FE-515 Homework 3

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2023-04-13

```
\# 1. Download option prices of ticker \hat{\ \ }VIX for all expiration dates and name it VIX.options library(quantmod)
```

```
## Loading required package: xts
## Loading required package: zoo
##
## Attaching package: 'zoo'
## The following objects are masked from 'package:base':
##
##
      as.Date, as.Date.numeric
##
## # We noticed you have dplyr installed. The dplyr lag() function breaks how
## # base R's lag() function is supposed to work, which breaks lag(my_xts).
## # If you call library(dplyr) later in this session, then calls to lag(my_xts)
## # that you enter or source() into this session won't work correctly.
## # All package code is unaffected because it is protected by the R namespace
## # mechanism.
## #
## # Set 'options(xts.warn_dplyr_breaks_lag = FALSE)' to suppress this warning.
## # You can use stats::lag() to make sure you're not using dplyr::lag(), or you #
## # can add conflictRules('dplyr', exclude = 'lag') to your .Rprofile to stop
## # dplyr from breaking base R's lag() function.
## Loading required package: TTR
## Registered S3 method overwritten by 'quantmod':
##
    method
                    from
    as.zoo.data.frame zoo
```

##	\$ca	alls						
##			ConractSize	Currency	Expiration	Strike	Last	Chg
##	1	VIX230419C00010000	REGULAR	=	2023-04-19	10.0	8.35	-0.46999930
##	2	VIX230419C00010500	REGULAR	USD	2023-04-19	10.5	10.39	0.00000000
##	3	VIX230419C00011000	REGULAR	USD	2023-04-19	11.0	7.45	-0.65000060
##	4	VIX230419C00011500	REGULAR	USD	2023-04-19	11.5	9.39	0.00000000
##	5	VIX230419C00012000	REGULAR	USD	2023-04-19	12.0	7.05	0.00000000
##	6	VIX230419C00012500	REGULAR	USD	2023-04-19	12.5	9.05	0.00000000
##	7	VIX230419C00013000	REGULAR	USD	2023-04-19	13.0	5.51	-1.43999960
##	8	VIX230419C00013500	REGULAR	USD	2023-04-19	13.5	5.95	0.00000000
##	9	VIX230419C00014000	REGULAR	USD	2023-04-19	14.0	4.90	-0.54999970
##	10	VIX230419C00014500	REGULAR	USD	2023-04-19	14.5	4.85	0.00000000
##	11	VIX230419C00015000	REGULAR	USD	2023-04-19	15.0	3.40	-0.44999980
##	12	VIX230419C00016000	REGULAR	USD	2023-04-19	16.0	2.30	-0.58000016
##	13	VIX230419C00017000	REGULAR	USD	2023-04-19	17.0	1.35	-0.5000000
##		VIX230419C00018000	REGULAR		2023-04-19	18.0	0.67	-0.38999993
##	15	VIX230419C00019000	REGULAR		2023-04-19	19.0	0.35	-0.25000003
##		VIX230419C00020000	REGULAR		2023-04-19	20.0		-0.15000002
##		VIX230419C00021000	REGULAR		2023-04-19	21.0		-0.08999999
##		VIX230419C00022000	REGULAR		2023-04-19	22.0		-0.07000000
##		VIX230419C00023000	REGULAR		2023-04-19	23.0		-0.02000000
##		VIX230419C00024000	REGULAR		2023-04-19	24.0		-0.04000000
##		VIX230419C00025000	REGULAR		2023-04-19	25.0		-0.03000000
##		VIX230419C00026000	REGULAR		2023-04-19	26.0		-0.02000000
##		VIX230419C00027000	REGULAR		2023-04-19	27.0	0.03	0.00000000
##		VIX230419C00028000	REGULAR		2023-04-19	28.0	0.04	0.00000000
##		VIX230419C00029000	REGULAR		2023-04-19	29.0	0.03	0.00000000
##		VIX230419C00030000	REGULAR		2023-04-19	30.0	0.03	0.00000000
##		VIX230419C00031000	REGULAR		2023-04-19	31.0	0.02	0.01000000
##		VIX230419C00032000	REGULAR		2023-04-19	32.0		-0.01000000
##		VIX230419C00032500	REGULAR		2023-04-19	32.5		-0.01000000
##		VIX230419C00033000	REGULAR		2023-04-19	33.0		-0.01000000
##		VIX230419C00034000	REGULAR		2023-04-19	34.0	0.02	0.01000000
##		VIX230419C00035000 VIX230419C00036000	REGULAR		2023-04-19	35.0	0.02	0.00000000
##		VIX230419C00037000	REGULAR REGULAR		2023-04-19 2023-04-19	36.0 37.0	0.02	0.01000000
		VIX230419C00037000 VIX230419C00037500	REGULAR		2023-04-19	37.5	0.02	0.00000000
		VIX230419C00037500 VIX230419C00038000						
		VIX230419C00039000	REGULAR REGULAR		2023-04-19 2023-04-19	38.0 39.0	0.01	0.00000000
		VIX230419C00039000 VIX230419C00040000	REGULAR		2023-04-19	40.0	0.02	0.00000000
##		VIX230419C00040000 VIX230419C00042500	REGULAR		2023-04-19	40.0	0.01	0.00000000
##		VIX230419C00042300 VIX230419C00045000	REGULAR		2023 04 19	45.0	0.01	0.0000000
##		VIX230419C00043000 VIX230419C00047500	REGULAR		2023 04 13	47.5		-0.01000000
		VIX230419C00050000	REGULAR		2023 04 13	50.0	0.01	0.01000000
		VIX230419C00055000	REGULAR		2023 04 13	55.0	0.02	0.0000000
		VIX230419C00060000	REGULAR		2023-04-19	60.0	0.01	0.00000000
		VIX230419C00065000	REGULAR		2023 04 13	65.0	0.01	0.00000000
		VIX230419C00070000	REGULAR		2023-04-19	70.0	0.01	0.00000000
		VIX230419C00075000	REGULAR		2023-04-19	75.0	0.01	0.00000000
		VIX230419C00080000	REGULAR		2023-04-19	80.0	0.01	0.00000000
				CDD		50.5		3.000000

```
## 49 VIX230419C00085000
                             REGULAR
                                           USD 2023-04-19
                                                            85.0 0.01
                                                                         0.00000000
## 50 VIX230419C00090000
                             REGULAR
                                           USD 2023-04-19
                                                            90.0
                                                                  0.01
                                                                         0.00000000
## 51 VIX230419C00095000
                                           USD 2023-04-19
                             REGULAR
                                                            95.0
                                                                  0.02
                                                                         0.00000000
## 52 VIX230419C00100000
                                           USD 2023-04-19
                                                            100.0
                                                                  0.01
                             REGULAR
                                                                         0.00000000
## 53 VIX230419C00110000
                             REGULAR
                                           USD 2023-04-19
                                                            110.0
                                                                   0.04
                                                                         0.00000000
## 54 VIX230419C00120000
                             REGULAR
                                           USD 2023-04-19
                                                           120.0
                                                                  0.02
                                                                         0.00000000
## 55 VIX230419C00130000
                             REGULAR
                                           USD 2023-04-19
                                                           130.0
                                                                  0.02
                                                                         0.00000000
## 56 VIX230419C00140000
                             REGULAR
                                           USD 2023-04-19
                                                            140.0
                                                                  0.04
                                                                         0.0000000
## 57 VIX230419C00150000
                             REGULAR
                                           USD 2023-04-19
                                                            150.0
                                                                   0.02
                                                                         0.0000000
## 58 VIX230419C00160000
                             REGULAR
                                           USD 2023-04-19
                                                            160.0
                                                                  0.01
                                                                         0.00000000
  59 VIX230419C00170000
                             REGULAR
                                           USD 2023-04-19
                                                            170.0
                                                                  0.01
                                                                         0.00000000
##
   60
     VIX230419C00180000
                             REGULAR
                                           USD 2023-04-19
                                                            180.0
                                                                   0.01
                                                                         0.00000000
##
          ChgPct Bid Ask
                                      OI
                                                                    ΙV
                                                                         ITM
                             Vol
                                               LastTradeTime
##
       -5.328791 8.05 8.35
                              27
                                    3029 2023-04-14 14:16:43 6.687502
                                                                        TRUE
                              20
## 2
        0.000000 7.55 7.85
                                      21 2023-04-04 15:48:06 6.253908
                                                                        TRUE
## 3
       -8.024697 7.05 7.35
                                4
                                     464 2023-04-14 14:02:29 5.843753
                                                                        TRUE
## 4
        0.000000 6.55 6.85
                              10
                                     210 2023-04-04 15:48:08 5.449222
                                                                        TRUE
## 5
        0.000000 6.05 6.35
                                     595 2023-04-13 13:11:41 5.070316
                                                                        TRUE
                                1
## 6
        0.000000 5.55 5.85
                                     185 2023-03-30 13:43:31 4.703129
                                                                        TRUE
                              150
##
      -20.719420 5.05 5.35
                                3
                                     273 2023-04-14 09:45:41 4.347661
                                                                        TRUE
## 8
        0.000000 4.55 4.85
                                1
                                      28 2023-04-11 11:49:59 4.000005
                                                                        TRUE
      -10.091739 4.05 4.35
                                7
## 9
                                     769 2023-04-14 12:58:26 3.660157
                                                                        TRUE
                                      12 2023-04-12 09:39:06 3.328127
## 10
        0.000000 3.55 3.85
                                6
                                                                        TRUE
                                    2348 2023-04-14 14:11:24 3.039065
## 11 -11.688307 3.10 3.35
                             127
                                                                        TRUE
## 12 -20.138893 2.10 2.33
                              134
                                    1581 2023-04-14 15:58:45 2.359379
                                                                        TRUE
## 13 -27.027025 1.18 1.37
                              485
                                    1208 2023-04-14 16:14:59 1.746095
## 14 -36.792450 0.58 0.71 12686
                                   15439 2023-04-14 16:14:07 1.429690 FALSE
## 15 -41.666668 0.27 0.38
                            5194
                                   23590 2023-04-14 16:14:18 1.343753 FALSE
                            8074
                                  78224 2023-04-14 16:11:09 1.394534 FALSE
## 16 -41.666670 0.14 0.24
## 17 -37.499996 0.08 0.16 16430 148988 2023-04-14 16:00:54 1.468753 FALSE
## 18 -41.176470 0.05 0.12 31154
                                  81842 2023-04-14 16:00:46 1.570315 FALSE
  19 -18.181814 0.03 0.09 17642 104516 2023-04-14 15:49:14 1.656252 FALSE
  20 -44.444447 0.02 0.08 49165 139485 2023-04-14 16:00:58 1.781251 FALSE
  21 -33.33336 0.01 0.06 26395 220718 2023-04-14 16:06:27 1.843751 FALSE
      -28.571426 0.00 0.06
                            4253
                                  91049 2023-04-14 16:09:13 1.937500 FALSE
##
##
                                  70093 2023-04-14 16:01:54 2.031255 FALSE
  23
        0.000000 0.00 0.05
                              67
## 24
        0.000000 0.01 0.05
                            9972
                                  55123 2023-04-14 15:39:49 2.218754 FALSE
## 25
        0.000000 0.00 0.04
                              27
                                  59881 2023-04-14 16:04:10 2.218754 FALSE
        0.000000 0.01 0.04 13590 271880 2023-04-14 16:04:15 2.406254 FALSE
## 26
## 27 100.000000 0.00 0.03
                                2
                                  41301 2023-04-14 15:19:00 2.375004 FALSE
     -50.000000 0.00 0.03
                            2513
                                  35771 2023-04-14 15:38:40 2.468754 FALSE
     -50.000000 0.00 0.03
                            2952
                                  39367 2023-04-14 15:31:32 2.531254 FALSE
  30 -50.000000 0.00 0.03
                              273
                                   31016 2023-04-14 09:56:24 2.562504 FALSE
##
  31 100.000000 0.00 0.03
                             800
                                  30123 2023-04-14 15:37:10 2.687503 FALSE
  32
        0.000000 0.00 0.03
                              130 166294 2023-04-14 16:14:51 2.750003 FALSE
## 33 100.000000 0.00 0.03
                                   30245 2023-04-14 15:19:27 2.875003 FALSE
                            1400
##
  34
        0.000000 0.00 0.02
                            4000
                                   42075 2023-04-13 15:23:40 2.812503 FALSE
                             1002
##
  35
        0.000000 0.00 0.02
                                  11313 2023-04-14 15:45:50 2.875003 FALSE
##
  36
        0.000000 0.00 0.02
                                4
                                  12323 2023-04-12 13:41:08 2.875003 FALSE
##
  37
        0.000000 0.00 0.02
                              50
                                  38578 2023-04-13 11:01:22 3.000002 FALSE
                              92 125507 2023-04-14 15:42:27 3.062502 FALSE
##
  38
        0.000000 0.00 0.02
## 39
        0.000000 0.00 0.03
                              30
                                  17005 2023-04-14 15:18:07 3.375002 FALSE
## 40
        0.000000 0.00 0.03
                               3
                                  61013 2023-04-14 15:18:12 3.562501 FALSE
## 41 -50.000000 0.00 0.03
                              80
                                  25090 2023-04-14 15:18:48 3.750001 FALSE
```

```
## 42 100.000000 0.00 0.03
                                   85041 2023-04-14 11:45:03 3.875000 FALSE
##
  43
        0.000000 0.00 0.03
                                   36257 2023-04-14 10:41:54 4.187505 FALSE
                              100
        0.000000 0.00 0.02
                              200 100799 2023-04-14 13:41:51 4.250005 FALSE
##
   44
##
  45
        0.000000 0.00 0.02
                              150
                                   69489 2023-04-14 13:42:39 4.500004 FALSE
##
   46
        0.000000 0.00 0.02
                              100
                                   91297 2023-04-14 13:42:57 4.687504 FALSE
        0.000000 0.00 0.02
                                   76048 2023-04-14 13:43:22 4.875004 FALSE
##
   47
                              100
                                   33334 2023-04-14 13:43:46 5.062504 FALSE
  48
        0.000000 0.00 0.02
## 49
        0.000000 0.00 0.02
                                   26166 2023-04-05 15:58:07 5.250003 FALSE
##
   50
        0.000000 0.00 0.02
                                3
                                   12932 2023-04-10 15:31:31 5.375003 FALSE
##
  51
        0.000000 0.00 0.02
                               56
                                    4028 2023-03-28 15:25:32 5.500003 FALSE
   52
        0.000000 0.00 0.02
                                   76474 2023-04-10 09:39:21 5.687503 FALSE
                                1
   53
        0.000000 0.00 0.02
                                2
                                    2026 2023-03-21 09:39:29 5.937503 FALSE
##
##
   54
        0.000000 0.00 0.02
                               10
                                    3527 2023-03-31 15:47:57 6.125002 FALSE
  55
        0.000000 0.00 0.02
##
                                4
                                    3453 2023-03-22 12:15:04 6.375002 FALSE
##
  56
        0.000000 0.00 0.02
                                6
                                    7179 2023-03-20 10:01:08 6.625002 FALSE
##
  57
        0.000000 0.00 0.02
                               15
                                    1702 2023-03-22 10:20:07 6.750002 FALSE
        0.000000 0.00 0.02
                              240
                                    4457 2023-03-21 16:13:00 6.875001 FALSE
##
   58
##
   59
        0.000000 0.00 0.02
                                4
                                     844 2023-03-23 13:58:15 7.125001 FALSE
##
        0.000000 0.00 0.02
                                   15392 2023-03-30 14:10:59 7.250001 FALSE
   60
                               50
##
##
   $puts
              ContractID ConractSize Currency Expiration Strike
##
                                                                     Last
                                                                                Chg
      VIX230419P00010000
                              REGULAR
                                            USD 2023-04-19
                                                             10.0
                                                                     0.01 0.0000000
##
  1
                                            USD 2023-04-19
  2
      VIX230419P00011000
                              REGULAR
                                                             11.0
                                                                     0.01 0.0000000
##
  3
      VIX230419P00011500
                              REGULAR
                                           USD 2023-04-19
                                                             11.5
                                                                     0.01 0.0000000
      VIX230419P00012000
                              REGULAR
                                            USD 2023-04-19
                                                             12.0
                                                                     0.01 0.0000000
## 5
      VIX230419P00013000
                                            USD 2023-04-19
                                                             13.0
                              REGULAR
                                                                     0.01 0.0000000
  6
      VIX230419P00013500
                              REGULAR
                                            USD 2023-04-19
                                                             13.5
                                                                     0.01 0.0000000
## 7
                                            USD 2023-04-19
                                                             14.0
      VIX230419P00014000
                              REGULAR
                                                                     0.01 0.0000000
## 8
      VIX230419P00014500
                              REGULAR
                                            USD 2023-04-19
                                                             14.5
                                                                     0.01 0.0000000
## 9
      VIX230419P00015000
                              REGULAR
                                            USD 2023-04-19
                                                             15.0
                                                                     0.01 0.0000000
## 10 VIX230419P00016000
                              REGULAR
                                            USD 2023-04-19
                                                             16.0
                                                                     0.01 0.0000000
   11 VIX230419P00017000
                              REGULAR
                                            USD 2023-04-19
                                                             17.0
                                                                     0.07 0.0200000
## 12 VIX230419P00018000
                                            USD 2023-04-19
                                                             18.0
                              REGULAR
                                                                     0.40 0.1100000
   13 VIX230419P00019000
                              REGULAR
                                            USD 2023-04-19
                                                             19.0
                                                                     1.07 0.2500001
                                           USD 2023-04-19
                                                             20.0
  14 VIX230419P00020000
                              REGULAR
                                                                     1.90 0.3199999
## 15 VIX230419P00021000
                              REGULAR
                                            USD 2023-04-19
                                                             21.0
                                                                     2.83 0.3799999
## 16 VIX230419P00022000
                              REGULAR
                                            USD 2023-04-19
                                                             22.0
                                                                     3.75 0.4500000
  17 VIX230419P00023000
                              REGULAR
                                            USD 2023-04-19
                                                             23.0
                                                                     4.66 0.4099998
                                            USD 2023-04-19
                                                             24.0
## 18 VIX230419P00024000
                              REGULAR
                                                                     5.40 0.2300000
  19 VIX230419P00025000
                              REGULAR
                                            USD 2023-04-19
                                                             25.0
                                                                     6.65 0.7000003
## 20 VIX230419P00026000
                                            USD 2023-04-19
                                                             26.0
                                                                     7.80 0.4500003
                              REGULAR
  21 VIX230419P00027000
                              REGULAR
                                            USD 2023-04-19
                                                             27.0
                                                                     8.65 0.3499994
                                                             28.0
  22 VIX230419P00028000
                              REGULAR
                                            USD 2023-04-19
                                                                     9.59 0.6000004
## 23 VIX230419P00029000
                              REGULAR
                                            USD 2023-04-19
                                                             29.0
                                                                    10.67 1.1900005
                                            USD 2023-04-19
                                                             30.0
                                                                    11.62 0.4700003
## 24 VIX230419P00030000
                              REGULAR
  25 VIX230419P00031000
                              REGULAR
                                            USD 2023-04-19
                                                             31.0
                                                                    11.10 0.0000000
  26 VIX230419P00032000
                              REGULAR
                                            USD 2023-04-19
                                                             32.0
                                                                    13.35 1.0799999
  27 VIX230419P00032500
                              REGULAR
                                            USD 2023-04-19
                                                             32.5
                                                                    12.10 0.0000000
  28 VIX230419P00033000
                              REGULAR
                                            USD 2023-04-19
                                                             33.0
                                                                    14.58 2.2299995
                                            USD 2023-04-19
                                                             34.0
                                                                    14.24 0.0000000
  29 VIX230419P00034000
                              REGULAR
## 30 VIX230419P00035000
                              REGULAR
                                            USD 2023-04-19
                                                             35.0
                                                                   16.28 0.7800007
## 31 VIX230419P00036000
                              REGULAR
                                           USD 2023-04-19
                                                             36.0
                                                                   17.12 0.0000000
## 32 VIX230419P00037000
                              REGULAR
                                           USD 2023-04-19
                                                             37.0 16.55 0.0000000
```

```
## 33 VIX230419P00037500
                              REGULAR
                                            USD 2023-04-19
                                                              37.5 15.45 0.0000000
                                                              38.0
## 34 VIX230419P00038000
                              REGULAR
                                            USD 2023-04-19
                                                                    17.96 0.0000000
  35 VIX230419P00039000
                              REGULAR
                                            USD 2023-04-19
                                                              39.0
                                                                    18.32 0.0000000
  36 VIX230419P00040000
                                            USD 2023-04-19
                                                              40.0
                                                                    20.02 0.0000000
                              REGULAR
   37 VIX230419P00042500
                              REGULAR
                                            USD 2023-04-19
                                                              42.5
                                                                    22.37 0.0000000
                                                              45.0
   38 VIX230419P00045000
                              REGULAR
                                            USD 2023-04-19
                                                                    22.70 0.0000000
##
   39 VIX230419P00047500
                              REGULAR
                                            USD 2023-04-19
                                                              47.5
                                                                    27.50 0.0000000
## 40 VIX230419P00050000
                              REGULAR
                                            USD 2023-04-19
                                                              50.0
                                                                    30.65 0.0000000
  41 VIX230419P00055000
                              REGULAR
                                            USD 2023-04-19
                                                              55.0
                                                                    33.15 0.0000000
  42 VIX230419P00060000
                              REGULAR
                                            USD 2023-04-19
                                                              60.0
                                                                    38.75 0.0000000
  43 VIX230419P00065000
                              REGULAR
                                            USD 2023-04-19
                                                              65.0
                                                                    44.20 0.0000000
                                            USD 2023-04-19
                                                              70.0
                                                                    48.75 0.0000000
  44 VIX230419P00070000
                              REGULAR
   45 VIX230419P00075000
                              REGULAR
                                            USD 2023-04-19
                                                              75.0
                                                                    54.20 0.0000000
   46 VIX230419P00080000
                              REGULAR
                                            USD 2023-04-19
                                                              80.0
                                                                    59.30 0.0000000
                              REGULAR
  47 VIX230419P00085000
                                            USD 2023-04-19
                                                              85.0
                                                                    64.15 0.0000000
## 48 VIX230419P00090000
                              REGULAR
                                            USD 2023-04-19
                                                              90.0
                                                                    64.95 0.0000000
                                            USD 2023-04-19
  49 VIX230419P00095000
                              REGULAR
                                                              95.0
                                                                    72.95 0.0000000
   50 VIX230419P00100000
                              REGULAR
                                            USD 2023-04-19
                                                             100.0
                                                                    80.48 0.0000000
  51 VIX230419P00110000
                                                             110.0
                                                                    83.27 0.0000000
                              REGULAR
                                            USD 2023-04-19
  52 VIX230419P00120000
                              REGULAR
                                            USD 2023-04-19
                                                             120.0
                                                                    98.05 0.0000000
##
  53 VIX230419P00130000
                              REGULAR
                                            USD 2023-04-19
                                                             130.0 103.00 0.0000000
   54 VIX230419P00140000
                              REGULAR
                                            USD 2023-04-19
                                                             140.0 112.65 0.0000000
## 55 VIX230419P00150000
                              REGULAR
                                            USD 2023-04-19
                                                             150.0 122.70 0.0000000
##
   56 VIX230419P00180000
                              REGULAR
                                            USD 2023-04-19
                                                             180.0 159.90 0.0000000
##
         ChgPct
                   Bid
                           Ask
                                 Vol
                                          ΩT
                                                   LastTradeTime
                                                                          TV
                                                                               ITM
##
  1
       0.000000
                  0.00
                          0.00
                                   3
                                          14 2023-04-10 15:23:06 0.5000050 FALSE
   2
       0.000000
                  0.00
                          0.02
                                             2023-02-21 10:15:01 1.8125009 FALSE
##
                                  ΝA
##
   3
       0.000000
                  0.00
                          0.00
                                   1
                                             2023-04-13 09:35:12 0.5000050 FALSE
                  0.00
                          0.02
                                          10 2023-02-21 10:15:01 1.5000025 FALSE
##
  4
       0.000000
                                   4
## 5
       0.00000
                  0.00
                          0.00
                                   4
                                          29 2023-03-27 10:30:40 0.5000050 FALSE
## 6
       0.000000
                  0.00
                          0.00
                                   1
                                             2023-04-06 08:52:43 0.5000050 FALSE
##
  7
       0.00000
                  0.00
                          0.00
                                   1
                                         193 2023-04-10 09:42:09 0.5000050 FALSE
## 8
       0.00000
                   0.00
                          0.00
                                   2
                                          62 2023-04-13 11:55:30 0.5000050 FALSE
##
  9
       0.00000
                  0.00
                          0.02
                                   5
                                       26195 2023-04-12 13:34:10 0.6250038 FALSE
       0.000000
                                       25272 2023-04-14 15:27:59 0.5156298 FALSE
##
   10
                  0.00
                          0.05
                                  83
                  0.03
                          0.10 12944 126785 2023-04-14 16:14:59 0.1855550 FALSE
##
  11 39.999996
## 12 37.931040
                   0.37
                          0.49 54270 161814 2023-04-14 16:14:59 0.0000100
                                                                              TRUE
## 13 30.487812
                   1.05
                          1.19 35823 143573 2023-04-14 16:14:59 0.0000100
                                                                              TRUE
  14 20.253159
                          2.06 14228 129837 2023-04-14 16:07:27 0.0000100
                                                                              TRUE
                   1.91
                                4175 177211 2023-04-14 16:01:12 0.0000100
                                                                              TRUE
## 15 15.510199
                  2.79
                          3.00
                                                                              TRUE
  16 13.636366
                  3.75
                          4.00
                                 125
                                       72923 2023-04-14 15:43:34 0.0000100
       9.647055
                          5.00
                                2052
                                      93901 2023-04-14 15:33:17 0.0000100
                                                                             TRUE
##
  17
                  4.75
##
   18
       4.448743
                  5.70
                          6.00
                                   6
                                      47481 2023-04-14 15:16:54 0.0000100
                                                                              TRUE
##
   19 11.764711
                          6.95
                                 126
                                       61116 2023-04-14 15:12:58 0.0000100
                                                                              TRUE
                  6.70
                                                                              TRUE
##
  20
       6.122453
                  7.70
                          7.95
                                  69
                                       48204 2023-04-14 16:13:07 0.0000100
       4.216861
                  8.70
                          8.95
                                1535
                                       19441 2023-04-14 15:12:27 0.0000100
                                                                              TRUE
## 21
##
   22
       6.674087
                  9.65
                          9.95
                                  37
                                       17702 2023-04-14 15:07:13 0.0000100
                                                                              TRUE
                                                                              TRUE
##
   23 12.552749
                  10.65
                         10.95
                                  33
                                        9538 2023-04-14 14:58:26 0.0000100
##
   24
       4.215249
                  11.65
                         11.95
                                  76
                                        7631 2023-04-14 15:12:27 0.0000100
                                                                              TRUE
##
   25
       0.00000
                  12.65
                         12.95
                                   1
                                         975 2023-04-12 11:05:04 0.0000100
                                                                              TRUE
                                                                             TRUE
##
   26
       8.801955
                  13.65
                         13.95
                                  31
                                        1451 2023-04-14 11:27:55 0.0000100
##
  27
       0.000000
                  14.15
                         14.45
                                   5
                                         385 2023-04-05 14:41:34 0.0000100
                                                                             TRUE
## 28 18.056675
                  14.65
                         14.95
                                   2
                                         119 2023-04-14 15:06:07 0.0000100
                                                                              TRUE
## 29
       0.000000
