Qu.: -0.3620
## Median : -0.1930   Median : -0.04300   Median : 0.2550   Median : -0.1980
## Mean   : -0.1917   Mean   : -0.08836   Mean   : 0.2094   Mean   : -0.1637
## 3rd Qu.: -0.0550   3rd Qu.: 0.11900   3rd Qu.: 0.4460   3rd Qu.: -0.0480
```

```

## Max. : 0.6840 Max. : 0.93300 Max. : 1.1450 Max. : 1.1210
## F1975 F1976 F1977 F1978
## Min. :-1.093000 Min. :-0.9590 Min. :-0.5520 Min. :-0.87100
## 1st Qu.: -0.274000 1st Qu.: -0.4360 1st Qu.: 0.0030 1st Qu.: -0.04300
## Median : -0.128000 Median : -0.2950 Median : 0.1910 Median : 0.08600
## Mean : -0.008567 Mean : -0.2568 Mean : 0.1775 Mean : 0.04388
## 3rd Qu.: 0.137000 3rd Qu.: -0.0850 3rd Qu.: 0.3410 3rd Qu.: 0.20500
## Max. : 1.893000 Max. : 0.7290 Max. : 1.0790 Max. : 0.90800
## F1979 F1980 F1981 F1982
## Min. :-1.2390 Min. :-0.7600 Min. :-0.9090 Min. :-0.6820
## 1st Qu.: 0.0960 1st Qu.: -0.0200 1st Qu.: 0.0170 1st Qu.: 0.0000
## Median : 0.2740 Median : 0.2820 Median : 0.1760 Median : 0.1800
## Mean : 0.2282 Mean : 0.2201 Mean : 0.1612 Mean : 0.1674
## 3rd Qu.: 0.4590 3rd Qu.: 0.4320 3rd Qu.: 0.3730 3rd Qu.: 0.3790
## Max. : 1.2910 Max. : 0.9700 Max. : 1.5620 Max. : 1.1350
## F1983 F1984 F1985 F1986
## Min. :-2.0620 Min. :-1.45500 Min. :-1.19300 Min. :-0.7650
## 1st Qu.: 0.1090 1st Qu.: -0.12600 1st Qu.: -0.06000 1st Qu.: 0.0150
## Median : 0.4570 Median : 0.04000 Median : 0.11300 Median : 0.1760
## Mean : 0.3336 Mean : 0.07001 Mean : 0.06246 Mean : 0.1538
## 3rd Qu.: 0.6770 3rd Qu.: 0.29400 3rd Qu.: 0.32400 3rd Qu.: 0.3380
## Max. : 1.6230 Max. : 0.79900 Max. : 0.89100 Max. : 0.8350
## F1987 F1988 F1989 F1990
## Min. :-1.6520 Min. :-0.5040 Min. :-1.5370 Min. :-0.7390
## 1st Qu.: 0.1730 1st Qu.: 0.3380 1st Qu.: -0.0250 1st Qu.: 0.2740
## Median : 0.4950 Median : 0.5010 Median : 0.1530 Median : 0.4800
## Mean : 0.3927 Mean : 0.4979 Mean : 0.2901 Mean : 0.5932
## 3rd Qu.: 0.6920 3rd Qu.: 0.6810 3rd Qu.: 0.4790 3rd Qu.: 0.8290
## Max. : 1.5620 Max. : 1.3360 Max. : 2.1790 Max. : 1.8430
## F1991 F1992 F1993 F1994
## Min. :-0.7000 Min. :-1.3440 Min. :-1.3550 Min. :-0.4250
## 1st Qu.: 0.1920 1st Qu.: -0.0610 1st Qu.: 0.0640 1st Qu.: 0.3050
## Median : 0.3900 Median : 0.3050 Median : 0.2990 Median : 0.4990
## Mean : 0.3682 Mean : 0.2231 Mean : 0.2507 Mean : 0.6148
## 3rd Qu.: 0.5380 3rd Qu.: 0.5330 3rd Qu.: 0.4870 3rd Qu.: 0.8650
## Max. : 1.1380 Max. : 1.4520 Max. : 1.0970 Max. : 1.9580
## F1995 F1996 F1997 F1998
## Min. :-0.3300 Min. :-0.787 Min. :-0.4220 Min. :-0.258
## 1st Qu.: 0.3480 1st Qu.: 0.077 1st Qu.: 0.2920 1st Qu.: 0.841
## Median : 0.5820 Median : 0.337 Median : 0.5580 Median : 1.018
## Mean : 0.5814 Mean : 0.317 Mean : 0.5492 Mean : 1.007
## 3rd Qu.: 0.7940 3rd Qu.: 0.545 3rd Qu.: 0.8080 3rd Qu.: 1.200
## Max. : 1.7010 Max. : 1.555 Max. : 1.9330 Max. : 2.470
## F1999 F2000 F2001 F2002
## Min. :-0.232 Min. :-0.7180 Min. :-0.1860 Min. : 0.0090
## 1st Qu.: 0.483 1st Qu.: 0.2810 1st Qu.: 0.5160 1st Qu.: 0.6810
## Median : 0.642 Median : 0.5230 Median : 0.6910 Median : 0.8270
## Mean : 0.761 Mean : 0.6106 Mean : 0.8095 Mean : 0.8783
## 3rd Qu.: 1.022 3rd Qu.: 0.8450 3rd Qu.: 1.1630 3rd Qu.: 1.0340
## Max. : 2.064 Max. : 2.0240 Max. : 1.9920 Max. : 1.7860
## F2003 F2004 F2005 F2006
## Min. : 0.1450 Min. : -0.133 Min. : 0.1030 Min. : -0.5050
## 1st Qu.: 0.7030 1st Qu.: 0.533 1st Qu.: 0.6720 1st Qu.: 0.6740
## Median : 0.8790 Median : 0.701 Median : 0.8410 Median : 0.8410

```