                 15.65
                         15.95
                                  20
                                         292 2023-04-10 13:54:06 0.0000100
                                                                             TRUE
```

```
5.032263
                 16.65
                         16.95
                                        949 2023-04-13 09:55:25 0.0000100
                                                                             TRUE
                                         52 2023-04-13 15:38:10 0.0000100
## 31
       0.000000
                 17.65
                         17.95
                                   1
                                                                             TRUE
       0.000000
                 18.65
                         18.95
                                        137 2023-04-04 16:01:32 0.0000100
                                                                             TRUE
                                                                             TRUE
                                        229 2023-01-17 09:35:54 0.0000100
##
  33
       0.000000
                 16.40
                         16.55
                                   4
##
   34
       0.000000
                 19.65
                         19.95
                                   4
                                        417 2023-04-12 15:51:29 0.0000100
                                                                             TRUE
                                        547 2023-04-03 09:30:24 0.0000100
  35
       0.000000
                 20.65
                         20.95
                                   4
                                                                             TRUE
##
##
  36
       0.000000
                 21.65
                         21.95
                                   2
                                        146 2023-04-12 16:00:39 0.0000100
                                                                             TRUE
## 37
       0.000000
                 24.15
                         24.45
                                   5
                                        128 2023-04-10 09:42:47 0.0000100
                                                                             TRUE
## 38
       0.000000
                 26.65
                         26.90
                                   3
                                         36 2023-03-23 09:43:53 0.0000100
                                                                             TRUE
## 39
       0.000000
                 29.15
                         29.40
                                  55
                                         55 2023-04-10 15:45:08 0.0000100
                                                                             TRUE
## 40
       0.000000
                 31.65
                         31.90
                                   6
                                        228 2023-04-12 09:31:10 0.0000100
                                                                             TRUE
                                                                             TRUE
## 41
       0.000000
                 36.65
                         36.90
                                   6
                                         26 2023-03-28 15:43:35 0.0000100
##
       0.000000
                 41.65
                         41.90
                                   3
                                         43 2023-03-29 03:57:32 0.0000100
                                                                             TRUE
  42
                 46.65
##
  43
       0.000000
                         46.90
                                   5
                                         30 2023-03-31 11:56:53 0.0000100
                                                                             TRUE
                                        105 2023-03-29 14:09:11 0.0000100
                                                                             TRUE
## 44
       0.000000
                 51.65
                         51.90
                                  10
## 45
       0.000000
                 56.65
                         56.90
                                  10
                                        130 2023-03-31 10:19:01 0.0000100
                                                                             TRUE
## 46
                 61.65
                                   5
                                           6 2023-04-03 13:02:24 0.0000100
                                                                             TRUE
       0.000000
                         61.90
                 66.65
                         66.90
       0.000000
                                   3
                                           3 2023-03-31 09:47:55 0.0000100
                                                                             TRUE
## 48
       0.000000
                 71.65
                         71.90
                                           3 2023-03-20 23:45:40 0.0000100
                                                                             TRUE
                                  NA
## 49
       0.000000
                 76.65
                         76.90
                                   3
                                          5 2023-03-28 15:43:44 0.0000100
                                                                             TRUE
## 50
       0.000000
                 81.65
                         81.90
                                   3
                                         29 2023-04-11 15:16:49 0.0000100
                                                                             TRUE
                                          1 2022-12-29 10:43:55 0.0000100
## 51
       0.000000
                 87.85
                         88.15
                                   1
                                                                             TRUE
       0.000000
                 95.70
                         96.05
                                           1 2023-02-14 15:37:36 0.0000100
                                                                             TRUE
## 52
                                  NA
## 53
       0.000000 107.65 107.90
                                   1
                                           1 2022-12-29 10:57:54 0.0000100
                                                                             TRUE
## 54
       0.000000 117.50 117.80
                                   1
                                           2 2022-12-30 08:19:20 0.0000100
                                                                             TRUE
## 55
       0.000000 127.40 127.70
                                   1
                                        101 2022-12-29 11:09:20 0.0000100
                                                                             TRUE
## 56
       0.000000 161.60 161.85
                                        182 2023-04-10 11:08:36 0.0000100
                                  10
                                                                             TRUE
#2. Download the current price (last quote price) for ^VIX
VIX_Last<- getQuote("^VIX")$Last</pre>
VIX_Last
## [1] 17.07
#3. For calls and puts of VIX.options at each expiration calculate the average of Bid and Ask. Create a
VIX.options.all<- getOptionChain("^VIX", NULL)</pre>
for (i in 1:length(VIX.options.all)) {
  VIX.options.all[[i]]$calls$Price<-0.5*(VIX.options.all[[i]]$calls$Bid + VIX.options.all[[i]]$calls$As
  VIX.options.all[[i]]$puts$Price<-0.5*(VIX.options.all[[i]]$puts$Bid + VIX.options.all[[i]]$puts$Ask)
}
print(head(VIX.options.all))
## $Apr.19.2023
   $Apr.19.2023$calls
##
              ContractID ConractSize Currency Expiration Strike
                                                                                 Chg
                                                                   Last
      VIX230419C00010000
                              REGULAR
                                            USD 2023-04-19
                                                                    8.35
                                                                         -0.46999930
##
  1
                                                             10.0
                              REGULAR
                                           USD 2023-04-19
                                                             10.5 10.39
## 2
      VIX230419C00010500
                                                                          0.00000000
      VIX230419C00011000
                                            USD 2023-04-19
                              REGULAR
                                                             11.0
                                                                    7.45 -0.65000060
## 4
      VIX230419C00011500
                              REGULAR
                                           USD 2023-04-19
                                                             11.5
                                                                    9.39
                                                                          0.0000000
      VIX230419C00012000
                                                                    7.05
                              REGULAR
                                            USD 2023-04-19
                                                             12.0
                                                                          0.0000000
## 6
      VIX230419C00012500
                                           USD 2023-04-19
                                                             12.5
                                                                    9.05
                              REGULAR
                                                                          0.00000000
  7
      VIX230419C00013000
                              REGULAR
                                            USD 2023-04-19
                                                             13.0
                                                                   5.51 -1.43999960
     VIX230419C00013500
                                           USD 2023-04-19
## 8
                              REGULAR
                                                             13.5 5.95
                                                                          0.00000000
```

40

```
## 9
      VIX230419C00014000
                              REGULAR
                                            USD 2023-04-19
                                                              14.0
                                                                    4.90 -0.54999970
                                            USD 2023-04-19
                                                              14.5
## 10 VIX230419C00014500
                              REGULAR
                                                                    4.85
                                                                         0.00000000
  11 VIX230419C00015000
                              REGULAR
                                            USD 2023-04-19
                                                              15.0
                                                                    3.40 -0.44999980
  12 VIX230419C00016000
                                            USD 2023-04-19
                                                              16.0
                                                                    2.30 -0.58000016
                              REGULAR
   13 VIX230419C00017000
                              REGULAR
                                            USD 2023-04-19
                                                              17.0
                                                                    1.35 -0.50000000
                                                              18.0
##
  14 VIX230419C00018000
                              REGULAR
                                            USD 2023-04-19
                                                                    0.67 -0.38999993
  15 VIX230419C00019000
                              REGULAR
                                            USD 2023-04-19
                                                              19.0
                                                                    0.35 -0.25000003
## 16 VIX230419C00020000
                              REGULAR
                                            USD 2023-04-19
                                                              20.0
                                                                    0.21 -0.15000002
   17 VIX230419C00021000
                              REGULAR
                                            USD 2023-04-19
                                                              21.0
                                                                    0.15 -0.08999999
   18 VIX230419C00022000
                              REGULAR
                                            USD 2023-04-19
                                                              22.0
                                                                    0.10 -0.07000000
   19 VIX230419C00023000
                              REGULAR
                                            USD 2023-04-19
                                                              23.0
                                                                    0.09 -0.02000000
                                            USD 2023-04-19
                                                                    0.05 -0.04000000
##
   20 VIX230419C00024000
                              REGULAR
                                                              24.0
   21 VIX230419C00025000
                              REGULAR
                                            USD 2023-04-19
                                                              25.0
                                                                    0.06 -0.03000000
  22 VIX230419C00026000
##
                              REGULAR
                                            USD 2023-04-19
                                                              26.0
                                                                    0.05 -0.02000000
  23 VIX230419C00027000
                                            USD 2023-04-19
                                                              27.0
                                                                    0.03
                                                                          0.0000000
##
                              REGULAR
   24
     VIX230419C00028000
                              REGULAR
                                            USD 2023-04-19
                                                              28.0
                                                                    0.04
                                                                          0.0000000
                                            USD 2023-04-19
##
   25 VIX230419C00029000
                              REGULAR
                                                              29.0
                                                                    0.03
                                                                          0.00000000
   26 VIX230419C00030000
                              REGULAR
                                            USD 2023-04-19
                                                              30.0
                                                                    0.03
                                                                          0.00000000
  27 VIX230419C00031000
                                            USD 2023-04-19
##
                              REGULAR
                                                              31.0
                                                                    0.02
                                                                          0.01000000
                                                                    0.01 -0.01000000
   28 VIX230419C00032000
                              REGULAR
                                            USD 2023-04-19
                                                              32.0
##
  29 VIX230419C00032500
                              REGULAR
                                            USD 2023-04-19
                                                              32 5
                                                                    0.01 -0.01000000
                                            USD 2023-04-19
                                                                    0.01 -0.01000000
   30 VIX230419C00033000
                              REGULAR
                                                                    0.02
  31 VIX230419C00034000
                              REGULAR
                                            USD 2023-04-19
                                                              34.0
                                                                          0.01000000
##
                                                                    0.02
   32 VIX230419C00035000
                              REGULAR
                                            USD 2023-04-19
                                                              35.0
                                                                          0.00000000
##
  33 VIX230419C00036000
                              REGULAR
                                            USD 2023-04-19
                                                              36.0
                                                                    0.02
                                                                          0.01000000
   34 VIX230419C00037000
                              REGULAR
                                            USD 2023-04-19
                                                              37.0
                                                                    0.02
                                                                          0.00000000
   35 VIX230419C00037500
                                            USD 2023-04-19
                                                              37.5
                                                                    0.02
##
                              REGULAR
                                                                          0.00000000
   36 VIX230419C00038000
                              REGULAR
                                            USD 2023-04-19
                                                              38.0
                                                                    0.01
                                                                          0.00000000
                                            USD 2023-04-19
                                                                    0.02
##
   37 VIX230419C00039000
                              REGULAR
                                                              39.0
                                                                          0.00000000
   38 VIX230419C00040000
                              REGULAR
                                            USD 2023-04-19
                                                              40.0
                                                                    0.01
                                                                          0.00000000
##
  39 VIX230419C00042500
                              REGULAR
                                            USD 2023-04-19
                                                              42.5
                                                                    0.01
                                                                          0.00000000
   40 VIX230419C00045000
                              REGULAR
                                            USD 2023-04-19
                                                              45.0
                                                                    0.01
                                                                          0.00000000
   41 VIX230419C00047500
                              REGULAR
                                            USD 2023-04-19
                                                              47.5
                                                                    0.01 -0.01000000
                                            USD 2023-04-19
##
  42 VIX230419C00050000
                              REGULAR
                                                              50.0
                                                                    0.02
                                                                          0.01000000
   43 VIX230419C00055000
                              REGULAR
                                            USD 2023-04-19
                                                              55.0
                                                                    0.01
                                                                          0.0000000
                                            USD 2023-04-19
##
   44 VIX230419C00060000
                              REGULAR
                                                              60.0
                                                                    0.01
                                                                          0.00000000
  45 VIX230419C00065000
                              REGULAR
                                            USD 2023-04-19
                                                              65.0
                                                                    0.01
                                                                          0.00000000
  46 VIX230419C00070000
                                            USD 2023-04-19
                                                              70.0
                                                                    0.01
                                                                          0.0000000
##
                              REGULAR
  47 VIX230419C00075000
                                            USD 2023-04-19
                                                                    0.01
                              REGULAR
                                                              75.0
                                                                          0.0000000
##
  48 VIX230419C00080000
                                            USD 2023-04-19
                                                              80.0
                                                                    0.01
                                                                          0.00000000
                              REGULAR
   49 VIX230419C00085000
                              REGULAR
                                            USD 2023-04-19
                                                              85.0
                                                                    0.01
                                                                          0.00000000
  50 VIX230419C00090000
                                            USD 2023-04-19
                                                              90.0
                                                                    0.01
##
                              REGULAR
                                                                          0.00000000
   51 VIX230419C00095000
                              REGULAR
                                            USD 2023-04-19
                                                              95.0
                                                                    0.02
                                                                          0.00000000
   52 VIX230419C00100000
                                            USD 2023-04-19
                                                             100.0
                                                                    0.01
##
                              REGULAR
                                                                          0.00000000
   53 VIX230419C00110000
                              REGULAR
                                            USD 2023-04-19
                                                             110.0
                                                                    0.04
                                                                          0.0000000
                                            USD 2023-04-19
                                                             120.0
                                                                    0.02
## 54 VIX230419C00120000
                              REGULAR
                                                                          0.00000000
   55 VIX230419C00130000
                              REGULAR
                                            USD 2023-04-19
                                                             130.0
                                                                    0.02
                                                                          0.0000000
   56 VIX230419C00140000
                              REGULAR
                                            USD 2023-04-19
                                                             140.0
                                                                    0.04
                                                                          0.00000000
                                            USD 2023-04-19
                                                                    0.02
   57 VIX230419C00150000
                              REGULAR
                                                             150.0
                                                                          0.0000000
   58 VIX230419C00160000
                              REGULAR
                                            USD
                                                2023-04-19
                                                             160.0
                                                                    0.01
                                                                          0.0000000
##
##
   59 VIX230419C00170000
                              REGULAR
                                            USD 2023-04-19
                                                             170.0
                                                                    0.01
                                                                          0.0000000
##
   60 VIX230419C00180000
                              REGULAR
                                            USD 2023-04-19
                                                             180.0
                                                                    0.01
                                                                          0.00000000
##
                              Vol
                                      ΩT
                                                                     TV
                                                                          ITM Price
          ChgPct Bid Ask
                                                LastTradeTime
## 1
       -5.328791 8.05 8.35
                               27
                                    3029 2023-04-14 14:16:43 6.687502
                                                                         TRUE 8.200
```

```
## 2
       0.000000 7.55 7.85
                              20
                                     21 2023-04-04 15:48:06 6.253908
                                                                       TRUE 7.700
## 3
       -8.024697 7.05 7.35
                                    464 2023-04-14 14:02:29 5.843753
                               4
                                                                       TRUE 7.200
## 4
       0.000000 6.55 6.85
                              10
                                    210 2023-04-04 15:48:08 5.449222
                                                                       TRUE 6.700
## 5
        0.000000 6.05 6.35
                                    595 2023-04-13 13:11:41 5.070316
                                                                       TRUE 6.200
                               1
## 6
       0.000000 5.55 5.85
                             150
                                    185 2023-03-30 13:43:31 4.703129
                                                                       TRUE 5.700
                                    273 2023-04-14 09:45:41 4.347661
## 7
     -20.719420 5.05 5.35
                               3
                                                                       TRUE 5.200
        0.000000 4.55 4.85
                               1
                                     28 2023-04-11 11:49:59 4.000005
                                                                       TRUE 4.700
                               7
## 9
     -10.091739 4.05 4.35
                                    769 2023-04-14 12:58:26 3.660157
                                                                       TRUE 4.200
## 10
        0.000000 3.55 3.85
                               6
                                     12 2023-04-12 09:39:06 3.328127
                                                                       TRUE 3.700
## 11 -11.688307 3.10 3.35
                             127
                                   2348 2023-04-14 14:11:24 3.039065
                                                                       TRUE 3.225
## 12 -20.138893 2.10 2.33
                             134
                                   1581 2023-04-14 15:58:45 2.359379
                                                                       TRUE 2.215
## 13 -27.027025 1.18 1.37
                             485
                                   1208 2023-04-14 16:14:59 1.746095
                                                                       TRUE 1.275
## 14 -36.792450 0.58 0.71 12686
                                  15439 2023-04-14 16:14:07 1.429690 FALSE 0.645
## 15 -41.666668 0.27 0.38 5194
                                 23590 2023-04-14 16:14:18 1.343753 FALSE 0.325
## 16 -41.666670 0.14 0.24 8074 78224 2023-04-14 16:11:09 1.394534 FALSE 0.190
## 17 -37.499996 0.08 0.16 16430 148988 2023-04-14 16:00:54 1.468753 FALSE 0.120
## 18 -41.176470 0.05 0.12 31154 81842 2023-04-14 16:00:46 1.570315 FALSE 0.085
## 19 -18.181814 0.03 0.09 17642 104516 2023-04-14 15:49:14 1.656252 FALSE 0.060
## 20 -44.444447 0.02 0.08 49165 139485 2023-04-14 16:00:58 1.781251 FALSE 0.050
## 21 -33.333336 0.01 0.06 26395 220718 2023-04-14 16:06:27 1.843751 FALSE 0.035
## 22 -28.571426 0.00 0.06 4253 91049 2023-04-14 16:09:13 1.937500 FALSE 0.030
        0.000000 0.00 0.05
                                 70093 2023-04-14 16:01:54 2.031255 FALSE 0.025
                              67
        0.000000 0.01 0.05
                            9972
                                  55123 2023-04-14 15:39:49 2.218754 FALSE 0.030
## 24
                                  59881 2023-04-14 16:04:10 2.218754 FALSE 0.020
## 25
        0.000000 0.00 0.04
                              27
## 26
        0.000000 0.01 0.04 13590 271880 2023-04-14 16:04:15 2.406254 FALSE 0.025
## 27 100.000000 0.00 0.03
                               2
                                 41301 2023-04-14 15:19:00 2.375004 FALSE 0.015
## 28 -50.000000 0.00 0.03
                            2513
                                  35771 2023-04-14 15:38:40 2.468754 FALSE 0.015
                                  39367 2023-04-14 15:31:32 2.531254 FALSE 0.015
## 29 -50.000000 0.00 0.03
                            2952
## 30 -50.000000 0.00 0.03
                             273
                                  31016 2023-04-14 09:56:24 2.562504 FALSE 0.015
## 31 100.000000 0.00 0.03
                                  30123 2023-04-14 15:37:10 2.687503 FALSE 0.015
## 32
        0.000000 0.00 0.03
                             130 166294 2023-04-14 16:14:51 2.750003 FALSE 0.015
##
  33 100.000000 0.00 0.03
                            1400
                                  30245 2023-04-14 15:19:27 2.875003 FALSE 0.015
##
  34
        0.000000 0.00 0.02
                            4000
                                  42075 2023-04-13 15:23:40 2.812503 FALSE 0.010
        0.000000 0.00 0.02
                            1002
                                  11313 2023-04-14 15:45:50 2.875003 FALSE 0.010
##
  35
  36
        0.000000 0.00 0.02
                                  12323 2023-04-12 13:41:08 2.875003 FALSE 0.010
##
                               4
        0.000000 0.00 0.02
                              50 38578 2023-04-13 11:01:22 3.000002 FALSE 0.010
## 37
## 38
        0.000000 0.00 0.02
                              92 125507 2023-04-14 15:42:27 3.062502 FALSE 0.010
## 39
        0.000000 0.00 0.03
                              30 17005 2023-04-14 15:18:07 3.375002 FALSE 0.015
        0.000000 0.00 0.03
                               3
                                  61013 2023-04-14 15:18:12 3.562501 FALSE 0.015
## 40
## 41 -50.000000 0.00 0.03
                              80
                                  25090 2023-04-14 15:18:48 3.750001 FALSE 0.015
## 42 100.000000 0.00 0.03
                                 85041 2023-04-14 11:45:03 3.875000 FALSE 0.015
## 43
        0.000000 0.00 0.03
                                  36257 2023-04-14 10:41:54 4.187505 FALSE 0.015
                             100
## 44
        0.000000 0.00 0.02
                             200 100799 2023-04-14 13:41:51 4.250005 FALSE 0.010
## 45
        0.000000 0.00 0.02
                                 69489 2023-04-14 13:42:39 4.500004 FALSE 0.010
                             150
                                  91297 2023-04-14 13:42:57 4.687504 FALSE 0.010
## 46
        0.000000 0.00 0.02
                                  76048 2023-04-14 13:43:22 4.875004 FALSE 0.010
        0.000000 0.00 0.02
## 47
                             100
## 48
        0.000000 0.00 0.02
                             200
                                  33334 2023-04-14 13:43:46 5.062504 FALSE 0.010
        0.000000 0.00 0.02
                                  26166 2023-04-05 15:58:07 5.250003 FALSE 0.010
## 49
## 50
        0.000000 0.00 0.02
                               3
                                  12932 2023-04-10 15:31:31 5.375003 FALSE 0.010
## 51
        0.000000 0.00 0.02
                              56
                                   4028 2023-03-28 15:25:32 5.500003 FALSE 0.010
## 52
        0.000000 0.00 0.02
                                  76474 2023-04-10 09:39:21 5.687503 FALSE 0.010
                               1
## 53
        0.000000 0.00 0.02
                               2
                                   2026 2023-03-21 09:39:29 5.937503 FALSE 0.010
## 54
        0.000000 0.00 0.02
                              10
                                   3527 2023-03-31 15:47:57 6.125002 FALSE 0.010
## 55
        0.000000 0.00 0.02
                               4
                                   3453 2023-03-22 12:15:04 6.375002 FALSE 0.010
```

```
## 56
        0.000000 0.00 0.02
                                6
                                    7179 2023-03-20 10:01:08 6.625002 FALSE 0.010
##
        0.000000 0.00 0.02
                               15
                                    1702 2023-03-22 10:20:07 6.750002 FALSE 0.010
   57
                                    4457 2023-03-21 16:13:00 6.875001 FALSE 0.010
##
   58
        0.000000 0.00 0.02
                              240
##
   59
        0.000000 0.00 0.02
                                4
                                     844 2023-03-23 13:58:15 7.125001 FALSE 0.010
##
        0.000000 0.00 0.02
                               50
                                   15392 2023-03-30 14:10:59 7.250001 FALSE 0.010
##
   $Apr.19.2023$puts
##
##
              ContractID ConractSize Currency Expiration Strike
                                                                     Last
                                                                                 Chg
##
      VIX230419P00010000
                              REGULAR
                                            USD 2023-04-19
                                                              10.0
                                                                     0.01 0.0000000
  1
##
   2
      VIX230419P00011000
                              REGULAR
                                            USD 2023-04-19
                                                              11.0
                                                                     0.01 0.0000000
   3
      VIX230419P00011500
                              REGULAR
                                            USD 2023-04-19
                                                              11.5
                                                                     0.01 0.0000000
                                            USD 2023-04-19
                                                              12.0
##
   4
      VIX230419P00012000
                              REGULAR
                                                                     0.01 0.0000000
##
   5
      VIX230419P00013000
                              REGULAR
                                            USD 2023-04-19
                                                              13.0
                                                                     0.01 0.0000000
##
  6
      VIX230419P00013500
                              REGULAR
                                            USD 2023-04-19
                                                              13.5
                                                                     0.01 0.0000000
##
  7
                                            USD 2023-04-19
                                                              14.0
      VIX230419P00014000
                              REGULAR
                                                                     0.01 0.0000000
## 8
      VIX230419P00014500
                              REGULAR
                                            USD 2023-04-19
                                                              14.5
                                                                     0.01 0.0000000
                                            USD 2023-04-19
##
  9
      VIX230419P00015000
                              REGULAR
                                                              15.0
                                                                     0.01 0.0000000
   10 VIX230419P00016000
                              REGULAR
                                            USD 2023-04-19
                                                              16.0
                                                                     0.01 0.0000000
  11 VIX230419P00017000
                                            USD 2023-04-19
                                                              17.0
                              REGULAR
                                                                     0.07 0.0200000
   12 VIX230419P00018000
                              REGULAR
                                            USD 2023-04-19
                                                              18.0
                                                                     0.40 0.1100000
  13 VIX230419P00019000
                              REGULAR
                                            USD 2023-04-19
                                                              19.0
                                                                     1.07 0.2500001
  14 VIX230419P00020000
                                            USD 2023-04-19
                                                              20.0
                              REGULAR
                                                                     1.90 0.3199999
                                            USD 2023-04-19
## 15 VIX230419P00021000
                              REGULAR
                                                              21.0
                                                                     2.83 0.3799999
  16 VIX230419P00022000
                              REGULAR
                                            USD 2023-04-19
                                                              22.0
                                                                     3.75 0.4500000
                                                                     4.66 0.4099998
## 17 VIX230419P00023000
                              REGULAR
                                            USD 2023-04-19
                                                              23.0
  18 VIX230419P00024000
                              REGULAR
                                            USD 2023-04-19
                                                              24.0
                                                                     5.40 0.2300000
  19 VIX230419P00025000
                                            USD 2023-04-19
                                                              25.0
                              REGULAR
                                                                     6.65 0.7000003
   20 VIX230419P00026000
                              REGULAR
                                            USD 2023-04-19
                                                              26.0
                                                                     7.80 0.4500003
                                            USD 2023-04-19
                                                              27.0
  21 VIX230419P00027000
                              REGULAR
                                                                     8.65 0.3499994
  22 VIX230419P00028000
                              REGULAR
                                            USD 2023-04-19
                                                              28.0
                                                                     9.59 0.6000004
## 23 VIX230419P00029000
                              REGULAR
                                            USD 2023-04-19
                                                              29.0
                                                                    10.67 1.1900005
   24 VIX230419P00030000
                              REGULAR
                                            USD 2023-04-19
                                                              30.0
                                                                    11.62 0.4700003
   25 VIX230419P00031000
                              REGULAR
                                            USD 2023-04-19
                                                              31.0
                                                                    11.10 0.0000000
                                            USD 2023-04-19
                                                              32.0
  26 VIX230419P00032000
                              REGULAR
                                                                    13.35 1.0799999
      VIX230419P00032500
                              REGULAR
                                            USD 2023-04-19
                                                              32.5
                                                                    12.10 0.0000000
                                            USD 2023-04-19
                                                              33.0
                                                                    14.58 2.2299995
  28 VIX230419P00033000
                              REGULAR
  29 VIX230419P00034000
                              REGULAR
                                            USD 2023-04-19
                                                              34.0
                                                                    14.24 0.0000000
  30 VIX230419P00035000
                              REGULAR
                                            USD 2023-04-19
                                                              35.0
                                                                    16.28 0.7800007
   31 VIX230419P00036000
                                            USD 2023-04-19
                                                                    17.12 0.0000000
                              REGULAR
                                                              36.0
                                            USD 2023-04-19
                                                              37.0
  32 VIX230419P00037000
                                                                    16.55 0.0000000
                              REGULAR
   33 VIX230419P00037500
                              REGULAR
                                            USD 2023-04-19
                                                              37.5
                                                                    15.45 0.0000000
   34 VIX230419P00038000
                                            USD 2023-04-19
                                                              38.0
                                                                    17.96 0.0000000
                              REGULAR
   35 VIX230419P00039000
                              REGULAR
                                            USD 2023-04-19
                                                              39.0
                                                                    18.32 0.0000000
   36 VIX230419P00040000
                                            USD 2023-04-19
                                                              40.0
                                                                    20.02 0.0000000
                              REGULAR
   37 VIX230419P00042500
                              REGULAR
                                            USD 2023-04-19
                                                              42.5
                                                                    22.37 0.0000000
                                            USD 2023-04-19
                                                              45.0
                                                                    22.70 0.0000000
  38 VIX230419P00045000
                              REGULAR
   39 VIX230419P00047500
                              REGULAR
                                            USD 2023-04-19
                                                              47.5
                                                                    27.50 0.0000000
  40 VIX230419P00050000
                              REGULAR
                                            USD 2023-04-19
                                                              50.0
                                                                    30.65 0.0000000
                                            USD 2023-04-19
  41 VIX230419P00055000
                              REGULAR
                                                              55.0
                                                                    33.15 0.0000000
  42 VIX230419P00060000
                              REGULAR
                                            USD 2023-04-19
                                                              60.0
                                                                    38.75 0.0000000
  43 VIX230419P00065000
                              REGULAR
                                            USD 2023-04-19
                                                              65.0
                                                                    44.20 0.0000000
## 44 VIX230419P00070000
                              REGULAR
                                            USD 2023-04-19
                                                              70.0
                                                                    48.75 0.0000000
## 45 VIX230419P00075000
                              REGULAR
                                            USD 2023-04-19
                                                              75.0
                                                                    54.20 0.0000000
## 46 VIX230419P00080000
                              REGULAR
                                            USD 2023-04-19
                                                              80.0
                                                                    59.30 0.0000000
```

```
## 47 VIX230419P00085000
                              REGULAR
                                            USD 2023-04-19
                                                              85.0 64.15 0.0000000
## 48 VIX230419P00090000
                              REGULAR
                                            USD 2023-04-19
                                                              90.0
                                                                    64.95 0.0000000
## 49 VIX230419P00095000
                              REGULAR
                                            USD 2023-04-19
                                                              95.0
                                                                    72.95 0.0000000
## 50 VIX230419P00100000
                                            USD 2023-04-19
                                                             100.0
                                                                     80.48 0.0000000
                              REGULAR
## 51 VIX230419P00110000
                              REGULAR
                                            USD 2023-04-19
                                                             110.0
                                                                     83.27 0.0000000
## 52 VIX230419P00120000
                              REGULAR
                                            USD 2023-04-19
                                                             120.0 98.05 0.0000000
## 53 VIX230419P00130000
                              REGULAR
                                            USD 2023-04-19
                                                             130.0 103.00 0.0000000
## 54 VIX230419P00140000
                              REGULAR
                                            USD 2023-04-19
                                                             140.0 112.65 0.0000000
   55 VIX230419P00150000
                              REGULAR
                                            USD 2023-04-19
                                                             150.0 122.70 0.0000000
##
   56 VIX230419P00180000
                              REGULAR
                                            USD 2023-04-19
                                                             180.0 159.90 0.0000000
##
         ChgPct
                                  Vol
                                          OI
                                                    LastTradeTime
                                                                          IV
                                                                                ITM
                    Bid
                           Ask
       0.00000
##
   1
                   0.00
                          0.00
                                    3
                                             2023-04-10 15:23:06 0.5000050 FALSE
##
   2
       0.000000
                   0.00
                          0.02
                                             2023-02-21 10:15:01 1.8125009 FALSE
                                   NA
##
  3
       0.000000
                   0.00
                          0.00
                                    1
                                           2 2023-04-13 09:35:12 0.5000050 FALSE
                                          10 2023-02-21 10:15:01 1.5000025 FALSE
       0.00000
                          0.02
## 4
                   0.00
                                    4
##
   5
       0.00000
                   0.00
                          0.00
                                    4
                                             2023-03-27 10:30:40 0.5000050 FALSE
                          0.00
                                          22 2023-04-06 08:52:43 0.5000050 FALSE
##
       0.00000
                   0.00
  6
                                    1
       0.000000
                   0.00
                          0.00
                                         193 2023-04-10 09:42:09 0.5000050 FALSE
##
  7
                                    1
## 8
                                          62 2023-04-13 11:55:30 0.5000050 FALSE
       0.000000
                   0.00
                          0.00
                                    2
##
  9
       0.00000
                   0.00
                          0.02
                                    5
                                       26195 2023-04-12 13:34:10 0.6250038 FALSE
## 10
       0.000000
                   0.00
                          0.05
                                   83
                                       25272 2023-04-14 15:27:59 0.5156298 FALSE
## 11 39.999996
                          0.10 12944 126785 2023-04-14 16:14:59 0.1855550 FALSE
                   0.03
## 12 37.931040
                   0.37
                          0.49 54270 161814 2023-04-14 16:14:59 0.0000100
                                                                              TRUE
## 13 30.487812
                          1.19 35823 143573 2023-04-14 16:14:59 0.0000100
                   1.05
                                                                              TRUE
## 14 20.253159
                   1.91
                          2.06 14228 129837 2023-04-14 16:07:27 0.0000100
                                                                              TRUE
  15 15.510199
                   2.79
                          3.00
                                 4175
                                     177211 2023-04-14 16:01:12 0.0000100
                                                                              TRUE
  16 13.636366
                   3.75
                                  125
                                       72923 2023-04-14 15:43:34 0.0000100
                                                                              TRUE
##
                          4.00
##
       9.647055
                   4.75
                          5.00
                                 2052
                                       93901 2023-04-14 15:33:17 0.0000100
                                                                              TRUE
   17
                                    6
                                                                              TRUE
##
   18
       4.448743
                   5.70
                          6.00
                                       47481 2023-04-14 15:16:54 0.0000100
##
  19 11.764711
                   6.70
                          6.95
                                  126
                                       61116 2023-04-14 15:12:58 0.0000100
                                                                              TRUE
##
  20
       6.122453
                   7.70
                          7.95
                                   69
                                       48204 2023-04-14 16:13:07 0.0000100
                                                                              TRUE
##
   21
       4.216861
                   8.70
                          8.95
                                1535
                                       19441 2023-04-14 15:12:27 0.0000100
                                                                              TRUE
##
       6.674087
                   9.65
                          9.95
                                   37
                                       17702 2023-04-14 15:07:13 0.0000100
                                                                              TRUE
                                                                              TRUE
##
   23
      12.552749
                  10.65
                         10.95
                                   33
                                        9538 2023-04-14 14:58:26 0.0000100
       4.215249
                         11.95
                                   76
                                        7631 2023-04-14 15:12:27 0.0000100
                                                                              TRUE
##
   24
                  11.65
##
   25
       0.000000
                  12.65
                         12.95
                                    1
                                         975 2023-04-12 11:05:04 0.0000100
                                                                              TRUE
##
   26
       8.801955
                  13.65
                         13.95
                                   31
                                        1451 2023-04-14 11:27:55 0.0000100
                                                                              TRUE
       0.000000
                         14.45
                                    5
                                         385 2023-04-05 14:41:34 0.0000100
                                                                              TRUE
##
  27
                  14.15
      18.056675
                         14.95
                                    2
                                         119 2023-04-14 15:06:07 0.0000100
                                                                              TRUE
##
   28
                  14.65
                                         292 2023-04-10 13:54:06 0.0000100
##
   29
       0.000000
                  15.65
                         15.95
                                   20
                                                                              TRUE
##
   30
       5.032263
                  16.65
                         16.95
                                   40
                                         949 2023-04-13 09:55:25 0.0000100
                                                                              TRUE
                         17.95
                                          52 2023-04-13 15:38:10 0.0000100
                                                                              TRUE
##
   31
       0.000000
                  17.65
                                    1
##
   32
       0.000000
                  18.65
                         18.95
                                    9
                                         137 2023-04-04 16:01:32 0.0000100
                                                                              TRUE
       0.000000
                         16.55
                                    4
                                         229 2023-01-17 09:35:54 0.0000100
                                                                              TRUE
##
   33
                  16.40
##
   34
       0.000000
                  19.65
                         19.95
                                    4
                                         417 2023-04-12 15:51:29 0.0000100
                                                                              TRUE
                         20.95
                                         547 2023-04-03 09:30:24 0.0000100
                                                                              TRUE
##
   35
       0.000000
                  20.65
                                    4
                                    2
##
   36
       0.000000
                  21.65
                         21.95
                                         146 2023-04-12 16:00:39 0.0000100
                                                                              TRUE
                                                                              TRUE
##
   37
       0.000000
                  24.15
                         24.45
                                    5
                                         128 2023-04-10 09:42:47 0.0000100
                         26.90
##
   38
       0.000000
                  26.65
                                    3
                                          36 2023-03-23 09:43:53 0.0000100
                                                                              TRUE
##
   39
       0.00000
                  29.15
                         29.40
                                   55
                                             2023-04-10 15:45:08 0.0000100
                                                                              TRUE
                                    6
##
   40
       0.000000
                  31.65
                         31.90
                                         228 2023-04-12 09:31:10 0.0000100
                                                                              TRUE
##
       0.000000
                  36.65
                         36.90
                                    6
                                          26 2023-03-28 15:43:35 0.0000100
                                                                              TRUE
       0.000000
                  41.65
                                    3
                                          43 2023-03-29 03:57:32 0.0000100
                                                                              TRUE
## 42
                         41.90
## 43
       0.000000
                  46.65
                         46.90
                                    5
                                          30 2023-03-31 11:56:53 0.0000100
                                                                              TRUE
```

```
0.000000 51.65
                        51.90
                                   10
                                         105 2023-03-29 14:09:11 0.0000100
                                                                              TRUE
## 45
       0.000000
                 56.65
                         56.90
                                   10
                                         130 2023-03-31 10:19:01 0.0000100
                                                                              TRUE
       0.000000
                  61.65
## 46
                         61.90
                                    5
                                           6 2023-04-03 13:02:24 0.0000100
                                                                              TRUE
                                           3 2023-03-31 09:47:55 0.0000100
## 47
       0.000000
                  66.65
                         66.90
                                    3
                                                                              TRUE
##
  48
       0.000000
                  71.65
                         71.90
                                   NA
                                           3 2023-03-20 23:45:40 0.0000100
                                                                              TRUE
       0.000000
                 76.65
                         76.90
                                    3
                                           5 2023-03-28 15:43:44 0.0000100
                                                                              TRUE
##
  49
       0.000000
                         81.90
                                    3
                                          29 2023-04-11 15:16:49 0.0000100
                                                                              TRUE
## 50
                  81.65
                                           1 2022-12-29 10:43:55 0.0000100
## 51
       0.000000
                 87.85
                         88.15
                                    1
                                                                              TRUE
## 52
       0.000000
                 95.70
                         96.05
                                   NA
                                           1 2023-02-14 15:37:36 0.0000100
                                                                              TRUE
                                           1 2022-12-29 10:57:54 0.0000100
## 53
       0.000000 107.65 107.90
                                    1
                                                                              TRUE
  54
       0.000000 117.50 117.80
                                    1
                                           2 2022-12-30 08:19:20 0.0000100
                                                                              TRUE
## 55
       0.000000 127.40 127.70
                                    1
                                         101 2022-12-29 11:09:20 0.0000100
                                                                              TRUE
       0.000000 161.60 161.85
                                         182 2023-04-10 11:08:36 0.0000100
##
  56
                                   10
                                                                              TRUE
##
        Price
## 1
        0.000
## 2
        0.010
## 3
        0.000
## 4
        0.010
## 5
        0.000
## 6
        0.000
## 7
        0.000
## 8
        0.000
## 9
        0.010
## 10
        0.025
## 11
        0.065
## 12
        0.430
## 13
        1.120
## 14
        1.985
## 15
        2.895
## 16
        3.875
## 17
        4.875
## 18
        5.850
## 19
        6.825
## 20
        7.825
## 21
        8.825
## 22
        9.800
## 23
       10.800
## 24
       11.800
## 25
       12.800
## 26
       13.800
## 27
       14.300
## 28
       14.800
## 29
       15.800
## 30
       16.800
## 31
       17.800
## 32
       18.800
## 33
       16.475
## 34
       19.800
## 35
       20.800
## 36
       21.800
## 37
       24.300
## 38
       26.775
## 39
       29.275
## 40 31.775
```

```
## 42
       41.775
##
  43
       46.775
##
       51.775
  44
##
   45
       56.775
##
   46
       61.775
##
   47
       66.775
       71.775
## 48
##
   49
       76.775
##
  50
       81.775
  51
       88.000
##
  52
       95.875
##
   53 107.775
   54 117.650
##
  55 127.550
##
  56 161.725
##
##
##
   $Apr.26.2023
   $Apr.26.2023$calls
##
               ContractID ConractSize Currency Expiration Strike
                                                                     Last
                                                                                   Chg
                                             USD 2023-04-26
##
      VIXW230426C00011500
                               REGULAR
                                                               11.5
                                                                     9.03
                                                                           0.00000000
  2
      VIXW230426C00013500
                               REGULAR
                                             USD 2023-04-26
                                                               13.5 10.00
                                                                           0.00000000
##
##
  3
      VIXW230426C00017000
                               REGULAR
                                             USD 2023-04-26
                                                               17.0
                                                                     2.29 -0.27999997
## 4
      VIXW230426C00018000
                               REGULAR
                                             USD 2023-04-26
                                                               18.0
                                                                     1.53 -0.22000003
## 5
      VIXW230426C00019000
                               REGULAR
                                             USD 2023-04-26
                                                               19.0
                                                                     0.98 -0.22000003
      VIXW230426C00020000
                                             USD 2023-04-26
                                                               20.0
                                                                     0.75 -0.14999998
##
  6
                               REGULAR
##
  7
      VIXW230426C00021000
                               REGULAR
                                             USD 2023-04-26
                                                               21.0
                                                                     0.51 -0.19000000
                                                               22.0
## 8
      VIXW230426C00022000
                               REGULAR
                                             USD 2023-04-26
                                                                     0.45 - 0.11000001
## 9
      VIXW230426C00023000
                               REGULAR
                                             USD 2023-04-26
                                                               23.0
                                                                     0.34 -0.15000000
## 10 VIXW230426C00024000
                               REGULAR
                                                 2023-04-26
                                                               24.0
                                                                     0.27 - 0.13000000
  11 VIXW230426C00025000
                               REGULAR
                                             USD
                                                 2023-04-26
                                                               25.0
                                                                     0.24 -0.08000000
   12 VIXW230426C00026000
                               REGULAR
                                                 2023-04-26
                                                                     0.24 -0.02000000
                                                               27.0
  13 VIXW230426C00027000
                               REGULAR
                                             USD 2023-04-26
                                                                     0.18 -0.02000000
   14 VIXW230426C00028000
                               REGULAR
                                             USD 2023-04-26
                                                               28.0
                                                                     0.13 -0.02000001
                                             USD 2023-04-26
  15 VIXW230426C00029000
                               REGULAR
                                                               29.0
                                                                     0.11 -0.02000000
## 16 VIXW230426C00030000
                               REGULAR
                                             USD 2023-04-26
                                                                     0.13
                                                                           0.02000000
## 17 VIXW230426C00031000
                                             USD 2023-04-26
                                                                     0.10
                                                                           0.00000000
                               REGULAR
                                                               31.0
  18 VIXW230426C00032000
                                                 2023-04-26
                                                               32.0
                                                                     0.06 -0.04000000
                               REGULAR
                                                                     0.05
## 19 VIXW230426C00033000
                                             USD 2023-04-26
                                                               33.0
                                                                           0.00000000
                               REGULAR
                                                                     0.03
  20 VIXW230426C00034000
                               REGULAR
                                             USD 2023-04-26
                                                               34.0
                                                                          -0.02000000
## 21 VIXW230426C00035000
                                             USD 2023-04-26
                                                               35.0
                                                                     0.06
                               REGULAR
                                                                           0.00000000
  22 VIXW230426C00036000
                               REGULAR
                                             USD 2023-04-26
                                                               36.0
                                                                     0.07
                                                                           0.0000000
  23 VIXW230426C00037000
                                             USD 2023-04-26
                                                               37.0
                                                                     0.05
                               REGULAR
                                                                           0.00000000
                                                                     0.29
  24 VIXW230426C00038000
                               REGULAR
                                             USD 2023-04-26
                                                               38.0
                                                                           0.0000000
                                                                     0.23
                                                               39.0
## 25 VIXW230426C00039000
                               REGULAR
                                             USD
                                                 2023-04-26
                                                                           0.00000000
  26 VIXW230426C00040000
                               REGULAR
                                             USD
                                                 2023-04-26
                                                               40.0
                                                                     0.05
                                                                           0.01000000
                                                                     0.03
  27 VIXW230426C00042500
                               REGULAR
                                             USD
                                                 2023-04-26
                                                               42.5
                                                                           0.00000000
                                             USD 2023-04-26
  28 VIXW230426C00045000
                               REGULAR
                                                               45.0
                                                                     0.03
                                                                           0.00000000
   29 VIXW230426C00050000
                               REGULAR
                                             USD
                                                 2023-04-26
                                                               50.0
                                                                     0.04
                                                                           0.0000000
                                                                     0.02
   30 VIXW230426C00060000
                               REGULAR
                                             USD 2023-04-26
                                                               60.0
                                                                           0.0000000
## 31 VIXW230426C00065000
                               REGULAR
                                             USD 2023-04-26
                                                               65.0
                                                                     0.09
                                                                           0.0000000
## 32 VIXW230426C00070000
                               REGULAR
                                             USD 2023-04-26
                                                               70.0
                                                                     0.05
                                                                           0.00000000
## 33 VIXW230426C00075000
                               REGULAR
                                             USD 2023-04-26
                                                               75.0 0.05
                                                                           0.00000000
```

41

36.775

```
## 34 VIXW230426C00080000
                              REGULAR
                                            USD 2023-04-26
                                                             80.0 0.01 0.00000000
                                            USD 2023-04-26
## 35 VIXW230426C00085000
                                                             85.0 0.04
                              REGULAR
                                                                         0.00000000
  36 VIXW230426C00090000
                              REGULAR
                                            USD 2023-04-26
                                                             90.0
                                                                  0.02
                                                                         0.00000000
  37 VIXW230426C00095000
                              REGULAR
                                            USD 2023-04-26