```
## Mean :0.9138 Mean : 0.764 Mean :0.8612 Mean : 0.9116
## 3rd Qu.:1.0490 3rd Qu.: 0.969 3rd Qu.:1.0470 3rd Qu.: 1.1620
## Max. :2.3280 Max. : 1.760 Max. :2.2010 Max. : 2.3430
## F2007 F2008 F2009 F2010
## Min. :-0.2190 Min. :0.0780 Min. :-0.3190 Min. :-0.341
## 1st Qu.: 0.6640 1st Qu.:0.4630 1st Qu.: 0.6900 1st Qu.: 0.766
## Median : 0.8750 Median :0.6670 Median : 0.8920 Median : 1.111
## Mean : 0.9552 Mean :0.7675 Mean : 0.8991 Mean : 1.108
## 3rd Qu.: 1.0900 3rd Qu.:1.0310 3rd Qu.: 1.1340 3rd Qu.: 1.311
## Max. : 2.7290 Max. :2.1300 Max. : 1.6950 Max. : 3.058
## F2011 F2012 F2013 F2014
## Min. :-0.0480 Min. :0.1250 Min. :0.1180 Min. :-0.092
## 1st Qu.: 0.5380 1st Qu.:0.5880 1st Qu.:0.7150 1st Qu.: 0.777
## Median : 0.7710 Median :0.7970 Median :0.8650 Median : 0.960
## Mean : 0.8256 Mean :0.8684 Mean :0.8899 Mean : 1.090
## 3rd Qu.: 1.0710 3rd Qu.:1.0670 3rd Qu.:1.0980 3rd Qu.: 1.306
## Max. : 1.6980 Max. :2.1440 Max. :1.6420 Max. : 2.704
## F2015 F2016 F2017 F2018
## Min. :-0.430 Min. :0.250 Min. :0.017 Min. :0.238
## 1st Qu.: 1.018 1st Qu.:1.129 1st Qu.:1.023 1st Qu.:0.850
## Median : 1.192 Median :1.411 Median :1.252 Median :1.101
## Mean : 1.225 Mean :1.403 Mean :1.271 Mean :1.237
## 3rd Qu.: 1.450 3rd Qu.:1.660 3rd Qu.:1.539 3rd Qu.:1.498
## Max. : 2.613 Max. :2.381 Max. :2.493 Max. :2.524
## F2019 F2020 Temperature_2021 Temperature_2022
## Min. :0.050 Min. :0.229 Min. :-0.425 Min. :-1.305
## 1st Qu.:1.161 1st Qu.:1.160 1st Qu.: 1.019 1st Qu.: 0.875
## Median :1.379 Median :1.434 Median : 1.327 Median : 1.280
## Mean :1.385 Mean :1.483 Mean : 1.361 Mean : 1.334
## 3rd Qu.:1.616 3rd Qu.:1.734 3rd Qu.: 1.660 3rd Qu.: 1.745
## Max. :2.652 Max. :3.317 Max. : 2.676 Max. : 3.243
## F2022_Fahrenheit F2022_x_2
## Min. :29.65 Min. :-2.610
## 1st Qu.:33.58 1st Qu.: 1.750
## Median :34.30 Median : 2.560
## Mean :34.40 Mean : 2.668
## 3rd Qu.:35.14 3rd Qu.: 3.490
## Max. :37.84 Max. : 6.486
```

Statistical Functions