                                                             95.0
                                                                   0.19
                                                                         0.00000000
          ChgPct Bid Ask
                            Vol
                                   ΩT
                                            LastTradeTime
                                                                TV
                                                                      TTM Price
        0.000000 6.42 8.59
## 1
                              2
                                    5 2023-04-10 13:17:44 4.335942
                                                                    TRUE 7.505
                                 150 2023-03-24 09:30:17 3.302736
        0.000000 4.41 6.61
                            150
                                                                     TRUE 5.510
## 3
     -10.894940 0.79 3.47
                            353
                                  42 2023-04-14 15:59:29 1.783204
                                                                    TRUE 2.130
      -12.571430 0.08 1.90
                            521
                                 443 2023-04-14 16:06:49 1.160160 FALSE 0.990
     -18.333336 0.00 2.25
                            721 2623 2023-04-14 16:00:41 1.558596 FALSE 1.125
     -16.666664 0.00 1.91 1271 3049 2023-04-14 16:08:37 1.647463 FALSE 0.955
      -27.142859 0.00 1.68
                            369
                                2863 2023-04-14 15:52:41 1.748048 FALSE 0.840
## 7
## 8
     -19.642860 0.00 1.52
                            207 4020 2023-04-14 15:57:00 1.855469 FALSE 0.760
## 9
      -30.612246 0.00 1.39
                              63
                                 570 2023-04-14 16:00:41 1.953125 FALSE 0.695
## 10 -32.500000 0.00 0.30
                            230
                                  862 2023-04-14 15:58:01 1.343753 FALSE 0.150
## 11
     -25.000000 0.00 1.16
                            362
                                  974 2023-04-14 15:38:24 2.115239 FALSE 0.580
                                 318 2023-04-14 14:27:21 2.189458 FALSE 0.535
## 12
       -7.692306 0.00 1.07
                              16
       -9.999998 0.00 0.98
                                1288 2023-04-14 15:48:49 2.250004 FALSE 0.490
  14 -13.333340 0.00 0.91
                                1410 2023-04-14 15:22:42 2.314457 FALSE 0.455
     -15.384613 0.00 0.85
                                 106 2023-04-14 15:08:30 2.375004 FALSE 0.425
##
  16
       18.181814 0.08 0.79
                            498 1412 2023-04-14 15:33:59 2.492191 FALSE 0.435
        0.000000 0.00 0.75
                                   92 2023-04-13 09:57:23 2.492191 FALSE 0.375
## 18 -40.000004 0.00 0.71
                                 313 2023-04-14 12:45:49 2.546879 FALSE 0.355
                                   36 2023-04-13 14:32:35 2.597660 FALSE 0.335
##
  19
        0.000000 0.00 0.67
                              1
##
  20
     -40.000004 0.00 0.64
                              1
                                   28 2023-04-14 14:57:05 2.648441 FALSE 0.320
  21
        0.000000 0.00 0.62
                              27
                                 244 2023-04-13 11:02:00 2.707034 FALSE 0.310
##
  22
        0.000000 0.00 0.60
                             20
                                   36 2023-04-13 11:11:11 2.761722 FALSE 0.300
##
  23
        0.000000 0.00 0.58
                              3
                                   20 2023-04-12 15:33:01 2.812503 FALSE 0.290
##
  24
        0.000000 0.00 0.56
                                   60 2023-03-30 15:15:54 2.859378 FALSE 0.280
                             10
##
  25
        0.000000 0.00 0.55
                                    2 2023-03-31 15:21:23 2.917971 FALSE 0.275
                              1
## 26
       25.000006 0.00 0.53
                              28
                                 221 2023-04-14 15:56:03 2.957034 FALSE 0.265
##
  27
        0.000000 0.00 0.51
                              5 2002 2023-04-14 10:28:51 3.085940 FALSE 0.255
##
  28
        0.000000 0.00 0.48
                                  111 2023-04-14 10:31:01 3.187502 FALSE 0.240
##
  29
                                  78 2023-04-12 09:37:51 3.382814 FALSE 0.220
        0.000000 0.00 0.44
                             10
##
  30
        0.000000 0.00 0.38
                                  187 2023-04-13 15:55:13 3.707032 FALSE 0.190
                              1
##
  31
        0.000000 0.00 0.37
                                   12 2023-03-30 03:11:17 3.867188 FALSE 0.185
                              10
## 32
        0.000000 0.00 0.35
                                   7 2023-04-03 11:04:17 3.992188 FALSE 0.175
## 33
        0.000000 0.00 0.34
                              5
                                    5 2023-03-31 13:30:42 4.117192 FALSE 0.170
##
  34
        0.000000 0.00 0.32
                              1
                                    1 2023-04-10 13:28:48 4.210942 FALSE 0.160
        0.000000 0.00 0.31
                                   28 2023-03-31 13:43:58 4.312505 FALSE 0.155
##
  35
                              18
  36
        0.000000 0.00 0.30
                              4
                                   33 2023-04-03 15:10:55 4.414067 FALSE 0.150
                                   3 2023-03-23 14:47:22 4.515629 FALSE 0.150
##
        0.000000 0.00 0.30
  37
                             NΑ
##
##
   $Apr.26.2023$puts
##
               ContractID ConractSize Currency Expiration Strike
                                                                   Last
                                                             13.5
## 1
      VIXW230426P00013500
                              REGULAR
                                            USD 2023-04-26
                                                                   0.02 0.00000000
##
  2
      VIXW230426P00014000
                              REGULAR
                                            USD 2023-04-26
                                                             14.0
                                                                   0.11 0.00000000
## 3
      VIXW230426P00015000
                              REGULAR
                                            USD 2023-04-26
                                                             15.0
                                                                   0.02 0.00000000
## 4
      VIXW230426P00016000
                              REGULAR
                                            USD 2023-04-26
                                                             16.0
                                                                   0.04 0.02000000
## 5
      VIXW230426P00017000
                              REGULAR
                                            USD 2023-04-26
                                                             17.0
                                                                   0.11 0.02000000
      VIXW230426P00018000
                                            USD 2023-04-26
## 6
                              REGULAR
                                                             18.0
                                                                   0.35 0.00000000
## 7
      VIXW230426P00019000
                              REGULAR
                                            USD 2023-04-26
                                                             19.0 0.88 0.13999999
## 8
      VIXW230426P00020000
                              REGULAR
                                            USD 2023-04-26
                                                             20.0 1.49 0.13000000
## 9
      VIXW230426P00021000
                              REGULAR
                                            USD 2023-04-26
                                                             21.0 2.29 0.07999992
```

```
## 10 VIXW230426P00022000
                               REGULAR
                                            USD 2023-04-26
                                                               22.0 3.17 0.07000017
## 11 VIXW230426P00023000
                                                               23.0
                                            USD 2023-04-26
                                                                    4.08 0.08999991
                               REGULAR
                                                                     4.90 0.09000015
## 12 VIXW230426P00024000
                               REGULAR
                                            USD 2023-04-26
                                                               25.0
## 13 VIXW230426P00025000
                                            USD 2023-04-26
                                                                    5.85 0.08999968
                               REGULAR
  14 VIXW230426P00026000
                               REGULAR
                                            USD 2023-04-26
                                                               26.0
                                                                     6.73 0.82999990
## 15 VIXW230426P00027000
                                            USD 2023-04-26
                               REGULAR
                                                               27.0
                                                                    5.15 0.00000000
## 16 VIXW230426P00028000
                               REGULAR
                                            USD 2023-04-26
                                                               28.0
                                                                    8.01 0.00000000
                                                               29.0 9.11 0.00000000
## 17 VIXW230426P00029000
                               REGULAR
                                            USD 2023-04-26
  18 VIXW230426P00030000
                               REGULAR
                                            USD 2023-04-26
                                                               30.0 10.96 1.15999980
   19 VIXW230426P00032000
                               REGULAR
                                            USD 2023-04-26
                                                               32.0 11.14 0.00000000
   20 VIXW230426P00034000
                               REGULAR
                                             USD 2023-04-26
                                                               34.0 11.59 0.00000000
      VIXW230426P00035000
                                            USD 2023-04-26
                                                              35.0 14.01 0.00000000
##
                               REGULAR
                                              LastTradeTime
##
          ChgPct
                          Ask Vol
                                    OI
                                                                    IV
                                                                         ITM
                                                                              Price
                    Bid
                                    57 2023-03-24 10:16:52 0.6406286 FALSE
##
        0.000000
                  0.00
                         0.02
                               57
                                                                              0.010
## 2
        0.00000
                         0.02
                               NA
                                       2023-03-22 14:35:00 0.5468795 FALSE
                  0.00
                                                                              0.010
##
   3
        0.00000
                  0.00
                         0.03
                               10
                                    50
                                       2023-03-30 15:15:16 0.4648491 FALSE
                                                                              0.015
                         0.05
##
      100.000000
                  0.00
                                8
                                    14 2023-04-14 13:10:02 0.3125069 FALSE
                                                                              0.025
   4
##
                  0.03
                         0.12 238
                                   514 2023-04-14 15:59:43 0.1289150 FALSE
                                                                              0.075
       22.222216
                                   686 2023-04-14 15:58:46 0.8300798
                                                                        TRUE
##
  6
        0.000000
                  0.30
                        1.54 309
                                                                              0.920
##
  7
       18.918917
                  0.00 10.00
                              236 1420
                                       2023-04-14 15:55:14 3.2148457
                                                                        TRUE
                                                                              5.000
##
  8
        9.558823
                  0.30
                         2.00 132
                                   493 2023-04-14 14:14:51 0.0000100
                                                                        TRUE
                                                                              1.150
## 9
                  0.00 10.00
                               94 1247 2023-04-14 15:31:24 1.9667970
                                                                        TRUE
                                                                              5.000
        3.619906
                               17
                  0.00 10.00
                                    38 2023-04-14 14:27:18 0.9101571
                                                                        TRUE
                                                                              5.000
## 10
        2.258070
                         5.70
                               18
                                    56 2023-04-14 09:47:48 0.0000100
                                                                        TRUE
                                                                              4.325
##
  11
        2.255637
                  2.95
## 12
        1.871105
                  3.88
                         6.60
                                6
                                   442 2023-04-13 13:52:18 0.0000100
                                                                        TRUE
                                                                              5.240
  13
        1.562494
                  4.84
                         7.53
                               15
                                    32 2023-04-14 13:17:19 0.0000100
                                                                        TRUE
                                                                              6.185
       14.067795
                  5.81
                         8.47
                                   421 2023-04-14 11:26:36 0.0000100
                                                                        TRUE
                                                                              7.140
##
   14
                                1
##
   15
        0.000000
                  6.80
                         9.41
                                5
                                     5 2023-03-28 03:22:39 0.0000100
                                                                        TRUE
                                                                              8.105
                                                                        TRUE 9.075
##
        0.00000
                  7.78 10.37
                                    11 2023-04-12 14:00:26 0.0000100
  16
##
  17
        0.000000
                  8.78 11.33
                                    12 2023-04-11 12:30:23 0.0000100
                                                                        TRUE 10.055
##
   18
       11.836733
                  9.77 12.30
                                1
                                    18 2023-04-14 15:51:58 0.0000100
                                                                        TRUE 11.035
##
   19
        0.000000 11.76 14.25
                                2
                                     2 2023-03-31 14:30:22 0.0000100
                                                                        TRUE 13.005
##
   20
        0.000000 13.76 16.22
                                    10 2023-03-23 09:45:51 0.0000100
                                                                        TRUE 14.990
##
   21
        0.000000 14.76 17.20
                               10
                                    30 2023-04-06 10:54:33 0.0000100
                                                                        TRUE 15.980
##
##
   $May.03.2023
   $May.03.2023$calls
##
               ContractID ConractSize Currency Expiration Strike Last
                                                                                   Chg
                                            USD 2023-05-03
##
      VIXW230503C00014000
                               REGULAR
                                                              14.0 5.92 0.000000000
  1
  2
      VIXW230503C00015000
                               REGULAR
                                            USD 2023-05-03
                                                               15.0 5.27
                                                                         0.000000000
      VIXW230503C00016000
                                            USD 2023-05-03
                                                              16.0 4.07 -2.049999700
##
  .3
                               REGULAR
  4
      VIXW230503C00018000
                               REGULAR
                                            USD 2023-05-03
                                                              18.0 2.09 -0.190000060
## 5
      VIXW230503C00019000
                                            USD 2023-05-03
                                                               19.0 1.50 -0.210000040
                               REGULAR
## 6
      VIXW230503C00020000
                               REGULAR
                                            USD 2023-05-03
                                                               20.0 1.18 -0.120000005
## 7
                                            USD 2023-05-03
                                                               21.0 1.01 -0.090000030
      VIXW230503C00021000
                               REGULAR
## 8
      VIXW230503C00022000
                               REGULAR
                                            USD 2023-05-03
                                                               22.0 0.78 -0.170000020
      VIXW230503C00023000
                               REGULAR
                                            USD 2023-05-03
                                                               23.0 0.63 -0.130000000
                                                               24.0 0.57 -0.019999980
## 10 VIXW230503C00024000
                               REGULAR
                                            USD 2023-05-03
## 11 VIXW230503C00025000
                               REGULAR
                                            USD 2023-05-03
                                                               25.0 0.40 -0.119999975
## 12 VIXW230503C00026000
                               REGULAR
                                            USD 2023-05-03
                                                               26.0 0.40 -0.099999994
## 13 VIXW230503C00027000
                               REGULAR
                                            USD 2023-05-03
                                                               27.0 0.35 -0.080000010
## 14 VIXW230503C00028000
                               REGULAR
                                            USD 2023-05-03
                                                              28.0 0.33 0.010000020
## 15 VIXW230503C00029000
                               REGULAR
                                            USD 2023-05-03
                                                              29.0 0.23 -0.059999987
```

```
## 16 VIXW230503C00030000
                               REGULAR
                                            USD 2023-05-03
                                                              30.0 0.21 -0.030000001
                                            USD 2023-05-03
                                                              31.0 0.26
## 17 VIXW230503C00031000
                               REGULAR
                                                                          0.039999990
                                                                          0.000000000
## 18 VIXW230503C00032000
                               REGULAR
                                            USD 2023-05-03
                                                              32.0 0.26
  19 VIXW230503C00035000
                                            USD 2023-05-03
                                                              35.0 0.12
                               REGULAR
                                                                          0.009999998
  20 VIXW230503C00037000
                               REGULAR
                                            USD 2023-05-03
                                                              37.0 0.13
                                                                          0.00000000
                                            USD 2023-05-03
  21 VIXW230503C00038000
                               REGULAR
                                                              38.0 0.14
                                                                          0.000000000
  22 VIXW230503C00040000
                               REGULAR
                                            USD 2023-05-03
                                                              40.0 0.05 -0.050000000
## 23 VIXW230503C00042500
                               REGULAR
                                            USD 2023-05-03
                                                              42.5 0.05
                                                                          0.000000000
  24 VIXW230503C00045000
                               REGULAR
                                            USD 2023-05-03
                                                              45.0 0.09
                                                                          0.00000000
  25 VIXW230503C00050000
                               REGULAR
                                            USD 2023-05-03
                                                              50.0 0.08
                                                                          0.000000000
  26 VIXW230503C00055000
                               REGULAR
                                            USD 2023-05-03
                                                              55.0 0.03 -0.150000000
                                            USD 2023-05-03
  27 VIXW230503C00060000
                               REGULAR
                                                              60.0 0.03
                                                                          0.000000000
   28 VIXW230503C00065000
                               REGULAR
                                            USD 2023-05-03
                                                              65.0 0.02
                                                                          0.000000000
   29 VIXW230503C00070000
                                            USD 2023-05-03
                                                                          0.00000000
                               REGULAR
                                                              70.0 0.05
   30 VIXW230503C00085000
                               REGULAR
                                            USD 2023-05-03
                                                              85.0 0.04
##
                                                                          0.00000000
##
          ChgPct
                  Bid
                              Vol
                                    OI
                                              LastTradeTime
                                                                   IV
                                                                        ITM Price
                         Ask
## 1
        0.000000 4.33
                               20
                                    95 2023-04-13 14:20:12 2.713870
                                                                       TRUE 5.405
                        6.48
##
        0.000000 3.30
                        5.53
                               25
                                    32 2023-04-13 09:51:22 2.335942
                                                                       TRUE 4.415
                                       2023-04-14 13:39:22 1.981445
##
  3
      -33.496727 2.25
                        4.64
                                     1
                                                                       TRUE 3.445
                                1
##
   4
       -8.333336 0.67
                        3.19
                              253
                                   444
                                       2023-04-14 16:00:25 1.531252 FALSE 1.930
## 5
      -12.280705 0.20
                        2.67
                              262
                                   655 2023-04-14 15:58:44 1.428714 FALSE 1.435
                        3.70 5446
                                   788 2023-04-14 15:59:51 1.904297 FALSE 1.850
  6
       -9.230770 0.00
## 7
                        1.24 1264 1126 2023-04-14 15:57:00 1.193363 FALSE 0.620
       -8.181821 0.00
                                   766 2023-04-14 15:58:52 1.568362 FALSE 0.910
  8
      -17.894740 0.00
                        1.82
                              458
## 9
      -17.105263 0.50
                        0.75
                              102
                                    80 2023-04-14 15:44:21 1.466800 FALSE 0.625
  10
       -3.389827 0.45
                        0.59
                              766
                                    68 2023-04-14 15:26:58 1.488284 FALSE 0.520
  11 -23.076920 0.34
                        0.55
                              225
                                   233 2023-04-14 15:59:28 1.519534 FALSE 0.445
   12 -19.999998 0.28
                        0.48
                                2
                                       2023-04-14 09:30:02 1.544924 FALSE 0.380
  13 -18.604654 0.23
                        0.42
                                   123 2023-04-14 14:32:59 1.568362 FALSE 0.325
                                1
  14
        3.125006 0.20
                        0.33
                               57
                                    81 2023-04-14 13:23:34 1.570315 FALSE 0.265
##
   15
      -20.689651 0.16
                        0.29
                                4
                                       2023-04-14 14:15:59 1.585940 FALSE 0.225
   16
      -12.500002 0.14
                        0.30
                              109
                                       2023-04-14 16:02:00 1.652345 FALSE 0.220
##
       18.181814 0.11
                        0.22
                                4
                                   258 2023-04-14 09:44:39 1.621096 FALSE 0.165
                        0.20
                                    42 2023-04-11 11:16:48 1.640627 FALSE 0.145
##
   18
        0.000000 0.09
                               12
##
   19
        9.090907 0.05
                                2
                                       2023-04-14 09:32:48 1.687502 FALSE 0.095
                        0.14
##
        0.000000 0.03
                                5
                                    46 2023-04-13 11:09:17 1.718751 FALSE 0.075
  20
                       0.12
##
  21
        0.000000 0.00
                        0.70
                                3
                                    23 2023-04-12 15:49:01 2.347660 FALSE 0.350
##
  22
      -50.000000 0.00
                        0.66
                                   509 2023-04-14 10:46:59 2.421879 FALSE 0.330
                               20
   23
        0.000000 0.00
                                4
                                     8 2023-04-13 14:23:05 2.507816 FALSE 0.310
##
                        0.62
                                   622 2023-04-12 14:21:22 2.593754 FALSE 0.295
##
  24
        0.000000 0.00
                        0.59
                              200
                                    48 2023-04-12 14:43:12 2.746097 FALSE 0.270
   25
        0.000000 0.00
                        0.54
                               13
      -83.333330 0.00
                       0.50
                              200
                                     2 2023-04-14 16:00:42 2.878909 FALSE 0.250
##
   26
                                    57
                                       2023-04-13 11:06:37 7.041017 FALSE 5.000
##
   27
        0.000000 0.00 10.00
                                5
##
        0.000000 0.00
                      0.45
                               16
                                   271 2023-04-14 13:52:10 3.117190 FALSE 0.225
   28
##
   29
        0.000000 0.00
                       0.43
                               20
                                    20 2023-04-06 11:30:18 3.222658 FALSE 0.215
                                     3 2023-04-04 11:21:46 3.476564 FALSE 0.190
##
   30
        0.000000 0.00
                       0.38
                               NA
##
##
   $May.03.2023$puts
##
               ContractID ConractSize Currency Expiration Strike
                                                                                  Chg
                                                                    Last
##
      VIXW230503P00012000
                               REGULAR
                                            USD 2023-05-03
                                                              12.0
                                                                     0.01
                                                                           0.0000000
   1
   2
                                            USD 2023-05-03
                                                              13.0
##
      VIXW230503P00013000
                               REGULAR
                                                                     0.01
                                                                           0.00000000
  3
      VIXW230503P00013500
                               REGULAR
                                            USD 2023-05-03
                                                              13.5
                                                                     0.01
                                                                           0.00000000
## 4
      VIXW230503P00014000
                               REGULAR
                                            USD 2023-05-03
                                                              14.0
                                                                    0.04
                                                                           0.00000000
## 5
      VIXW230503P00015000
                               REGULAR
                                            USD 2023-05-03
                                                              15.0 0.02
                                                                           0.00000000
```

```
VIXW230503P00016000
                               REGULAR
                                            USD 2023-05-03
                                                              16.0 0.05 0.03000000
                                            USD 2023-05-03
## 7
      VIXW230503P00017000
                               REGULAR
                                                              17.0 0.14
                                                                          0.05000000
      VIXW230503P00018000
                                                                    0.40
                               REGULAR
                                            USD 2023-05-03
                                                                          0.05000001
      VIXW230503P00019000
                                            USD 2023-05-03
                                                              19.0
                                                                    0.74 -0.00999999
                               REGULAR
## 10 VIXW230503P00020000
                               REGULAR
                                            USD 2023-05-03
                                                              20.0
                                                                    1.54
                                                                          0.18999994
## 11 VIXW230503P00021000
                                            USD 2023-05-03
                                                              21.0
                                                                    2.30
                               REGULAR
                                                                          0.2000005
## 12 VIXW230503P00022000
                               REGULAR
                                            USD 2023-05-03
                                                              22.0
                                                                    2.89
                                                                          0.00000000
                                                              25.0
                                                                    5.01
## 13 VIXW230503P00025000
                               REGULAR
                                            USD 2023-05-03
                                                                          0.00000000
## 14 VIXW230503P00026000
                               REGULAR
                                            USD 2023-05-03
                                                              26.0 5.86
                                                                           0.0000000
## 15 VIXW230503P00030000
                               REGULAR
                                            USD 2023-05-03
                                                              30.0 10.46
                                                                          0.69999980
  16 VIXW230503P00032000
                               REGULAR
                                            USD 2023-05-03
                                                              32.0 10.42
                                                                          0.00000000
     VIXW230503P00035000
                                            USD 2023-05-03
                                                              35.0 14.35
##
                               REGULAR
                                                                          0.00000000
          ChgPct
                          Ask Vol
                                   ΟI
                                                                  ΙV
                                                                       ITM
                                                                            Price
                   Bid
                                            LastTradeTime
                                                                             0.010
## 1
        0.000000
                  0.00
                         0.02
                                4
                                      2023-03-31 15:45:35 0.7187528 FALSE
## 2
                        0.02
                                5
                                      2023-03-31 15:46:48 0.5625044 FALSE
        0.00000
                  0.00
                                    5
                                                                             0.010
##
  3
        0.000000
                  0.00
                        0.02
                               90
                                   90 2023-03-31 13:54:05 0.5000050 FALSE
                                                                             0.010
                                    1 2023-03-30 11:24:09 0.7382839 FALSE
## 4
        0.000000
                  0.00
                        0.28
                               NΑ
                                                                             0.140
## 5
        0.00000
                  0.00
                        0.04
                                2
                                   23 2023-04-14 09:57:18 0.3867249 FALSE
                                                                             0.020
                               13
                                   33 2023-04-14 10:03:11 0.3027413 FALSE
##
  6
      150.000020
                  0.00
                        0.10
                                                                             0.050
##
  7
       55.55553
                  0.07
                        0.16
                               46
                                   69 2023-04-14 11:44:58 0.1279384 FALSE
                                                                             0.115
## 8
       14.285718
                  0.37
                        0.54 115 258 2023-04-14 15:58:42 0.0000100
                                                                      TRUE
                                                                             0.455
## 9
                               14 173 2023-04-14 11:51:04 0.0000100
                                                                      TRUE
       -1.333332
                  0.79
                        1.10
                                                                             0.945
## 10
                  0.00 10.00 127
                                   68 2023-04-14 14:39:57 2.0507861
                                                                      TRUE
       14.074069
                                                                             5.000
                               10 201 2023-04-14 15:58:42 1.5371117
                                                                      TRUE
##
  11
        9.523812
                  0.00 10.00
                                                                             5.000
                               22
                                    8 2023-04-13 14:02:39 0.7109404
## 12
        0.000000
                  0.00 10.00
                                                                      TRUF.
                                                                             5.000
  13
        0.000000
                  4.71
                        7.29
                                    7 2023-04-12 10:59:53 0.0000100
                                                                      TRUE
                                                                             6.000
        0.000000
                  5.64
                        8.21
                                5
                                  15 2023-04-10 11:22:56 0.0000100
                                                                      TRUE
##
  14
                                                                            6.925
                                2
##
  15
        7.172129
                  9.50 12.00
                                   12 2023-04-14 15:51:58 0.0000100
                                                                      TRUE 10.750
        0.000000 11.47 13.93
                                   1 2023-03-30 10:41:49 0.0000100
                                                                      TRUE 12.700
##
  16
                               NA
##
  17
        0.000000 14.44 16.85
                                1
                                    1 2023-04-06 12:53:12 0.0000100
                                                                      TRUE 15.645
##
##
   $May.10.2023
   $May.10.2023$calls
##
               ContractID ConractSize Currency Expiration Strike Last
                                                                                 Chg
## 1
                                            USD 2023-05-10
     VIXW230510C00011000
                               REGULAR
                                                                11 9.75
                                                                         0.00000000
      VIXW230510C00014000
                               REGULAR
                                            USD 2023-05-10
                                                                14 6.75
                                                                         0.00000000
## 3
      VIXW230510C00015000
                               REGULAR
                                            USD 2023-05-10
                                                                15 4.38
                                                                         0.30000020
      VIXW230510C00017000
                                            USD 2023-05-10
                                                                17 2.46 -0.25000000
                               REGULAR
                                            USD 2023-05-10
## 5
      VIXW230510C00018000
                               REGULAR
                                                                18 1.89 -0.22999990
## 6
      VIXW230510C00019000
                               REGULAR
                                            USD 2023-05-10
                                                                19 1.53 -0.14999998
      VIXW230510C00020000
                                            USD 2023-05-10
                                                                20 1.26 -0.15999997
## 7
                               REGULAR
## 8
     VIXW230510C00022000
                               REGULAR
                                            USD 2023-05-10
                                                                22 0.91 -0.09999996
## 9
     VIXW230510C00023000
                                            USD 2023-05-10
                                                                23 0.77 -0.06999999
                               REGULAR
## 10 VIXW230510C00025000
                               REGULAR
                                            USD 2023-05-10
                                                                25 0.64 -0.02000004
## 11 VIXW230510C00027000
                                            USD 2023-05-10
                                                                27 0.49
                               REGULAR
                                                                         0.03000000
  12 VIXW230510C00030000
                               REGULAR
                                            USD 2023-05-10
                                                                30 0.37 -0.09000000
## 13 VIXW230510C00035000
                               REGULAR
                                            USD 2023-05-10
                                                                35 0.22 0.01000000
  14 VIXW230510C00037000
                               REGULAR
                                            USD 2023-05-10
                                                                37 0.15 -0.22999999
  15 VIXW230510C00060000
                               REGULAR
                                            USD 2023-05-10
                                                                60 0.02
                                                                         0.00000000
   16 VIXW230510C00095000
                               REGULAR
                                            USD 2023-05-10
                                                                95 0.06
##
                                                                         0.00000000
          ChgPct Bid Ask Vol
##
                                  OI
                                           LastTradeTime
                                                                IV
                                                                     ITM Price
                                  10 2023-04-06 10:12:47 3.021487
## 1
        0.000000 6.68 9.23
                            10
                                                                    TRUE 7.955
## 2
        0.000000 3.62 6.33 338
                                 338 2023-04-06 07:34:27 2.007817
                                                                    TRUE 4.975
```

```
## 3
        7.352946 2.52 5.43 315 4669 2023-04-14 15:20:48 1.701173 TRUE 3.975
##
       -9.225092 0.76 3.96 343
                                 443 2023-04-14 16:10:00 1.313480
                                                                    TRUE 2.360
      -10.849052 0.20 3.39 424
                                 112 2023-04-14 15:59:28 1.222660 FALSE 1.795
##
       -8.928570 0.00 2.96 470
                                 252 2023-04-14 16:01:09 1.238285 FALSE 1.480
  6
##
      -11.267604 0.00 2.64 295
                                 502 2023-04-14 15:59:53 1.310550 FALSE 1.320
##
  8
       -9.900987 0.00 2.23 214
                                 406 2023-04-14 16:10:00 1.460940 FALSE 1.115
  9
       -8.333333 0.00 2.08
                                  50 2023-04-14 14:47:43 1.531252 FALSE 1.040
       -3.030309 0.00 0.80 197
## 10
                                 344 2023-04-14 16:00:42 1.248051 FALSE 0.400
  11
        6.521739 0.00 1.66
                                  37 2023-04-14 14:55:00 1.769532 FALSE 0.830
                             20
  12
      -19.565218 0.00 1.42
                                 352 2023-04-14 15:55:57 1.902344 FALSE 0.710
  13
        4.761908 0.00 1.14
                                 105 2023-04-14 12:58:46 2.082036 FALSE 0.570
      -60.526310 0.00 1.05
                              5
                                   5 2023-04-14 13:27:29 2.142583 FALSE 0.525
##
   14
##
   15
        0.000000 0.00 0.67
                             12
                                  12 2023-04-13 13:39:25 2.714847 FALSE 0.335
                              8
                                   8 2023-04-06 13:40:47 3.265627 FALSE 0.265
##
   16
        0.000000 0.00 0.53
##
   $May.10.2023$puts
##
               ContractID ConractSize Currency Expiration Strike
                                                                                  Chg
                                                                    Last
##
      VIXW230510P00015000
                               REGULAR
                                            USD 2023-05-10
                                                                    0.04 0.000000000
      VIXW230510P00016000
                               REGULAR
                                            USD 2023-05-10
##
  2
                                                                16
                                                                    0.12 0.009999998
  3
      VIXW230510P00017000
                               REGULAR
                                            USD 2023-05-10
                                                                    0.35 0.049999982
##
  4
      VIXW230510P00018000
                               REGULAR
                                            USD 2023-05-10
                                                                18
                                                                    0.75 0.040000020
      VIXW230510P00019000
                               REGULAR
                                            USD 2023-05-10
                                                                19
                                                                    1.40 0.159999970
      VIXW230510P00022000
                                            USD 2023-05-10
                                                                22
                                                                    3.75 0.250000000
## 6
                               REGULAR
                                            USD 2023-05-10
      VIXW230510P00026000
                               REGULAR
                                                                26
                                                                    7.08 0.000000000
                                            USD 2023-05-10
## 8
      VIXW230510P00028000
                               REGULAR
                                                                28
                                                                    9.23 0.379999160
      VIXW230510P00029000
                               REGULAR
                                            USD 2023-05-10
                                                                    8.23 0.000000000
##
  10 VIXW230510P00030000
                               REGULAR
                                            USD 2023-05-10
                                                                30 10.76 0.000000000
##
         ChgPct Bid
                             Vol
                                   OI
                                            LastTradeTime
                                                                  ΙV
                                                                       ITM
                                                                             Price
                        Ask
## 1
       0.000000 0.00
                      0.72
                              14
                                  212 2023-04-14 15:54:36 0.6582065 FALSE
                                                                             0.360
  2
       9.090907 0.00
                      1.11 1262
                                  364 2023-04-14 15:48:45 0.5800823 FALSE
                                                                             0.555
##
  .3
      16.666660 0.00
                      1.63
                           1083
                                  462 2023-04-14 15:59:17 0.9384772 FALSE
                                                                             0.815
##
       5.633806 0.40
                      2.22
                             218
                                  643 2023-04-14 15:59:33 0.9394537
                                                                      TRUE.
                                                                             1.310
##
      12.903222 0.50
                      2.92
                             432 2021 2023-04-14 15:48:45 0.9550786
                                                                      TRUE
                                                                             1.710
                      5.43
                                                                      TRUE
##
  6
       7.142858 2.23
                              15
                                   69 2023-04-14 14:49:15 1.0429735
                                                                             3.830
##
       0.000000 5.84
                      9.12
                              10
                                   32 2023-04-13 11:40:45 1.0976608
                                                                      TRUE
                                                                             7.480
##
  8
       4.293776 7.75 10.97
                             100
                                   61 2023-04-14 15:56:11 0.9296882
                                                                      TRUE
                                                                            9.360
##
       0.000000 8.71 11.91
                              56
                                   56 2023-04-06 09:37:07 0.0000100
                                                                      TRUE 10.310
##
  10
       0.000000 9.69 12.86
                               1
                                   53 2023-04-13 10:28:01 0.0000100
                                                                      TRUE 11.275
##
##
   $May.17.2023
   $May.17.2023$calls
##
              ContractID ConractSize Currency Expiration Strike Last
                                                                                  Chg
                                           USD 2023-05-17
##
      VIX230517C00010000
                              REGULAR
                                                             10.0 10.24 -0.079999920
  1
  2
      VIX230517C00010500
                              REGULAR
                                           USD 2023-05-17
                                                             10.5 11.68
                                                                         0.00000000
## 3
                                           USD 2023-05-17
                                                                   9.16 -0.140000340
      VIX230517C00011000
                              REGULAR
                                                             11.0
##
  4
      VIX230517C00011500
                              REGULAR
                                           USD 2023-05-17
                                                             11.5 10.68
                                                                         0.00000000
## 5
      VIX230517C00012000
                              REGULAR
                                           USD 2023-05-17
                                                             12.0
                                                                   8.62
                                                                         0.000000000
## 6
                                                                   7.25 -0.300000200
      VIX230517C00013000
                              REGULAR
                                           USD 2023-05-17
                                                             13.0
## 7
      VIX230517C00013500
                              REGULAR
                                           USD 2023-05-17
                                                             13.5
                                                                   8.60
                                                                         0.00000000
                                           USD 2023-05-17
                                                                   6.35 -0.599999900
## 8
      VIX230517C00014000
                              REGULAR
                                                             14.0
      VIX230517C00014500
                              REGULAR
                                           USD 2023-05-17
                                                             14.5
                                                                   5.95
                                                                        0.000000000
## 10 VIX230517C00015000
                              REGULAR
                                           USD 2023-05-17
                                                             15.0
                                                                  5.25 -0.099999905
## 11 VIX230517C00016000
                              REGULAR
                                           USD 2023-05-17
                                                             16.0 4.20 -0.180000300
```

```
## 12 VIX230517C00017000
                              REGULAR
                                            USD 2023-05-17
                                                              17.0
                                                                    3.40 -0.199999810
                                                              18.0
## 13 VIX230517C00018000
                              REGULAR
                                            USD 2023-05-17
                                                                    2.72 -0.240000010
                                            USD 2023-05-17
  14 VIX230517C00019000
                              REGULAR
                                                              19.0
                                                                    2.25 -0.140000100
  15 VIX230517C00020000
                              REGULAR
                                            USD 2023-05-17
                                                              20.0
                                                                    1.81 -0.180000070
   16 VIX230517C00021000
                              REGULAR
                                            USD 2023-05-17
                                                              21.0
                                                                    1.56 -0.170000080
##
                                                              22.0
  17 VIX230517C00022000
                              REGULAR
                                            USD 2023-05-17
                                                                    1.37 -0.120000005
  18 VIX230517C00023000
                              REGULAR
                                            USD 2023-05-17
                                                              23.0
                                                                    1.18 -0.120000005
##
  19 VIX230517C00024000
                              REGULAR
                                            USD 2023-05-17
                                                              24.0
                                                                    1.04 -0.090000030
   20 VIX230517C00025000
                              REGULAR
                                            USD 2023-05-17
                                                              25.0
                                                                    0.92 -0.099999964
   21 VIX230517C00026000
                              REGULAR
                                            USD 2023-05-17
                                                              26.0
                                                                    0.83 -0.069999990
   22 VIX230517C00027000
                              REGULAR
                                            USD 2023-05-17
                                                              27.0
                                                                    0.74 -0.060000002
                                                2023-05-17
                                                              28.0
##
   23 VIX230517C00028000
                              REGULAR
                                            USD
                                                                    0.66 -0.039999960
   24 VIX230517C00029000
                              REGULAR
                                            USD 2023-05-17
                                                              29.0
                                                                    0.59 -0.040000020
                                            USD 2023-05-17
##
   25 VIX230517C00030000
                              REGULAR
                                                              30.0
                                                                    0.54 -0.039999960
  26 VIX230517C00031000
                              REGULAR
                                            USD 2023-05-17
##
                                                              31.0
                                                                    0.51 -0.009999990
      VIX230517C00032000
                              REGULAR
                                            USD
                                                2023-05-17
                                                              32.0
                                                                    0.45 -0.030000001
##
   28 VIX230517C00032500
                              REGULAR
                                            USD 2023-05-17
                                                              32.5
                                                                    0.42 -0.030000001
   29 VIX230517C00033000
                              REGULAR
                                            USD 2023-05-17
                                                              33.0
                                                                    0.39 -0.040000020
   30 VIX230517C00034000
##
                              REGULAR
                                            USD 2023-05-17
                                                              34.0
                                                                    0.43
                                                                          0.030000001
   31 VIX230517C00035000
                              REGULAR
                                            USD 2023-05-17
                                                              35.0
                                                                    0.35 -0.030000001
##
   32 VIX230517C00036000
                              REGULAR
                                            USD 2023-05-17
                                                              36.0
                                                                    0.33
                                                                          0.000000000
                                            USD 2023-05-17
                                                                    0.33
   33 VIX230517C00037000
                              REGULAR
                                                              37.0
                                                                          0.010000020
                                                                    0.28
  34 VIX230517C00037500
                              REGULAR
                                            USD 2023-05-17
                                                              37.5
                                                                          0.000000000
##
   35 VIX230517C00038000
                              REGULAR
                                            USD 2023-05-17
                                                              38.0
                                                                    0.28
                                                                          0.00000000
##
   36 VIX230517C00039000
                              REGULAR
                                            USD 2023-05-17
                                                              39.0
                                                                    0.27
                                                                          0.020000010
   37 VIX230517C00040000
                              REGULAR
                                            USD 2023-05-17
                                                              40.0
                                                                    0.24
                                                                          0.000000000
   38 VIX230517C00042500
                                                2023-05-17
                                                              42.5
                                                                    0.18 -0.029999986
##
                              REGULAR
                                            USD
   39 VIX230517C00045000
                              REGULAR
                                            USD 2023-05-17
                                                              45.0
                                                                    0.18
                                                                          0.010000005
                                            USD 2023-05-17
##
   40 VIX230517C00047500
                              REGULAR
                                                              47.5
                                                                    0.13 -0.030000001
  41 VIX230517C00050000
                              REGULAR
                                            USD 2023-05-17
                                                              50.0
                                                                    0.12 -0.009999998
## 42 VIX230517C00055000
                              REGULAR
                                            USD
                                                2023-05-17
                                                              55.0
                                                                    0.11
                                                                          0.019999996
   43 VIX230517C00060000
                              REGULAR
                                            USD 2023-05-17
                                                              60.0
                                                                    0.07
                                                                          0.00000000
   44 VIX230517C00065000
                              REGULAR
                                            USD 2023-05-17
                                                              65.0
                                                                    0.06
                                                                          0.00999998
   45 VIX230517C00070000
                                                              70.0
##
                              REGULAR
                                            USD 2023-05-17
                                                                    0.05
                                                                          0.00000000
     VIX230517C00075000
                              REGULAR
                                                2023-05-17
                                                                    0.05
                                                                          0.010000002
                                            USD
                                                              75.0
##
   47 VIX230517C00080000
                              REGULAR
                                            USD 2023-05-17
                                                              80.0
                                                                    0.03 -0.010000000
  48 VIX230517C00085000
                              REGULAR
                                            USD 2023-05-17
                                                              85.0
                                                                    0.04
                                                                          0.000000000
  49 VIX230517C00090000
                              REGULAR
                                            USD 2023-05-17
                                                              90.0
                                                                    0.02
                                                                          0.00000000
##
   50 VIX230517C00095000
                                                                    0.02
                              REGULAR
                                            USD 2023-05-17
                                                              95.0
                                                                          0.00000000
                                                                    0.02
  51 VIX230517C00100000
                                            USD 2023-05-17
                                                             100.0
                                                                          0.000000000
                              REGULAR
   52 VIX230517C00110000
                              REGULAR
                                            USD 2023-05-17
                                                             110.0
                                                                    0.02
                                                                          0.00000000
   53 VIX230517C00120000
                                            USD 2023-05-17
                                                             120.0
                                                                    0.02
                              REGULAR
                                                                          0.000000000
   54 VIX230517C00130000
                              REGULAR
                                            USD 2023-05-17
                                                             130.0
                                                                    0.01
                                                                          0.00000000
   55 VIX230517C00140000
                                            USD 2023-05-17
                                                             140.0
                                                                    0.01
##
                              REGULAR
                                                                          0.000000000
   56 VIX230517C00150000
                              REGULAR
                                            USD 2023-05-17
                                                             150.0
                                                                    0.01
                                                                          0.00000000
   57 VIX230517C00160000
                                            USD 2023-05-17
                                                             160.0
                                                                    0.02
                              REGULAR
                                                                          0.00000000
   58 VIX230517C00170000
                              REGULAR
                                            USD 2023-05-17
                                                             170.0
                                                                    0.02
                                                                          0.00000000
##
   59 VIX230517C00180000
                              REGULAR
                                            USD 2023-05-17
                                                             180.0
                                                                    0.02
                                                                          0.00000000
##
           ChgPct
                   Bid
                          Ask
                                Vol
                                         OI
                                                  LastTradeTime
                                                                       ΙV
                                                                             TTM
##
       -0.7751931 9.85
                        10.15
                                 54
                                        707
                                           2023-04-14 14:22:14 3.916016
                                                                            TRUE
   2
                         9.65
                                 20
                                         20 2023-04-04 15:48:06 3.691407
##
        0.0000000 9.35
                                                                            TRUE
##
   3
       -1.5053800 8.85
                         9.15
                                 75
                                       1200 2023-04-14 14:57:49 3.478517
                                                                            TRUE
## 4
        0.0000000 8.40
                         8.65
                                 10
                                         10 2023-04-04 15:48:08 3.294924
                                                                           TRUE
## 5
        0.0000000 7.90
                         8.15
                                 13
                                        638 2023-04-13 09:46:39 3.103518
                                                                           TRUE
```

```
## 6
       -3.9735124 6.90
                        7.15
                                 16
                                       803 2023-04-14 15:50:37 2.744144
## 7
                                         3 2023-03-30 10:01:25 2.574222
                                                                           TRUE
        0.0000000 6.40
                         6.65
                                 NΑ
## 8
       -8.6330920 5.90
                         6.15
                                  3
                                       525 2023-04-14 10:08:09 2.410160
                                                                           TRUE
## 9
        0.0000000 5.40
                                       621 2023-04-13 15:07:59 2.251957
                                                                           TRUE
                         5.65
                                  1
## 10
       -1.8691572 4.90
                         5.20
                                790
                                      3324 2023-04-14 15:55:59 2.111333
       -4.1095960 4.00
                         4.25
                                205
                                      2467 2023-04-14 15:59:58 1.848634
## 11
## 12
       -5.5555506 3.15
                         3.40
                                199
                                      2137 2023-04-14 16:14:13 1.625978
## 13
       -8.1081085 2.53
                         2.69 10861
                                     12478 2023-04-14 16:14:34 1.486331 FALSE
## 14
       -5.8577447 2.06
                         2.20
                                905
                                     10313 2023-04-14 16:09:39 1.417972 FALSE
## 15
       -9.0452290 1.80
                         1.85
                               9627
                                     27611 2023-04-14 16:14:33 1.415042 FALSE
  16
       -9.8265930 1.46
                         1.58
                               1293
                                     91352 2023-04-14 16:06:48 1.391605 FALSE
       -8.0536920 1.30
                         1.37
                              28547
                                     95736 2023-04-14 16:14:59 1.412112 FALSE
##
   17
##
       -9.2307700 1.12
                         1.19 10053
                                     44949 2023-04-14 15:59:42 1.418948 FALSE
   18
                               1938 182925 2023-04-14 16:11:01 1.433597 FALSE
## 19
       -7.9646053 0.98
                         1.05
       -9.8039180 0.86
                         0.92 30699 126151 2023-04-14 16:11:01 1.445315 FALSE
## 20
##
  21
       -7.7777770 0.76
                         0.82
                                852
                                     66736 2023-04-14 16:05:16 1.462893 FALSE
                         0.74
                               1250
                                     48661 2023-04-14 16:10:14 1.479495 FALSE
##
  22
       -7.5000005 0.67
##
  23
       -5.7142806 0.61
                         0.66
                                467
                                     42949 2023-04-14 16:01:54 1.498049 FALSE
       -6.3492100 0.54
                                     16121 2023-04-14 15:55:24 1.513674 FALSE
##
                         0.60
                                308
  24
##
   25
       -6.8965450 0.50
                         0.54 31560 207556 2023-04-14 16:14:59 1.533205 FALSE
##
  26
       -1.9230751 0.45
                         0.49
                                631
                                     12358 2023-04-14 15:27:30 1.548830 FALSE
       -6.2500010 0.41
                         0.45
                               5099 139905 2023-04-14 15:58:36 1.566408 FALSE
  27
                         0.43
                                229
                                     28028 2023-04-14 16:11:01 1.572268 FALSE
## 28
       -6.6666670 0.39
                                     10357 2023-04-14 16:08:47 1.578127 FALSE
##
  29
       -9.3023310 0.37
                         0.41
                                 26
## 30
        7.5000005 0.34
                         0.38
                               2057
                                     16510 2023-04-14 10:45:55 1.595705 FALSE
   31
       -7.8947372 0.30
                         0.35
                               9668
                                     58551 2023-04-14 16:01:43 1.605471 FALSE
##
        0.0000000 0.28
                         0.32
                               6701
                                     20237 2023-04-14 11:47:26 1.619143 FALSE
  32
##
   33
        3.1250064 0.26
                         0.30
                               2767
                                      8969 2023-04-14 11:42:02 1.636721 FALSE
##
        0.0000000 0.25
                         0.29
                                     12423 2023-04-13 15:12:03 1.644533 FALSE
   34
                                 10
##
  35
        0.0000000 0.24
                         0.28
                                 15
                                      5744 2023-04-14 09:57:06 1.652345 FALSE
## 36
        8.0000040 0.22
                         0.26
                                  4
                                      8646 2023-04-14 14:56:22 1.664064 FALSE
##
   37
        0.0000000 0.20
                         0.24
                               9501
                                     91675 2023-04-14 16:03:56 1.671877 FALSE
##
   38
      -14.2857070 0.16
                         0.20
                               3888
                                     38521 2023-04-14 16:06:24 1.695314 FALSE
        5.8823560 0.14
                               6408
                                     50589 2023-04-14 15:53:17 1.726564 FALSE
## 39
                         0.17
      -18.7500020 0.11
                                 27
                                     31977 2023-04-14 16:06:18 1.750001 FALSE
##
                         0.15
                         0.13 15535 253665 2023-04-14 15:59:50 1.781251 FALSE
## 41
       -7.6923065 0.10
## 42
       22.2222160 0.07
                         0.11
                                155 107093 2023-04-14 15:58:35 1.835938 FALSE
## 43
        0.0000000 0.05
                         0.09
                               4156
                                     45785 2023-04-14 15:38:43 1.875001 FALSE
       19.9999960 0.04
                         0.07
                               1408
                                     79968 2023-04-14 15:00:22 1.906250 FALSE
## 44
        0.0000000 0.03
                         0.06
                                     42751 2023-04-14 09:57:32 1.945313 FALSE
## 45
                                 15
       25.0000060 0.02
  46
                         0.05
                                773
                                     43042 2023-04-14 14:23:31 1.968750 FALSE
      -25.0000000 0.01
                         0.04 10675
                                     33646 2023-04-14 15:59:03 1.968750 FALSE
## 47
## 48
        0.0000000 0.00
                         0.04
                                  3
                                     75788 2023-04-12 11:46:02 1.968750 FALSE
## 49
        0.0000000 0.00
                         0.04
                                401 102891 2023-04-14 13:20:09 2.031255 FALSE
## 50
        0.0000000 0.00
                         0.05
                                  4
                                      3090 2023-04-11 11:55:28 2.140630 FALSE
                                     19904 2023-04-11 14:39:25 2.187505 FALSE
        0.0000000 0.00
                         0.05
## 51
                                  1
## 52
        0.0000000 0.00
                         0.05
                                 10
                                      1233 2023-04-06 14:05:01 2.281254 FALSE
                                100
                                       788 2023-04-04 11:05:43 2.312504 FALSE
## 53
        0.0000000 0.00
                         0.04
## 54
        0.0000000 0.00
                         0.04
                                720
                                      2363 2023-04-04 11:07:23 2.406254 FALSE
## 55
        0.0000000 0.00
                         0.03
                                370
                                      2801 2023-04-04 11:06:17 2.406254 FALSE
## 56
        0.0000000 0.00
                                     10131 2023-04-12 09:48:58 2.468754 FALSE
                         0.03
                                 10
## 57
        0.0000000 0.00
                         0.03
                                250
                                      3059 2023-03-31 14:09:29 2.531254 FALSE
## 58
        0.0000000 0.00
                         0.03
                                120
                                      3061 2023-03-29 15:20:00 2.593754 FALSE
## 59
        0.0000000 0.00
                        0.03
                                100
                                      5507 2023-03-29 10:47:18 2.656253 FALSE
```

```
Price
##
     10.000
## 1
## 2
       9.500
## 3
       9.000
## 4
       8.525
## 5
       8.025
## 6
       7.025
## 7
       6.525
## 8
       6.025
## 9
       5.525
## 10
       5.050
       4.125
## 11
## 12
       3.275
       2.610
## 13
## 14
       2.130
## 15
       1.825
## 16
       1.520
## 17
       1.335
       1.155
## 18
## 19
       1.015
## 20
       0.890
## 21
       0.790
## 22
       0.705
## 23
       0.635
## 24
       0.570
## 25
       0.520
## 26
       0.470
## 27
       0.430
## 28
       0.410
## 29
       0.390
       0.360
## 30
## 31
       0.325
## 32
       0.300
## 33
       0.280
## 34
       0.270
## 35
       0.260
## 36
       0.240
## 37
       0.220
## 38
       0.180
## 39
       0.155
## 40
       0.130
       0.115
## 41
## 42
       0.090
## 43
       0.070
## 44
       0.055
       0.045
## 45
## 46
       0.035
## 47
       0.025
## 48
       0.020
## 49
       0.020
## 50
       0.025
## 51
      0.025
## 52 0.025
## 53 0.020
```

```
## 54
       0.020
##
  55
       0.015
##
   56
       0.015
##
   57
       0.015
##
   58
       0.015
##
   59
       0.015
##
##
   $May.17.2023$puts
##
               ContractID ConractSize Currency Expiration Strike
                                                                       Last
##
   1
      VIX230517P00010000
                               REGULAR
                                             USD 2023-05-17
                                                                10.0
                                                                       0.01
##
   2
      VIX230517P00011000
                               REGULAR
                                             USD 2023-05-17
                                                                11.0
                                                                       0.01
                                                                12.0
##
   3
      VIX230517P00012000
                               REGULAR
                                             USD 2023-05-17
                                                                       0.01
##
   4
      VIX230517P00013000
                               REGULAR
                                             USD 2023-05-17
                                                                13.0
                                                                       0.01
##
   5
      VIX230517P00014000
                               REGULAR
                                             USD 2023-05-17
                                                                14.0
                                                                       0.01
##
      VIX230517P00014500
   6
                               REGULAR
                                             USD 2023-05-17
                                                                14.5
                                                                       0.01
##
      VIX230517P00015000
                               REGULAR
                                             USD
                                                 2023-05-17
                                                                15.0
                                                                       0.04
##
  8
      VIX230517P00016000
                                             USD 2023-05-17
                                                                       0.08
                               REGULAR
                                                                16.0
      VIX230517P00017000
                                             USD 2023-05-17
                                                                       0.23
##
                               REGULAR
                                                                17.0
   10 VIX230517P00018000
##
                               REGULAR
                                             USD 2023-05-17
                                                                18.0
                                                                       0.54
   11 VIX230517P00019000
                               REGULAR
                                             USD 2023-05-17
                                                                19.0
                                                                       1.06
##
   12 VIX230517P00020000
                               REGULAR
                                             USD 2023-05-17
                                                                20.0
                                                                       1.68
   13 VIX230517P00021000
                               REGULAR
                                             USD 2023-05-17
                                                                21.0
                                                                       2.44
                                                                       3.23
##
  14 VIX230517P00022000
                               REGULAR
                                             USD 2023-05-17
                                                                22.0
   15 VIX230517P00023000
                               REGULAR
                                             USD 2023-05-17
                                                                23.0
                                                                       4.06
##
   16 VIX230517P00024000
                               REGULAR
                                             USD 2023-05-17
                                                                24.0
                                                                       4.90
   17 VIX230517P00025000
                               REGULAR.