```
#Mean of F2022
mean_F2022 <- mean(df$Temperature_2022) # nolint
print(paste("Mean of Temperature_2022:", mean_F2022))
```

```
## [1] "Mean of Temperature_2022: 1.33417197452229"
```

```
#Median of F2022
median_F2022 <- median(df$Temperature_2022) # nolint
print(paste("Median of Temperature_2022:", median_F2022))
```

```
## [1] "Median of Temperature_2022: 1.28"
```

```
#Mode of F2022
get_mode <- function(v) {
  unique_val <- unique(v)
  unique_val[which.max(tabulate(match(v, unique_val)))]
}
mode_F2022 <- get_mode(df$Temperature_2022) # nolint
print(paste("Mode of Temperature_2022:", mode_F2022))
```

```
## [1] "Mode of Temperature_2022: 1.48"
```

```
#Range of F2022
range_F2022 <- range(df$Temperature_2022) # nolint
print(paste("Range of Temperature_2022:", range_F2022))
```

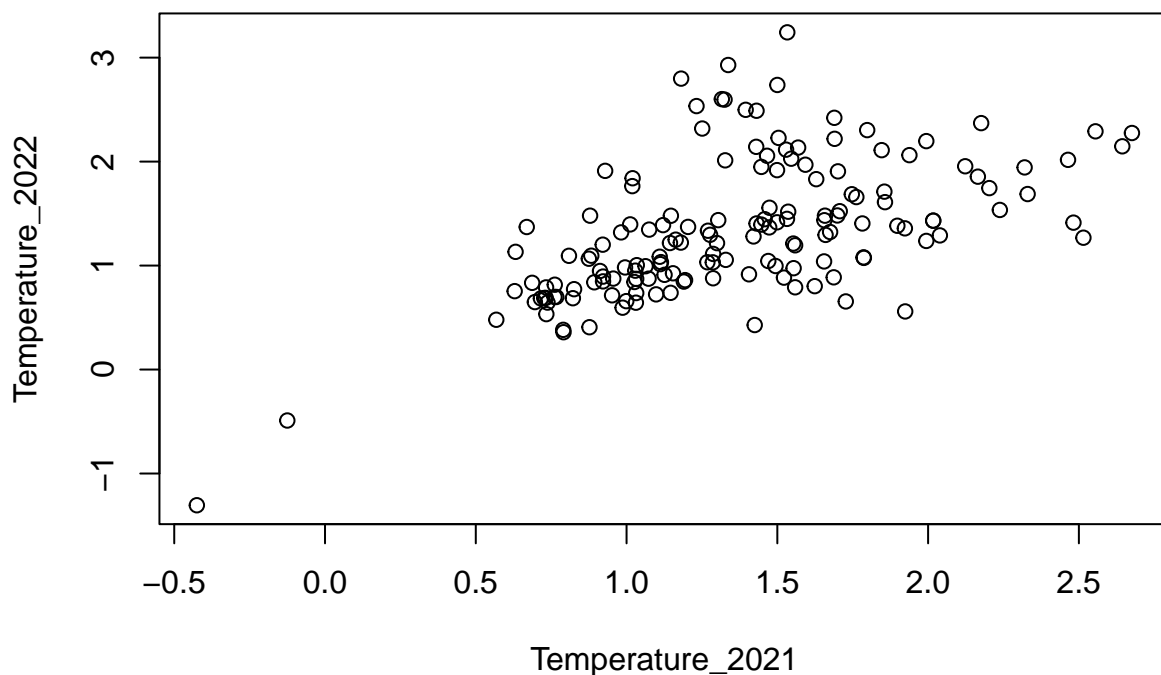
```
## [1] "Range of Temperature_2022: -1.305" "Range of Temperature_2022: 3.243"
```

Plots and Correlation

Scatter Plot

```
plot(df$Temperature_2021, df$Temperature_2022,
     main = "Scatter Plot of Temperature_2021 vs Temperature 2022",
     xlab = "Temperature_2021", ylab = "Temperature_2022")
```

Scatter Plot of Temperature_2021 vs Temperature 2022



Bar Plot

```
library(ggplot2)
library(dplyr)