                                             USD 2023-05-17
                                                                25.0
                                                                       5.65
                                                                26.0
                                                                       6.65
   18
      VIX230517P00026000
                               REGULAR
                                             USD
                                                 2023-05-17
   19
      VIX230517P00027000
                               REGULAR
                                             USD 2023-05-17
                                                                27.0
                                                                       7.60
                                                                       8.20
##
   20 VIX230517P00028000
                               REGULAR
                                             USD 2023-05-17
                                                                28.0
   21 VIX230517P00029000
                               REGULAR
                                             USD 2023-05-17
                                                                29.0
                                                                       9.35
##
   22
      VIX230517P00030000
                               REGULAR
                                             USD
                                                 2023-05-17
                                                                30.0
                                                                      10.30
##
   23 VIX230517P00031000
                               REGULAR
                                             USD 2023-05-17
                                                               31.0
                                                                      11.22
      VIX230517P00032000
                               REGULAR
                                             USD 2023-05-17
                                                                32.0
                                                                      11.97
      VIX230517P00032500
##
   25
                                             USD 2023-05-17
                                                                32.5
                                                                      12.65
                               REGULAR
      VIX230517P00033000
                               REGULAR
                                             USD 2023-05-17
                                                                33.0
                                                                      11.05
##
   27
      VIX230517P00034000
                               REGULAR
                                             USD 2023-05-17
                                                               34.0
                                                                      14.08
   28 VIX230517P00035000
                               REGULAR
                                             USD 2023-05-17
                                                                35.0
                                                                      14.80
  29 VIX230517P00036000
                                             USD 2023-05-17
                                                                      14.65
##
                               REGULAR
                                                               36.0
   30 VIX230517P00037000
                                                                      16.90
                               REGULAR
                                             USD 2023-05-17
                                                               37.0
##
   31 VIX230517P00037500
                                             USD 2023-05-17
                                                               37.5
                                                                      16.10
                               REGULAR
   32 VIX230517P00040000
                               REGULAR
                                             USD 2023-05-17
                                                                40.0
                                                                      19.80
   33 VIX230517P00042500
                                                                42.5
                                                                      22.25
##
                               REGULAR
                                             USD 2023-05-17
   34 VIX230517P00045000
                               REGULAR
                                             USD 2023-05-17
                                                                45.0
                                                                      23.22
##
                                             USD 2023-05-17
                                                                47.5
                                                                      25.77
   35 VIX230517P00047500
                               REGULAR
   36 VIX230517P00050000
                               REGULAR
                                             USD 2023-05-17
                                                                50.0
                                                                      29.60
##
   37
      VIX230517P00055000
                               REGULAR
                                             USD 2023-05-17
                                                                55.0
                                                                      32.80
##
   38
      VIX230517P00060000
                               REGULAR
                                             USD 2023-05-17
                                                                60.0
                                                                      38.96
##
   39 VIX230517P00065000
                               REGULAR
                                             USD 2023-05-17
                                                                65.0
                                                                      42.67
                                                               70.0
   40 VIX230517P00070000
                               REGULAR
                                             USD 2023-05-17
                                                                      46.11
##
      VIX230517P00075000
                               REGULAR
                                             USD
                                                 2023-05-17
                                                               75.0
                                                                      54.30
##
   42 VIX230517P00080000
                               REGULAR
                                             USD 2023-05-17
                                                               80.0
                                                                      59.30
   43 VIX230517P00090000
                               REGULAR
                                             USD 2023-05-17
                                                               90.0
                                                                      61.25
  44 VIX230517P00100000
                               REGULAR
                                             USD 2023-05-17
                                                              100.0
                                                                      74.00
## 45 VIX230517P00110000
                               REGULAR
                                             USD 2023-05-17
                                                              110.0
                                                                      86.62
```

```
## 46 VIX230517P00130000
                               REGULAR
                                             USD 2023-05-17
                                                              130.0 106.00
## 47 VIX230517P00140000
                              REGULAR
                                            USD 2023-05-17
                                                              140.0 116.21
                                                              150.0 123.30
  48 VIX230517P00150000
                              REGULAR
                                             USD 2023-05-17
##
      VIX230517P00180000
                              REGULAR
                                            USD
                                                2023-05-17
                                                              180.0 157.55
##
                Chg
                        ChgPct
                                   Bid
                                          Ask
                                                 Vol
                                                        ΟI
                                                                  LastTradeTime
       0.00000000
## 1
                      0.000000
                                  0.00
                                         0.02
                                                   1
                                                        32 2023-03-29 10:52:29
## 2
                                                   3
       0.00000000
                      0.000000
                                  0.00
                                         0.02
                                                          7 2023-04-12 10:55:11
## 3
       0.00000000
                      0.00000
                                  0.00
                                         0.02
                                                  43
                                                        43 2023-04-13 09:45:31
##
   4
       0.00000000
                      0.000000
                                  0.00
                                         0.02
                                                   5
                                                          8 2023-03-10 14:15:30
##
  5
       0.00000000
                      0.000000
                                  0.00
                                         0.03
                                                 212
                                                      2777 2023-04-14 11:23:10
##
  6
      -0.010000000
                    -50.000000
                                  0.00
                                         0.04
                                                  11
                                                      1421 2023-04-14 16:14:11
##
  7
       0.020000000
                    100.000000
                                  0.01
                                         0.05
                                                1637 12914 2023-04-14 14:59:27
## 8
       0.00999998
                     14.285712
                                  0.06
                                                 436 31695 2023-04-14 16:04:48
                                         0.10
       0.03000001
## 9
                     15.000001
                                  0.23
                                         0.26
                                                2967 71617 2023-04-14 16:14:11
## 10
       0.050000012
                     10.204084
                                  0.55
                                         0.60 21773 60128 2023-04-14 16:09:35
##
       0.079999920
                      8.163258
                                  1.06
                                              10532 61157 2023-04-14 16:14:15
                                         1.13
##
       0.099999905
                      6.329108
                                  1.70
                                         1.77 13978 63630 2023-04-14 16:14:15
   12
   13
       0.160000090
                      7.017548
                                  2.42
                                                1146 75363 2023-04-14 16:13:36
##
                                         2.50
##
  14
       0.20000050
                      6.600662
                                  3.20
                                         3.30
                                                 133 64265 2023-04-14 16:00:11
                                  4.00
##
   15
       0.260000000
                      6.842105
                                         4.15
                                                  73 49828 2023-04-14 15:59:57
##
   16
       0.200000290
                      4.255325
                                  4.85
                                         5.00
                                                 116 48555 2023-04-14 15:59:50
                                                  24 42157 2023-04-14 15:53:17
##
  17
       0.099999905
                      1.801800
                                  5.75
                                         5.90
## 18
       0.210000040
                      3.260870
                                  6.60
                                         6.80
                                                 104 31453 2023-04-14 15:58:30
                                                  95 23397 2023-04-14 16:00:00
##
   19
       0.250000000
                      3.401361
                                  7.55
                                         7.70
##
  20
      -0.100000380
                     -1.204824
                                  8.45
                                         8.65
                                                  93
                                                      9900 2023-04-14 13:43:13
##
  21
       0.370000840
                      4.120277
                                  9.40
                                         9.60
                                                  68
                                                      1795 2023-04-14 15:11:47
   22
                      1.778659
                                 10.30
##
       0.180000300
                                        10.55
                                                  56
                                                      1891
                                                           2023-04-14 15:46:01
##
   23
       0.170000080
                      1.538462
                                 11.30
                                        11.50
                                                  72
                                                      1635 2023-04-14 15:06:38
##
                                 12.25
                                                   2
   24
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                      3.726172
                                        12.45
                                                       269 2023-04-14 13:24:59
                                        12.90
##
  25
       0.449999800
                      3.688523
                                 12.70
                                                   5
                                                        95 2023-04-14 14:39:35
##
   26
       0.00000000
                      0.000000
                                 13.20
                                        13.40
                                                  30
                                                        51
                                                           2023-03-28 09:37:46
##
   27
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                     11.746028
                                 14.15
                                        14.35
                                                   1
                                                           2023-04-14 15:06:07
##
   28
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                      0.000000
                                 15.10
                                        15.35
                                                       209 2023-04-13 10:35:52
                                                   1
                                 16.05
##
   29
       0.00000000
                      0.000000
                                        16.30
                                                        98 2023-04-03 13:13:37
                                                   1
##
   30
       0.00000000
                      0.000000
                                 17.05
                                        17.30
                                                   3
                                                            2023-04-13 11:29:21
##
                                 17.50
   31
       0.00000000
                      0.000000
                                        17.75
                                                   1
                                                       245 2023-04-03 12:50:34
##
   32
       0.00000000
                      0.000000
                                 19.95
                                        20.20
                                                   1
                                                        39 2023-04-13 11:34:17
##
  33
                      0.000000
                                 22.40
                                        22.65
                                                   3
                                                        20 2023-04-13 11:43:36
       0.00000000
   34
                                 24.85
                                        25.15
                                                  10
                                                        12 2023-03-29 15:47:25
##
       0.00000000
                      0.000000
                                 22.65
##
   35
       0.00000000
                      0.000000
                                        23.00
                                                  NA
                                                          2 2023-02-16 15:39:46
                                 29.80
##
   36
       0.00000000
                      0.000000
                                        30.05
                                                  39
                                                       282 2023-04-13 11:24:10
                      0.000000
                                 34.75
                                                   2
##
   37
       0.000000000
                                        35.00
                                                        29 2023-03-30 15:02:43
##
   38
       0.00000000
                      0.000000
                                 39.70
                                        40.00
                                                   2
                                                        47
                                                            2023-04-11 10:26:21
##
                      0.000000
                                 44.70
                                                   2
                                                           2023-03-30 15:02:43
   39
       0.00000000
                                        44.95
##
  40
       0.00000000
                      0.000000
                                 49.65
                                        49.90
                                                   2
                                                          5
                                                           2023-03-21 10:36:05
                                 54.60
## 41
       5.799999000
                     11.958761
                                        54.90
                                                   5
                                                          1
                                                           2023-04-14 12:21:36
                      0.00000
##
   42
       0.00000000
                                 59.60
                                        59.85
                                                  10
                                                        13 2023-04-13 14:30:47
##
   43
       0.00000000
                      0.000000
                                 63.30
                                        63.55
                                                  20
                                                        20 2022-11-14 13:32:40
##
   44
       0.00000000
                      0.000000
                                 79.50
                                        79.75
                                                   1
                                                       112 2023-03-24 10:48:50
##
   45
       0.00000000
                      0.000000
                                 83.75
                                        84.25
                                                   3
                                                           2023-02-13 11:59:04
##
   46
       0.00000000
                      0.000000
                                  0.00
                                         0.00
                                                  34
                                                           2023-02-21 05:26:08
                                                        39
##
  47
       0.00000000
                      0.000000 113.35 113.90
                                                   3
                                                          3 2023-02-13 11:59:04
## 48
       0.000000000
                      0.000000 128.70 128.85
                                                   1
                                                       119 2023-03-13 09:37:17
## 49
       0.000000000
                      0.000000 159.15 159.40
                                                   8
                                                        19 2023-04-06 12:09:29
```

```
ΙV
                  ITM
                         Price
## 1 0.7812522 FALSE
                         0.010
## 2 0.6562534 FALSE
                         0.010
## 3
     0.5312547 FALSE
                         0.010
## 4
      0.4687553 FALSE
                         0.010
## 5
    0.3867249 FALSE
                         0.015
    0.3496159 FALSE
## 6
                         0.020
## 7
     0.3046945 FALSE
                         0.030
## 8
     0.2275468 FALSE
                         0.080
## 9 0.1455164 FALSE
                         0.245
## 10 0.0000100
                 TRUE
                         0.575
## 11 0.0000100
                 TRUE
                         1.095
## 12 0.0000100
                 TRUE
                         1.735
## 13 0.0000100
                 TRUE
                         2.460
## 14 0.0000100
                         3.250
                 TRUE
## 15 0.0000100
                 TRUE
                         4.075
## 16 0.0000100
                         4.925
                 TRUE
## 17 0.0000100
                 TRUE
                         5.825
## 18 0.0000100
                         6.700
                 TRUE
## 19 0.0000100
                 TRUE
                         7.625
## 20 0.0000100
                 TRUE
                         8.550
## 21 0.0000100
                 TRUE
                         9.500
## 22 0.0000100
                 TRUE
                        10.425
## 23 0.0000100
                 TRUE
                        11.400
## 24 0.0000100
                 TRUE
                       12.350
## 25 0.0000100
                 TRUE
                       12.800
## 26 0.0000100
                 TRUE
                       13.300
## 27 0.0000100
                 TRUE
                       14.250
## 28 0.0000100
                 TRUE
                       15.225
## 29 0.0000100
                 TRUE
                       16.175
## 30 0.0000100
                 TRUE
                        17.175
## 31 0.0000100
                 TRUE
                        17.625
## 32 0.0000100
                 TRUE
                       20.075
                        22.525
## 33 0.0000100
                 TRUE
## 34 0.0000100
                 TRUE
                        25.000
                 TRUE
## 35 0.0000100
                       22.825
## 36 0.0000100
                 TRUE
                       29.925
## 37 0.0000100
                 TRUE
                        34.875
## 38 0.0000100
                 TRUE
                        39.850
## 39 0.0000100
                       44.825
                 TRUE
## 40 0.0000100
                 TRUE
                       49.775
## 41 0.0000100
                 TRUE
                       54.750
## 42 0.0000100
                 TRUE
                       59.725
## 43 0.0000100
                 TRUE
                       63.425
## 44 0.0000100
                 TRUE
                       79.625
## 45 0.0000100
                 TRUE
                       84.000
## 46 0.0000100
                 TRUE
                         0.000
## 47 0.0000100
                 TRUE 113.625
## 48 0.0000100
                 TRUE 128.775
## 49 0.0000100
                 TRUE 159.275
##
##
## $Jun.21.2023
## $Jun.21.2023$calls
```

##		ContractID	ConractSize	Currency	Expiration	Strike	Last	Chg
##	1	VIX230621C00010000	REGULAR	USD	2023-06-21	10.0	11.67	-0.01000023
##	2	VIX230621C00011000	REGULAR	USD	2023-06-21	11.0	10.62	0.01999950
##	3	VIX230621C00012000	REGULAR	USD	2023-06-21	12.0	9.82	-0.57999990
##	4	VIX230621C00013000	REGULAR	USD	2023-06-21	13.0	9.00	0.00000000
##	5	VIX230621C00014000	REGULAR	USD	2023-06-21	14.0	9.00	0.00000000
##	6	VIX230621C00015000	REGULAR	USD	2023-06-21	15.0	6.80	0.10000038
##	7	VIX230621C00016000	REGULAR	USD	2023-06-21	16.0	5.80	-0.04999971
##	8	VIX230621C00017000	REGULAR	USD	2023-06-21	17.0	5.00	-0.01999998
##	9	VIX230621C00018000	REGULAR	USD	2023-06-21	18.0	4.25	-0.07000017
##	10	VIX230621C00019000	REGULAR	USD	2023-06-21	19.0	3.70	-0.04999995
##	11	VIX230621C00020000	REGULAR		2023-06-21	20.0	3.30	-0.04999995
##	12	VIX230621C00021000	REGULAR		2023-06-21	21.0	2.88	-0.01999998
##	13	VIX230621C00022000	REGULAR		2023-06-21	22.0	2.60	-0.04000020
##	14	VIX230621C00023000	REGULAR		2023-06-21	23.0	2.32	-0.04999995
##	15	VIX230621C00024000	REGULAR		2023-06-21	24.0	2.08	-0.05000019
##	16	VIX230621C00025000	REGULAR		2023-06-21	25.0	1.90	-0.05000007
##		VIX230621C00026000	REGULAR	USD	2023-06-21	26.0	1.74	0.03999996
##		VIX230621C00027000	REGULAR	USD	2023-06-21	27.0	1.60	-0.02999997
##		VIX230621C00028000	REGULAR	USD		28.0		-0.02999997
##		VIX230621C00029000	REGULAR	USD	2023-06-21	29.0		-0.01999998
##		VIX230621C00030000	REGULAR	USD	2023-06-21	30.0		-0.01999998
##		VIX230621C00031000	REGULAR	USD	2023-06-21	31.0		-0.00999999
##		VIX230621C00032000	REGULAR	USD	2023-06-21	32.0	1.10	0.06000006
##		VIX230621C00032500	REGULAR	USD	2023-06-21	32.5	1.05	0.00000000
##		VIX230621C00033000	REGULAR	USD	2023-06-21	33.0		-0.01999998
##		VIX230621C00034000	REGULAR	USD	2023-06-21	34.0	0.95	0.02999997
##		VIX230621C00035000	REGULAR	USD	2023-06-21	35.0	0.89	0.00000000
##		VIX230621C00036000	REGULAR	USD	2023-06-21	36.0		-0.08000004
##		VIX230621C00037000	REGULAR	USD	2023-06-21	37.0	0.80	0.04000002
##		VIX230621C00037500	REGULAR	USD	2023-06-21	37.5	0.83	0.07999998
##		VIX230621C00038000	REGULAR	USD	2023-06-21	38.0	0.72	0.01000005
##		VIX230621C00039000	REGULAR	USD	2023-06-21	39.0	0.67	0.00999999
##		VIX230621C00040000	REGULAR	USD	2023-06-21	40.0	0.65	0.01999998
##		VIX230621C00042500 VIX230621C00045000	REGULAR	USD	2023-06-21	42.5	0.56	0.03000003
##		VIX230621C00045000 VIX230621C00047500	REGULAR REGULAR	USD	2023-06-21 2023-06-21	45.0 47.5	0.50	0.00999999
##		VIX230621C00050000 VIX230621C00055000	REGULAR REGULAR		2023-06-21 2023-06-21	50.0 55.0	0.38	0.00000000
		VIX230621C00053000 VIX230621C00060000	REGULAR		2023 00 21	60.0		-0.03000000
##		VIX230621C00065000	REGULAR		2023 00 21	65.0	0.22	0.0000000
##		VIX230621C00003000	REGULAR		2023 00 21	70.0		-0.01000000
##		VIX230621C00076000	REGULAR		2023 00 21	75.0	0.14	0.0000000
##		VIX230621C00075000 VIX230621C00080000	REGULAR		2023 00 21	80.0		-0.04000000
##		VIX230621C00085000	REGULAR		2023-06-21	85.0	0.12	0.00000000
##		VIX230621C00090000	REGULAR		2023-06-21	90.0	0.10	0.02000000
##		VIX230621C00095000	REGULAR		2023-06-21	95.0	0.10	0.00000000
##		VIX230621C00100000	REGULAR		2023-06-21	100.0	0.06	0.00000000
##		VIX230621C00110000	REGULAR		2023-06-21	110.0		-0.01000000
##		VIX230621C00120000	REGULAR		2023-06-21	120.0	0.04	0.00000000
##		VIX230621C00130000	REGULAR		2023-06-21	130.0	0.05	0.00000000
##		VIX230621C00140000	REGULAR		2023-06-21	140.0	0.03	0.00000000
##		VIX230621C00150000	REGULAR		2023-06-21	150.0	0.03	0.00000000
		VIX230621C00160000	REGULAR		2023-06-21	160.0		-0.01000000

```
## 54 VIX230621C00170000
                              REGULAR
                                            USD 2023-06-21 170.0 0.02
                                                                          0.00000000
## 55 VIX230621C00180000
                                            USD 2023-06-21 180.0
                                                                   0.04
                                                                          0.00000000
                              REGULAR
                                                   LastTradeTime
##
            ChgPct
                      Bid
                            Ask
                                 Vol
                                         ΩT
                                                                        ΙV
                                                                              TTM
##
       -0.08561839 11.35
                                         993 2023-04-14 16:06:40 3.623048
                                                                             TRIIE
  1
                         11.65
                                  42
                                 109
##
   2
        0.18867455 10.40 10.65
                                        1089 2023-04-14 14:57:49 3.240236
                                                                             TRUE
   3
                    9.40
                                  25
                                         411 2023-04-10 13:06:44 2.894534
##
       -5.57692240
                           9.65
                                                                             TRUE
##
        0.00000000
                    8.40
                           8.65
                                   2
                                         813 2023-04-12 12:01:16 2.585941
                                                                             TRUE
                    7.45
## 5
        0.00000000
                           7.70
                                   2
                                          53 2023-04-04 15:50:06 2.327153
                                                                             TRUE
##
   6
        1.49254310
                     6.50
                           6.75
                                 976
                                        2694 2023-04-14 15:53:27 2.087407
                                                                             TRUE
                                  85
##
  7
       -0.85469600
                     5.55
                           5.80
                                         542 2023-04-14 16:13:12 1.861329
                                                                             TRUE
##
  8
       -0.39840603
                     4.75
                           5.00
                                 143
                                         620 2023-04-14 16:13:27 1.699220
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                    4.20
                                 510
##
  9
       -1.62037420
                           4.30
                                        1563 2023-04-14 16:11:48 1.599611 FALSE
##
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                    3.55
                           3.75
                                 509
                                        8498 2023-04-14 16:12:45 1.502932 FALSE
  10
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##
  11
                    3.10
                           3.30
                                1188
                                       29282 2023-04-14 16:09:01 1.451175 FALSE
## 12
                     2.75
                           2.89
                                 241
                                        8305 2023-04-14 16:14:26 1.414065 FALSE
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##
   13
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                    2.45
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                                 326
                                       82354 2023-04-14 15:57:36 1.394046 FALSE
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                                 543 145006 2023-04-14 15:59:16 1.384769 FALSE
##
   14
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       -2.34742670
                     1.99
                           2.11 1092
                                       62411 2023-04-14 15:59:55 1.379886 FALSE
##
   15
  16
                           1.92 1163
                                      84428 2023-04-14 16:11:50 1.378909 FALSE
##
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##
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                           1.75
                                  65
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##
   18
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                           1.61
                                 165
                                       81169 2023-04-14 15:57:36 1.386722 FALSE
                                 390
                                       57525 2023-04-14 15:58:29 1.384769 FALSE
##
  19
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                           1.48
                                       12587 2023-04-14 16:02:49 1.396487 FALSE
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  20
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                           1.37
                                 129
                           1.27 3988 488245 2023-04-14 16:11:01 1.401370 FALSE
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   21
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                    1.20
##
  22
       -0.86206810
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                           1.17
                                   6
                                        1815 2023-04-14 15:47:35 1.405276 FALSE
##
   23
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                           1.09
                                 573
                                       96068 2023-04-14 15:17:24 1.411136 FALSE
##
        0.0000000
                    0.97
                           1.06
                                   7
                                        4449 2023-04-14 15:53:28 1.410159 FALSE
   24
##
   25
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                           1.02
                                 115
                                        3169 2023-04-14 16:04:00 1.418460 FALSE
##
                    0.87
                           0.95
                                       94074 2023-04-14 15:56:40 1.417972 FALSE
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        3.26086660
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##
   27
        0.00000000
                     0.84
                           0.89
                                 976
                                      74027 2023-04-14 15:23:27 1.431643 FALSE
##
   28
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                           0.84
                                   6
                                        2127 2023-04-14 10:11:18 1.437503 FALSE
##
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                           0.79
                                 286
                                       27070 2023-04-14 11:41:15 1.443362 FALSE
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       10.6666500
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                           0.76
                                   1
                                       13650 2023-04-14 12:54:59 1.445315 FALSE
                                  53
                                        3391 2023-04-14 16:06:48 1.441409 FALSE
##
   31
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                           0.73
##
   32
        1.51515000
                    0.65
                           0.69
                                1003
                                        1738 2023-04-14 15:58:24 1.455081 FALSE
##
                    0.61
                           0.66 6747 438741 2023-04-14 15:59:38 1.462893 FALSE
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                                 160
                                      10997 2023-04-14 14:56:50 1.476565 FALSE
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                                 409
                                       34171 2023-04-14 15:58:50 1.490237 FALSE
        4.76190760
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                           0.45
                                  40
                                        2548 2023-04-14 13:48:46 1.505862 FALSE
##
   36
                    0.36
                           0.40
                                 529 106388 2023-04-14 16:06:18 1.521487 FALSE
##
  37
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                                       31372 2023-04-14 12:00:46 1.542971 FALSE
   38
       10.34482900
                     0.28
                           0.32 1108
      -12.00000000
                    0.22
                           0.26 4952 104312 2023-04-14 16:14:50 1.562502 FALSE
##
   39
##
   40
        0.00000000
                    0.18
                           0.21 8628
                                       25961 2023-04-13 15:48:11 1.578127 FALSE
##
       -5.88235600
                    0.14
                           0.18
                                       53127 2023-04-14 16:06:48 1.593752 FALSE
   41
                                   1
## 42
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                    0.12
                           0.16 4540
                                       34986 2023-04-14 15:56:32 1.621096 FALSE
                                 101
                     0.10
                                       25187 2023-04-14 14:19:18 1.636721 FALSE
## 43
      -28.57142600
                           0.14
##
   44
        0.00000000
                     0.08
                           0.12
                                  16
                                       53198 2023-04-12 15:00:24 1.644533 FALSE
##
   45
       25.00000600
                     0.07
                           0.10 1101
                                       16815 2023-04-14 13:21:24 1.656252 FALSE
##
   46
        0.00000000
                     0.05
                           0.09 6000
                                       15845 2023-04-05 15:55:31 1.656252 FALSE
##
   47
        0.00000000
                     0.04
                           0.08 1060
                                       7855 2023-04-13 15:11:45 1.664064 FALSE
                                4600
                                       12626 2023-04-14 10:45:54 1.703126 FALSE
##
   48
      -20.00000400
                    0.03
                           0.07
##
  49
        0.00000000
                    0.02
                           0.06
                                   1
                                        3448 2023-04-14 16:14:20 1.718751 FALSE
## 50
        0.00000000
                    0.01
                           0.05
                                  45
                                        4025 2023-04-06 10:08:54 1.726564 FALSE
## 51
        0.00000000 0.01
                           0.04
                                   1
                                         985 2023-04-14 16:01:44 1.750001 FALSE
```

```
0.00000000 0.00 0.05
                                       3870 2023-04-10 09:41:36 1.796876 FALSE
## 52
                                  1
## 53 -33.33333600 0.00
                          0.05
                                   1
                                       1041 2023-04-14 15:59:40 1.828126 FALSE
        0.00000000 0.00
                                       3976 2023-04-14 14:48:31 1.875001 FALSE
## 54
                          0.05
                                   5
## 55
        0.00000000 0.00 0.05
                                  11 17766 2023-03-31 15:48:38 1.906250 FALSE
##
       Price
## 1 11.500
## 2
     10.525
## 3
       9.525
## 4
       8.525
## 5
       7.575
## 6
       6.625
## 7
       5.675
## 8
       4.875
## 9
       4.250
## 10 3.650
## 11
       3.200
## 12
       2.820
       2.515
## 13
## 14
       2.265
## 15
       2.050
## 16
       1.865
## 17
       1.700
      1.570
## 18
## 19
       1.430
## 20
      1.335
## 21
      1.235
## 22
       1.140
## 23
       1.060
## 24
      1.015
## 25
      0.990
## 26
       0.910
## 27
       0.865
## 28
       0.810
## 29
       0.760
## 30
       0.735
## 31
      0.700
## 32
      0.670
## 33
       0.635
## 34
       0.550
       0.480
## 35
## 36
       0.425
## 37
       0.380
## 38
       0.300
## 39
       0.240
## 40
       0.195
## 41
       0.160
## 42
       0.140
## 43
       0.120
       0.100
## 44
## 45
       0.085
## 46
       0.070
## 47
      0.060
## 48 0.050
## 49 0.040
```

```
## 50
       0.030
##
  51
       0.025
##
   52
       0.025
##
   53
       0.025
##
   54
       0.025
##
       0.025
   55
##
##
   $Jun.21.2023$puts
##
               ContractID ConractSize Currency Expiration Strike
                                                                      Last
                                                                                     Chg
##
   1
      VIX230621P00010000
                               REGULAR
                                             USD 2023-06-21
                                                               10.0
                                                                      0.01
                                                                             0.0000000
##
   2
      VIX230621P00011000
                               REGULAR
                                             USD 2023-06-21
                                                               11.0
                                                                      0.01
                                                                             0.0000000
   3
                                                               12.0
                                                                      0.01
##
      VIX230621P00012000
                               REGULAR
                                             USD
                                                 2023-06-21
                                                                             0.00000000
##
   4
      VIX230621P00013000
                               REGULAR
                                             USD 2023-06-21
                                                               13.0
                                                                      0.01
                                                                             0.00000000
                                                 2023-06-21
                                                                            -0.01000000
##
   5
      VIX230621P00014000
                               REGULAR
                                             USD
                                                               14.0
                                                                      0.02
##
                                                                      0.06
   6
      VIX230621P00015000
                               REGULAR
                                             USD 2023-06-21
                                                               15.0
                                                                             0.02000000
##
   7
      VIX230621P00016000
                               REGULAR
                                             USD
                                                 2023-06-21
                                                               16.0
                                                                      0.12
                                                                             0.02999999
                                                                      0.29
##
   8
      VIX230621P00017000
                                             USD 2023-06-21
                                                               17.0
                                                                             0.03000000
                               REGULAR
      VIX230621P00018000
                                             USD 2023-06-21
                                                               18.0
                                                                      0.59
                                                                             0.0399996
##
                               REGULAR
   10 VIX230621P00019000
                                                                      1.00
##
                              REGULAR
                                             USD 2023-06-21
                                                               19.0
                                                                             0.02999997
      VIX230621P00020000
                               REGULAR
                                             USD 2023-06-21
                                                               20.0
                                                                      1.52
                                                                             0.00999999
##
   12 VIX230621P00021000
                               REGULAR
                                             USD 2023-06-21
                                                               21.0
                                                                      2.13
                                                                             0.01000023
                                                                      2.84
   13 VIX230621P00022000
                               REGULAR
                                             USD 2023-06-21
                                                               22.0
                                                                             0.03999996
  14 VIX230621P00023000
                               REGULAR
                                             USD 2023-06-21
                                                               23.0
                                                                      3.57
                                                                             0.01999998
##
                                                                      4.35
##
   15 VIX230621P00024000
                               REGULAR
                                             USD 2023-06-21
                                                               24.0
                                                                             0.0000000
##
  16 VIX230621P00025000
                              REGULAR
                                             USD 2023-06-21
                                                               25.0
                                                                      5.15
                                                                             0.0000000
   17 VIX230621P00026000
                               REGULAR
                                             USD 2023-06-21
                                                               26.0
                                                                      5.85
                                                                            -0.15000010
      VIX230621P00027000
                                                               27.0
                                                                      6.85
##
   18
                               REGULAR
                                             USD
                                                 2023-06-21
                                                                             0.04999971
   19
      VIX230621P00028000
                               REGULAR
                                             USD
                                                 2023-06-21
                                                               28.0
                                                                      7.70
                                                                             0.04999971
   20 VIX230621P00029000
                                                               29.0
                                                                      8.57
##
                               REGULAR
                                             USD 2023-06-21
                                                                             0.11999989
  21 VIX230621P00030000
                               REGULAR
                                             USD 2023-06-21
                                                               30.0
                                                                      9.44
                                                                             0.33999920
##
   22
      VIX230621P00031000
                               REGULAR
                                             USD
                                                 2023-06-21
                                                               31.0
                                                                      9.63
                                                                             0.00000000
##
   23
      VIX230621P00032000
                               REGULAR
                                             USD
                                                 2023-06-21
                                                               32.0
                                                                     11.09
                                                                             0.14000034
##
      VIX230621P00032500
                               REGULAR
                                             USD
                                                 2023-06-21
                                                               32.5
                                                                      11.46
                                                                             0.0000000
##
   25
      VIX230621P00033000
                               REGULAR
                                             USD
                                                 2023-06-21
                                                               33.0
                                                                     12.17
                                                                             0.02000046
                                                                             0.0000000
      VIX230621P00034000
                               REGULAR
                                             USD
                                                 2023-06-21
                                                                     12.25
   26
                                                               34.0
                                                                     14.00
##
   27
      VIX230621P00035000
                               REGULAR
                                             USD 2023-06-21
                                                               35.0
                                                                             0.0000000
##
   28 VIX230621P00036000
                               REGULAR
                                             USD 2023-06-21
                                                               36.0
                                                                     14.90
                                                                             0.0000000
  29 VIX230621P00037000
                                             USD 2023-06-21
                                                               37.0
                                                                     15.60
##
                               REGULAR
                                                                             1.00000000
   30 VIX230621P00037500
                                             USD 2023-06-21
                                                                      15.30
                               REGULAR
                                                               37.5
                                                                             0.00000000
##
   31 VIX230621P00038000
                                             USD 2023-06-21
                                                               38.0
                                                                     14.75
                                                                             0.0000000
                              REGULAR
   32 VIX230621P00039000
                              REGULAR
                                             USD 2023-06-21
                                                               39.0
                                                                     15.15
                                                                             0.0000000
   33 VIX230621P00040000
                                                 2023-06-21
                                                                     18.55
##
                               REGULAR
                                             USD
                                                               40.0
                                                                             0.00000000
   34 VIX230621P00042500
                               REGULAR
                                             USD 2023-06-21
                                                               42.5
                                                                     19.25
                                                                             0.0000000
##
   35 VIX230621P00045000
                                                 2023-06-21
                                                               45.0
                                                                     22.45
                               REGULAR
                                             USD
                                                                             0.00000000
   36 VIX230621P00047500
                               REGULAR
                                             USD 2023-06-21
                                                               47.5
                                                                     24.70
                                                                             0.00000000
                                                                     28.24
##
   37
      VIX230621P00050000
                               REGULAR
                                             USD
                                                 2023-06-21
                                                               50.0
                                                                            -0.07999992
##
   38
      VIX230621P00055000
                               REGULAR
                                             USD 2023-06-21
                                                               55.0
                                                                      31.82
                                                                             0.0000000
                                                                     38.02
##
   39 VIX230621P00060000
                               REGULAR
                                             USD 2023-06-21
                                                               60.0
                                                                            -0.09000015
                                                                             0.0000000
   40 VIX230621P00065000
                               REGULAR
                                             USD
                                                 2023-06-21
                                                               65.0
                                                                     41.60
##
   41
      VIX230621P00070000
                               REGULAR
                                             USD
                                                 2023-06-21
                                                               70.0
                                                                      44.65
                                                                             0.0000000
                                                                     57.80
##
   42 VIX230621P00080000
                               REGULAR
                                             USD
                                                 2023-06-21
                                                               80.0
                                                                             0.0000000
   43 VIX230621P00100000
                               REGULAR
                                             USD 2023-06-21
                                                              100.0
                                                                     76.25
                                                                             0.0000000
  44 VIX230621P00110000
                               REGULAR
                                             USD 2023-06-21
                                                              110.0
                                                                     85.00
                                                                             0.0000000
## 45 VIX230621P00130000
                               REGULAR
                                             USD 2023-06-21
                                                              130.0 105.12
                                                                             0.00000000
```

```
## 46 VIX230621P00150000
                              REGULAR
                                            USD 2023-06-21 150.0 124.88 0.00000000
                                    Vol
##
                                                                             TV
           ChgPct
                      Bid
                             Ask
                                            ΩT
                                                      LastTradeTime
                                                                                  TTM
## 1
        0.000000
                     0.00
                            0.02
                                      2
                                             5 2023-03-31 11:20:31 0.5312547 FALSE
##
  2
        0.0000000
                     0.00
                            0.02
                                      4
                                             5 2023-03-15 12:24:09 0.4921926 FALSE
##
  3
        0.000000
                     0.00
                            0.02
                                      5
                                            10 2023-03-21 09:52:01 0.4062559 FALSE
        0.000000
                     0.00
                            0.03
                                      4
                                           165 2023-04-14 13:49:20 0.3476628 FALSE
##
  4
                                           672 2023-04-14 14:17:17 0.2968820 FALSE
## 5
      -33.3333360
                     0.00
                            0.05
                                     14
       50.000000
## 6
                     0.03
                            0.07 29256
                                        105444 2023-04-14 16:00:07 0.2304764 FALSE
##
   7
       33.3333240
                     0.11
                            0.15
                                     89
                                         20089 2023-04-14 16:10:46 0.1836019 FALSE
## 8
       11.5384630
                     0.28
                            0.31
                                    240
                                         33439 2023-04-14 16:00:07 0.1181729 FALSE
## 9
        7.2727203
                     0.57
                            0.63 12961
                                         51502 2023-04-14 16:10:46 0.0000100
        3.0927806
                     0.99
                                   7388
                                         84123 2023-04-14 16:11:07 0.0000100
                                                                                 TRUE
##
  10
                            1.06
##
        0.6622511
                     1.53
                            1.60
                                    219
                                         53122 2023-04-14 15:34:49 0.0000100
                                                                                TRUE
  11
## 12
        0.4717089
                     2.15
                            2.23
                                   5016
                                         24674 2023-04-14 15:17:07 0.0000100
                                                                                 TRUE
## 13
        1.4285702
                                    169
                                         92716 2023-04-14 15:51:08 0.0000100
                                                                                 TRUE
                     2.84
                            2.95
##
   14
        0.5633798
                     3.55
                            3.70
                                    249
                                         57548 2023-04-14 15:32:31 0.0000100
                                                                                 TRUE
  15
        0.000000
                     4.30
                                      7
                                         61923 2023-04-14 15:53:16 0.0000100
##
                            4.45
                                                                                 TRUE
##
   16
        0.000000
                     5.15
                            5.30
                                         19142 2023-04-14 15:56:35 0.0000100
                                                                                 TRUE
  17
       -2.5000014
                                         14132 2023-04-14 13:26:03 0.0000100
                                                                                 TRUE
##
                     5.95
                            6.10
                                     61
##
   18
        0.7352899
                     6.80
                            6.95
                                     36
                                          9858 2023-04-14 15:20:29 0.0000100
                                                                                 TRUE
##
  19
        0.6535910
                     7.65
                            7.85
                                    216
                                          6880 2023-04-14 15:42:20 0.0000100
                                                                                 TRUE
##
  20
        1.4201170
                     8.55
                                   2000
                                           929 2023-04-14 16:11:07 0.0000100
                                                                                 TRUE
                            8.70
                     9.45
                                           598 2023-04-14 15:56:35 0.0000100
## 21
        3.7362550
                            9.60
                                      6
                                                                                 TRUE
                    10.35
                                     20
                                           329 2023-04-06 14:43:13 0.0000100
##
  22
        0.0000000
                           10.50
                                                                                 TRUE
                                      2
                                           217 2023-04-14 13:24:59 0.0000100
##
  23
        1.2785420
                    11.25
                           11.45
                                                                                 TRUE
##
  24
        0.000000
                    11.70
                           11.85
                                    154
                                           403 2023-04-12 13:06:53 0.0000100
                                                                                 TRUE
##
   25
        0.1646128
                    12.15
                                     12
                                            78 2023-04-14 15:31:58 0.0000100
                                                                                 TRUE
                           12.35
##
   26
        0.0000000
                    13.10
                           13.25
                                     10
                                            55 2023-04-04 09:36:42 0.0000100
                                                                                 TRUE
##
  27
        0.000000
                    14.00
                                     30
                                           115 2023-04-13 13:51:23 0.0000100
                                                                                 TRUE
                           14.25
##
  28
        0.0000000
                    14.95
                                      2
                                           102 2023-04-13 13:36:59 0.0000100
                                                                                 TRUE
                           15.15
##
  29
        6.8493150
                    15.90
                           16.10
                                     40
                                           701 2023-04-04 11:15:38 0.0000100
                                                                                 TRUE
##
   30
        0.000000
                    16.35
                           16.60
                                      3
                                              8 2023-03-31 10:02:01 0.0000100
                                                                                 TRUE
##
   31
        0.000000
                    16.25
                           16.35
                                      1
                                           565 2023-01-10 11:45:50 0.0000100
                                                                                 TRUE
        0.000000
                                              1 2023-03-10 13:45:23 0.0000100
                                                                                 TRUE
##
   32
                    16.80
                           17.05
                                     ΝA
##
   33
        0.000000
                    18.75
                           18.95
                                      2
                                               2023-04-13 09:46:02 0.0000100
                                                                                 TRUE
                                                                                 TRUE
##
        0.000000
                     0.00
                                      5
                                            20 2023-01-12 09:40:52 0.0000100
   34
                            0.00
##
   35
        0.000000
                    23.55
                           23.75
                                      1
                                             17 2023-03-31 10:26:36 0.0000100
                                                                                 TRUE
##
  36
        0.000000
                    25.95
                           26.20
                                    205
                                           215 2023-03-22 14:08:44 0.0000100
                                                                                 TRUE
   37
       -0.2824856
                    28.35
                           28.65
                                      5
                                            85 2023-04-14 10:39:37 0.0000100
                                                                                 TRUE
##
        0.000000
                    33.25
                                      2
                                            44 2023-04-04 11:29:33 0.0000100
##
  38
                           33.50
                                                                                 TRUE
       -0.2361589
                                            17 2023-04-14 10:39:37 0.0000100
##
   39
                    38.15
                           38.40
                                      5
                                                                                 TRUE
        0.0000000
                    43.05
                                      2
                                            54 2023-04-04 11:29:33 0.0000100
                                                                                 TRUE
##
   40
                           43.30
##
   41
        0.0000000
                    47.95
                           48.25
                                      6
                                            54 2023-03-24 10:34:58 0.0000100
                                                                                 TRUE
                    56.55
##
        0.000000
                           56.75
                                      1
                                             0 2023-03-06 10:35:55 0.0000100
                                                                                 TRUE
  42
## 43
        0.0000000
                    77.60
                           77.85
                                      8
                                           329 2023-03-30 10:34:02 0.0000100
                                                                                 TRUE
        0.0000000
                   87.50
                                             4 2023-03-21 12:23:21 0.0000100
##
  44
                           87.75
                                      1
                                                                                 TRUE
##
  45
        0.0000000 104.20 104.55
                                      1
                                             0
                                               2023-02-22 12:14:42 0.0000100
                                                                                 TRUE
##
  46
        0.0000000 116.20
                            0.00
                                    100
                                           324 2023-02-10 09:30:09 0.0000100
                                                                                TRUE
##
        Price
##
  1
        0.010
## 2
        0.010
## 3
        0.010
## 4
        0.015
## 5
        0.025
```

```
## 6
       0.050
## 7
       0.130
## 8
       0.295
## 9
       0.600
## 10
        1.025
## 11
       1.565
## 12
       2.190
## 13
       2.895
## 14
        3.625
## 15
       4.375
## 16
        5.225
## 17
       6.025
## 18
       6.875
## 19
       7.750
## 20
       8.625
## 21
       9.525
## 22 10.425
## 23 11.350
## 24 11.775
## 25 12.250
## 26 13.175
## 27 14.125
## 28 15.050
## 29 16.000
## 30 16.475
## 31 16.300
## 32 16.925
## 33 18.850
## 34
       0.000
## 35 23.650
## 36 26.075
## 37 28.500
## 38 33.375
## 39 38.275
## 40 43.175
## 41 48.100
## 42 56.650
## 43 77.725
## 44 87.625
## 45 104.375
## 46 58.100
#4. For calls and puts of VIX.options at each expiration, add a column of InTheMoney, which takes value
for (i in 1:length(VIX.options.all)) {
  VIX.options.all[[i]]$calls$InTheMoney<-VIX.options.all[[i]]$calls$Strike < VIX_Last</pre>
  VIX.options.all[[i]] $puts$InTheMoney<-VIX.options.all[[i]] $puts$Strike > VIX_Last
print(head(VIX.options.all))
## $Apr.19.2023
## $Apr.19.2023$calls
##
              ContractID ConractSize Currency Expiration Strike Last
                                                                               Chg
```

```
## 1
      VIX230419C00010000
                              REGULAR
                                            USD 2023-04-19
                                                              10.0 8.35 -0.46999930
##
   2
      VIX230419C00010500
                              REGULAR
                                            USD 2023-04-19
                                                              10.5 10.39
                                                                           0.00000000
                                                                    7.45 -0.65000060
##
   3
      VIX230419C00011000
                              REGULAR
                                            USD 2023-04-19
                                                              11.0
      VIX230419C00011500
                                            USD 2023-04-19
                                                                    9.39
##
   4
                              REGULAR
                                                              11.5
                                                                           0.00000000
##
   5
      VIX230419C00012000
                              REGULAR
                                            USD 2023-04-19
                                                              12.0
                                                                    7.05
                                                                           0.00000000