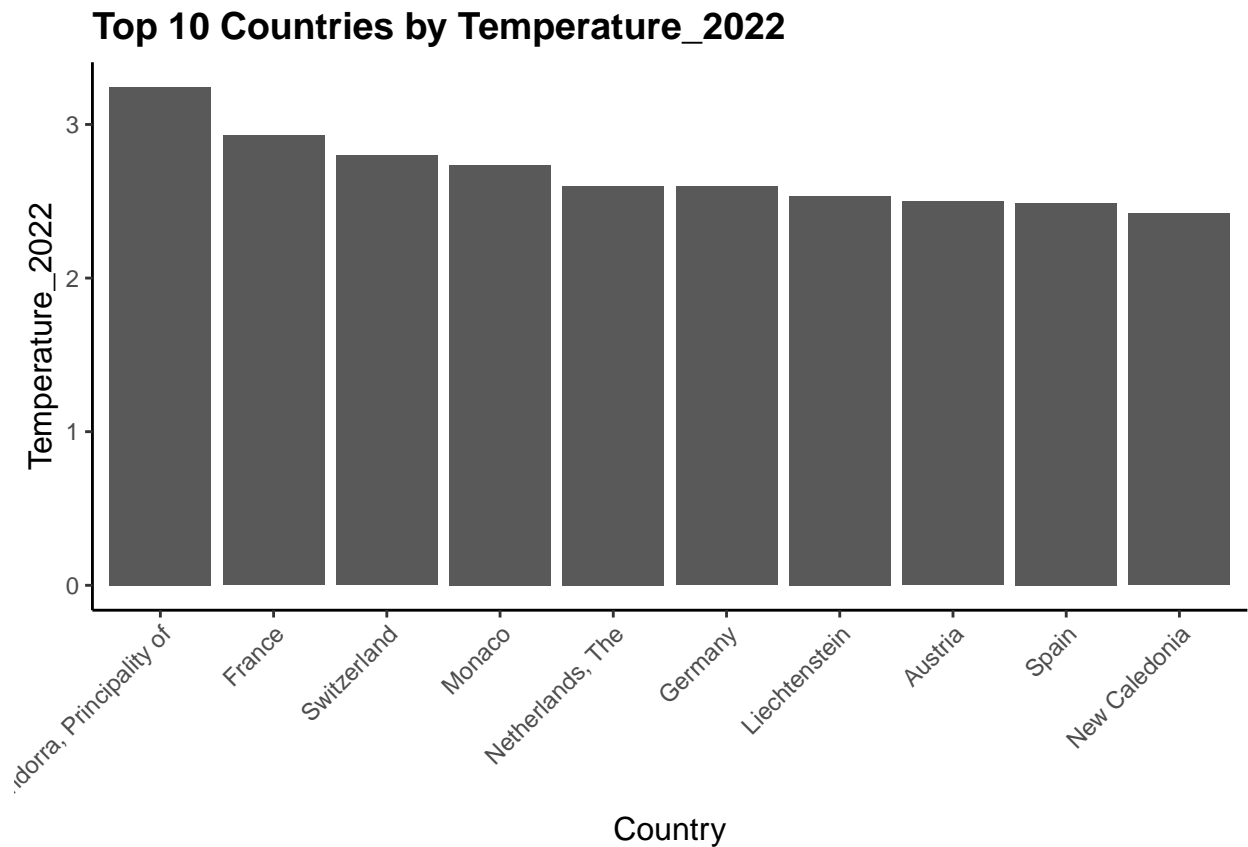
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##   filter, lag

## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union

# Getting the top 10 countries by Temperature_2022
top_10_countries <- df %>%
  arrange(desc(Temperature_2022)) %>%
  head(10)

# Creating the bar plot with only the top 10
ggplot(top_10_countries, aes(x = factor(Country, levels = Country),
                             y = Temperature_2022)) +
  geom_bar(stat = "identity") +
  labs(title = "Top 10 Countries by Temperature_2022",
       x = "Country",
       y = "Temperature_2022") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1),
        plot.title = element_text(size = 14, face = "bold"),
        axis.title.x = element_text(size = 12),
        axis.title.y = element_text(size = 12),
        panel.background = element_blank(),
        axis.line = element_line(colour = "black"))
```



Correlation

```
correlation_F2021_F2022 <- cor(df$Temperature_2021, df$Temperature_2022, use = "complete.obs") # nolint
print(paste("Correlation between Temperature_2021 and Temperature_2022:",
            correlation_F2021_F2022))
```

```
## [1] "Correlation between Temperature_2021 and Temperature_2022: 0.57464402453213"
```