##
   6
      VIX230419C00012500
                              REGULAR
                                            USD 2023-04-19
                                                              12.5
                                                                    9.05
                                                                           0.00000000
##
   7
      VIX230419C00013000
                              REGULAR
                                            USD 2023-04-19
                                                              13.0
                                                                    5.51 -1.43999960
## 8
      VIX230419C00013500
                              REGULAR
                                            USD 2023-04-19
                                                              13.5
                                                                    5.95
                                                                           0.00000000
##
  q
      VIX230419C00014000
                              REGULAR
                                            USD 2023-04-19
                                                              14.0
                                                                    4.90 -0.54999970
##
  10 VIX230419C00014500
                              REGULAR
                                            USD 2023-04-19
                                                              14.5
                                                                    4.85
                                                                           0.00000000
   11 VIX230419C00015000
                              REGULAR
                                            USD 2023-04-19
                                                              15.0
                                                                    3.40 -0.44999980
                                                2023-04-19
##
   12 VIX230419C00016000
                              REGULAR
                                            USD
                                                              16.0
                                                                    2.30 -0.58000016
   13 VIX230419C00017000
                              REGULAR
                                            USD 2023-04-19
                                                              17.0
                                                                    1.35 -0.50000000
##
   14 VIX230419C00018000
                              REGULAR
                                            USD 2023-04-19
                                                              18.0
                                                                    0.67 - 0.38999993
  15 VIX230419C00019000
                                            USD 2023-04-19
##
                              REGULAR
                                                              19.0
                                                                    0.35 -0.25000003
   16 VIX230419C00020000
                              REGULAR
                                            USD
                                                2023-04-19
                                                              20.0
                                                                    0.21 -0.15000002
##
   17 VIX230419C00021000
                              REGULAR
                                            USD 2023-04-19
                                                              21.0
                                                                    0.15 -0.08999999
   18 VIX230419C00022000
                              REGULAR
                                            USD 2023-04-19
                                                              22.0
                                                                    0.10 -0.07000000
   19 VIX230419C00023000
                              REGULAR
                                            USD 2023-04-19
                                                              23.0
                                                                    0.09 -0.02000000
   20 VIX230419C00024000
                              REGULAR
                                            USD 2023-04-19
                                                              24.0
                                                                    0.05 -0.04000000
##
  21 VIX230419C00025000
                              REGULAR
                                            USD 2023-04-19
                                                              25.0
                                                                    0.06 -0.03000000
                                            USD 2023-04-19
                                                                    0.05 -0.02000000
   22 VIX230419C00026000
                              REGULAR
                                                              26.0
## 23 VIX230419C00027000
                              REGULAR
                                            USD 2023-04-19
                                                              27.0
                                                                    0.03
                                                                           0.00000000
   24 VIX230419C00028000
                              REGULAR
                                            USD 2023-04-19
                                                              28.0
                                                                    0.04
                                                                           0.00000000
                                                              29.0
##
  25 VIX230419C00029000
                              REGULAR
                                            USD 2023-04-19
                                                                    0.03
                                                                           0.00000000
  26 VIX230419C00030000
                              REGULAR
                                            USD 2023-04-19
                                                              30.0
                                                                    0.03
                                                                           0.00000000
      VIX230419C00031000
                                                2023-04-19
                                                                    0.02
##
   27
                              REGULAR
                                            USD
                                                              31.0
                                                                           0.01000000
   28 VIX230419C00032000
                              REGULAR
                                            USD 2023-04-19
                                                              32.0
                                                                    0.01 -0.01000000
                                            USD 2023-04-19
##
   29 VIX230419C00032500
                              REGULAR
                                                              32.5
                                                                    0.01 -0.01000000
   30 VIX230419C00033000
                              REGULAR
                                            USD 2023-04-19
                                                              33.0
                                                                    0.01 -0.01000000
##
   31 VIX230419C00034000
                              REGULAR
                                            USD
                                                2023-04-19
                                                              34.0
                                                                    0.02
                                                                           0.01000000
##
   32 VIX230419C00035000
                              REGULAR
                                            USD 2023-04-19
                                                              35.0
                                                                    0.02
                                                                           0.00000000
##
   33 VIX230419C00036000
                              REGULAR
                                            USD 2023-04-19
                                                              36.0
                                                                    0.02
                                                                           0.01000000
                                                              37.0
##
   34 VIX230419C00037000
                              REGULAR
                                            USD 2023-04-19
                                                                    0.02
                                                                           0.00000000
      VIX230419C00037500
                              REGULAR
                                                2023-04-19
                                                              37.5
                                                                    0.02
                                                                           0.0000000
                                            USD
                                            USD 2023-04-19
##
   36 VIX230419C00038000
                              REGULAR
                                                              38.0
                                                                    0.01
                                                                           0.00000000
   37 VIX230419C00039000
                              REGULAR
                                            USD 2023-04-19
                                                              39.0
                                                                    0.02
                                                                           0.00000000
  38 VIX230419C00040000
                                            USD 2023-04-19
                                                                    0.01
##
                              REGULAR
                                                              40.0
                                                                           0.00000000
   39 VIX230419C00042500
                                            USD 2023-04-19
                              REGULAR
                                                              42.5
                                                                    0.01
                                                                           0.0000000
##
   40 VIX230419C00045000
                                            USD 2023-04-19
                                                              45.0
                                                                    0.01
                                                                           0.00000000
                              REGULAR
   41 VIX230419C00047500
                              REGULAR
                                            USD 2023-04-19
                                                              47.5
                                                                    0.01 -0.01000000
  42 VIX230419C00050000
                                            USD 2023-04-19
                                                                    0.02
##
                              REGULAR
                                                              50.0
                                                                           0.01000000
   43 VIX230419C00055000
                              REGULAR
                                            USD 2023-04-19
                                                              55.0
                                                                    0.01
                                                                           0.00000000
##
   44 VIX230419C00060000
                                            USD 2023-04-19
                                                              60.0
                                                                    0.01
                              REGULAR
                                                                           0.00000000
   45 VIX230419C00065000
                              REGULAR
                                            USD 2023-04-19
                                                              65.0
                                                                    0.01
                                                                           0.00000000
                                            USD 2023-04-19
##
  46 VIX230419C00070000
                              REGULAR
                                                              70.0
                                                                    0.01
                                                                           0.00000000
##
   47 VIX230419C00075000
                              REGULAR
                                            USD 2023-04-19
                                                              75.0
                                                                    0.01
                                                                           0.0000000
   48 VIX230419C00080000
                              REGULAR
                                            USD 2023-04-19
                                                              80.0
                                                                    0.01
                                                                           0.00000000
                                            USD 2023-04-19
                                                              85.0
   49 VIX230419C00085000
                              REGULAR
                                                                    0.01
                                                                           0.00000000
##
   50 VIX230419C00090000
                              REGULAR
                                            USD
                                                2023-04-19
                                                              90.0
                                                                    0.01
                                                                           0.0000000
##
  51 VIX230419C00095000
                              REGULAR
                                            USD 2023-04-19
                                                              95.0
                                                                    0.02
                                                                           0.00000000
## 52 VIX230419C00100000
                              REGULAR
                                            USD 2023-04-19
                                                             100.0
                                                                    0.01
                                                                           0.0000000
## 53 VIX230419C00110000
                              REGULAR
                                            USD 2023-04-19
                                                             110.0
                                                                    0.04
                                                                           0.0000000
## 54 VIX230419C00120000
                              REGULAR
                                            USD 2023-04-19
                                                             120.0
                                                                    0.02
                                                                           0.00000000
```

```
## 55 VIX230419C00130000
                             REGULAR
                                           USD 2023-04-19
                                                           130.0 0.02 0.00000000
                                          USD 2023-04-19
                                                           140.0
                                                                  0.04
## 56 VIX230419C00140000
                             REGULAR
                                                                        0.00000000
                                          USD 2023-04-19
## 57 VIX230419C00150000
                             REGULAR
                                                           150.0
                                                                  0.02
                                                                        0.00000000
## 58 VIX230419C00160000
                                           USD 2023-04-19
                                                           160.0
                                                                  0.01
                             REGULAR
                                                                        0.00000000
## 59 VIX230419C00170000
                             REGULAR
                                           USD 2023-04-19
                                                           170.0
                                                                  0.01
                                                                        0.00000000
  60 VIX230419C00180000
                                                          180.0 0.01
                             REGULAR
                                          USD 2023-04-19
                                                                        0.00000000
          ChgPct Bid Ask
                             Vol
                                     ΟI
                                               LastTradeTime
                                                                   ΙV
                                                                        ITM Price
## 1
       -5.328791 8.05 8.35
                              27
                                   3029 2023-04-14 14:16:43 6.687502
                                                                       TRUE 8.200
## 2
        0.000000 7.55 7.85
                              20
                                     21 2023-04-04 15:48:06 6.253908
                                                                       TRUE 7.700
## 3
       -8.024697 7.05 7.35
                               4
                                    464 2023-04-14 14:02:29 5.843753
                                                                       TRUE 7.200
       0.000000 6.55 6.85
                              10
                                     210 2023-04-04 15:48:08 5.449222
                                                                       TRUE 6.700
                                    595 2023-04-13 13:11:41 5.070316
## 5
        0.000000 6.05 6.35
                               1
                                                                       TRUE 6.200
## 6
        0.000000 5.55 5.85
                             150
                                    185 2023-03-30 13:43:31 4.703129
                                                                       TRUE 5.700
## 7
     -20.719420 5.05 5.35
                               3
                                    273 2023-04-14 09:45:41 4.347661
                                                                       TRUE 5.200
        0.000000 4.55 4.85
                                     28 2023-04-11 11:49:59 4.000005
                                                                       TRUE 4.700
## 8
                               1
## 9
      -10.091739 4.05 4.35
                               7
                                    769 2023-04-14 12:58:26 3.660157
                                                                       TRUE 4.200
        0.000000 3.55 3.85
                                     12 2023-04-12 09:39:06 3.328127
## 10
                               6
                                                                       TRUE 3.700
## 11 -11.688307 3.10 3.35
                             127
                                    2348 2023-04-14 14:11:24 3.039065
                                                                       TRUE 3.225
## 12 -20.138893 2.10 2.33
                             134
                                   1581 2023-04-14 15:58:45 2.359379
                                                                       TRUE 2.215
## 13 -27.027025 1.18 1.37
                             485
                                   1208 2023-04-14 16:14:59 1.746095
                                                                       TRUE 1.275
## 14 -36.792450 0.58 0.71 12686
                                  15439 2023-04-14 16:14:07 1.429690 FALSE 0.645
## 15 -41.666668 0.27 0.38
                            5194
                                  23590 2023-04-14 16:14:18 1.343753 FALSE 0.325
## 16 -41.666670 0.14 0.24
                            8074
                                  78224 2023-04-14 16:11:09 1.394534 FALSE 0.190
## 17 -37.499996 0.08 0.16 16430 148988 2023-04-14 16:00:54 1.468753 FALSE 0.120
## 18 -41.176470 0.05 0.12 31154 81842 2023-04-14 16:00:46 1.570315 FALSE 0.085
  19 -18.181814 0.03 0.09 17642 104516 2023-04-14 15:49:14 1.656252 FALSE 0.060
## 20 -44.444447 0.02 0.08 49165 139485 2023-04-14 16:00:58 1.781251 FALSE 0.050
  21 -33.333336 0.01 0.06 26395 220718 2023-04-14 16:06:27 1.843751 FALSE 0.035
## 22 -28.571426 0.00 0.06
                            4253
                                 91049 2023-04-14 16:09:13 1.937500 FALSE 0.030
## 23
        0.000000 0.00 0.05
                              67
                                  70093 2023-04-14 16:01:54 2.031255 FALSE 0.025
## 24
        0.000000 0.01 0.05
                            9972
                                  55123 2023-04-14 15:39:49 2.218754 FALSE 0.030
##
  25
        0.000000 0.00 0.04
                              27
                                  59881 2023-04-14 16:04:10 2.218754 FALSE 0.020
##
        0.000000 0.01 0.04 13590 271880 2023-04-14 16:04:15 2.406254 FALSE 0.025
                                  41301 2023-04-14 15:19:00 2.375004 FALSE 0.015
  27 100.000000 0.00 0.03
                               2
      -50.000000 0.00 0.03
                            2513
                                  35771 2023-04-14 15:38:40 2.468754 FALSE 0.015
                            2952
     -50.000000 0.00 0.03
                                  39367 2023-04-14 15:31:32 2.531254 FALSE 0.015
  30 -50.000000 0.00 0.03
                                  31016 2023-04-14 09:56:24 2.562504 FALSE 0.015
## 31 100.000000 0.00 0.03
                             800
                                  30123 2023-04-14 15:37:10 2.687503 FALSE 0.015
        0.000000 0.00 0.03
                             130 166294 2023-04-14 16:14:51 2.750003 FALSE 0.015
##
  33 100.000000 0.00 0.03
                            1400
                                  30245 2023-04-14 15:19:27 2.875003 FALSE 0.015
##
        0.000000 0.00 0.02
                                  42075 2023-04-13 15:23:40 2.812503 FALSE 0.010
                            4000
        0.000000 0.00 0.02
                            1002
                                  11313 2023-04-14 15:45:50 2.875003 FALSE 0.010
##
  35
##
  36
        0.000000 0.00 0.02
                               4
                                  12323 2023-04-12 13:41:08 2.875003 FALSE 0.010
##
        0.000000 0.00 0.02
                              50
                                  38578 2023-04-13 11:01:22 3.000002 FALSE 0.010
  37
##
  38
        0.000000 0.00 0.02
                              92 125507 2023-04-14 15:42:27 3.062502 FALSE 0.010
                                  17005 2023-04-14 15:18:07 3.375002 FALSE 0.015
        0.000000 0.00 0.03
                              30
## 39
## 40
        0.000000 0.00 0.03
                               3
                                  61013 2023-04-14 15:18:12 3.562501 FALSE 0.015
  41 -50.000000 0.00 0.03
                                  25090 2023-04-14 15:18:48 3.750001 FALSE 0.015
##
                              80
## 42
     100.000000 0.00 0.03
                                  85041 2023-04-14 11:45:03 3.875000 FALSE 0.015
## 43
        0.000000 0.00 0.03
                             100
                                  36257 2023-04-14 10:41:54 4.187505 FALSE 0.015
## 44
        0.000000 0.00 0.02
                             200 100799 2023-04-14 13:41:51 4.250005 FALSE 0.010
## 45
        0.000000 0.00 0.02
                                  69489 2023-04-14 13:42:39 4.500004 FALSE 0.010
## 46
        0.000000 0.00 0.02
                             100
                                  91297 2023-04-14 13:42:57 4.687504 FALSE 0.010
## 47
        0.000000 0.00 0.02
                             100 76048 2023-04-14 13:43:22 4.875004 FALSE 0.010
```

```
0.000000 0.00 0.02
                                   33334 2023-04-14 13:43:46 5.062504 FALSE 0.010
## 48
                              200
## 49
        0.000000 0.00 0.02
                                2
                                   26166 2023-04-05 15:58:07 5.250003 FALSE 0.010
        0.000000 0.00 0.02
## 50
                                   12932 2023-04-10 15:31:31 5.375003 FALSE 0.010
        0.000000 0.00 0.02
                                     4028 2023-03-28 15:25:32 5.500003 FALSE 0.010
## 51
                               56
##
  52
        0.000000 0.00 0.02
                                1
                                   76474 2023-04-10 09:39:21 5.687503 FALSE 0.010
## 53
        0.000000 0.00 0.02
                                2
                                     2026 2023-03-21 09:39:29 5.937503 FALSE 0.010
## 54
        0.000000 0.00 0.02
                               10
                                     3527 2023-03-31 15:47:57 6.125002 FALSE 0.010
        0.000000 0.00 0.02
                                4
                                     3453 2023-03-22 12:15:04 6.375002 FALSE 0.010
## 55
## 56
        0.000000 0.00 0.02
                                6
                                     7179 2023-03-20 10:01:08 6.625002 FALSE 0.010
        0.000000 0.00 0.02
                                     1702 2023-03-22 10:20:07 6.750002 FALSE 0.010
## 57
                               15
## 58
        0.000000 0.00 0.02
                              240
                                     4457 2023-03-21 16:13:00 6.875001 FALSE 0.010
                                     844 2023-03-23 13:58:15 7.125001 FALSE 0.010
## 59
        0.000000 0.00 0.02
                                4
        0.000000 0.00 0.02
                                   15392 2023-03-30 14:10:59 7.250001 FALSE 0.010
##
   60
                               50
##
      InTheMoney
## 1
            TRUE
## 2
            TRUE
## 3
            TRUE
## 4
            TRUE
## 5
            TRUE
## 6
            TRUE
## 7
            TRUE
## 8
            TRUE
## 9
            TRUE
## 10
            TRUE
## 11
            TRUE
## 12
            TRUE
## 13
            TRUE
## 14
           FALSE
## 15
           FALSE
## 16
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## 17
           FALSE
## 18
           FALSE
## 19
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## 20
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## 21
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## 22
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## 23
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## 24
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## 25
           FALSE
## 26
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## 27
           FALSE
## 28
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## 29
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## 30
           FALSE
## 31
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## 32
           FALSE
## 33
           FALSE
## 34
           FALSE
## 35
           FALSE
## 36
           FALSE
## 37
           FALSE
## 38
           FALSE
## 39
           FALSE
## 40
           FALSE
```

```
## 41
           FALSE
##
  42
           FALSE
##
  43
           FALSE
##
   44
           FALSE
##
   45
           FALSE
##
   46
           FALSE
  47
##
           FALSE
## 48
           FALSE
##
   49
           FALSE
##
   50
           FALSE
##
   51
           FALSE
   52
##
           FALSE
##
   53
           FALSE
   54
##
           FALSE
##
   55
           FALSE
##
   56
           FALSE
  57
##
           FALSE
##
   58
           FALSE
##
   59
           FALSE
##
   60
           FALSE
##
##
   $Apr.19.2023$puts
               ContractID ConractSize Currency Expiration Strike
##
                                                                      Last
                                                                                  Chg
##
      VIX230419P00010000
                              REGULAR
                                            USD 2023-04-19
                                                              10.0
                                                                      0.01 0.0000000
   1
##
   2
      VIX230419P00011000
                              REGULAR
                                            USD 2023-04-19
                                                              11.0
                                                                      0.01 0.0000000
   3
      VIX230419P00011500
                              REGULAR
                                            USD 2023-04-19
                                                              11.5
                                                                      0.01 0.0000000
                                                               12.0
##
   4
      VIX230419P00012000
                              REGULAR
                                            USD
                                                2023-04-19
                                                                      0.01 0.0000000
##
   5
      VIX230419P00013000
                              REGULAR
                                            USD 2023-04-19
                                                               13.0
                                                                      0.01 0.0000000
##
   6
                                                               13.5
      VIX230419P00013500
                              REGULAR
                                            USD 2023-04-19
                                                                      0.01 0.0000000
##
  7
      VIX230419P00014000
                              REGULAR
                                            USD 2023-04-19
                                                               14.0
                                                                      0.01 0.0000000
## 8
      VIX230419P00014500
                              REGULAR
                                            USD
                                                2023-04-19
                                                               14.5
                                                                      0.01 0.0000000
##
   9
      VIX230419P00015000
                              REGULAR
                                            USD 2023-04-19
                                                               15.0
                                                                      0.01 0.0000000
   10 VIX230419P00016000
                              REGULAR
                                            USD 2023-04-19
                                                               16.0
                                                                      0.01 0.0000000
                                                               17.0
   11 VIX230419P00017000
                              REGULAR
                                            USD 2023-04-19
                                                                      0.07 0.0200000
      VIX230419P00018000
                              REGULAR
                                            USD 2023-04-19
                                                               18.0
                                                                      0.40 0.1100000
   13 VIX230419P00019000
                              REGULAR
                                            USD 2023-04-19
                                                               19.0
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  14 VIX230419P00020000
                              REGULAR
                                            USD 2023-04-19
                                                               20.0
                                                                      1.90 0.3199999
  15 VIX230419P00021000
                                            USD 2023-04-19
                                                              21.0
                                                                      2.83 0.3799999
                              REGULAR
   16 VIX230419P00022000
                                            USD 2023-04-19
                                                               22.0
                              REGULAR
                                                                      3.75 0.4500000
  17 VIX230419P00023000
                                            USD 2023-04-19
                                                              23.0
                                                                      4.66 0.4099998
                              REGULAR
  18 VIX230419P00024000
                              REGULAR
                                            USD 2023-04-19
                                                               24.0
                                                                      5.40 0.2300000
   19 VIX230419P00025000
                                            USD 2023-04-19
                                                               25.0
                              REGULAR
                                                                      6.65 0.7000003
   20 VIX230419P00026000
                              REGULAR
                                            USD 2023-04-19
                                                               26.0
                                                                      7.80 0.4500003
   21 VIX230419P00027000
                                            USD 2023-04-19
                                                               27.0
                                                                      8.65 0.3499994
                              REGULAR
  22 VIX230419P00028000
                              REGULAR
                                            USD 2023-04-19
                                                               28.0
                                                                      9.59 0.6000004
## 23 VIX230419P00029000
                                                               29.0
                                                                     10.67 1.1900005
                              REGULAR
                                            USD 2023-04-19
   24
     VIX230419P00030000
                              REGULAR
                                            USD 2023-04-19
                                                               30.0
                                                                     11.62 0.4700003
   25 VIX230419P00031000
                              REGULAR
                                            USD 2023-04-19
                                                               31.0
                                                                     11.10 0.0000000
                                            USD 2023-04-19
                                                               32.0
   26 VIX230419P00032000
                              REGULAR
                                                                     13.35 1.0799999
      VIX230419P00032500
                              REGULAR
                                            USD 2023-04-19
                                                              32.5
                                                                     12.10 0.0000000
                                                                     14.58 2.2299995
##
   28 VIX230419P00033000
                              REGULAR
                                            USD 2023-04-19
                                                              33.0
  29 VIX230419P00034000
                              REGULAR
                                            USD 2023-04-19
                                                              34.0
                                                                     14.24 0.0000000
## 30 VIX230419P00035000
                              REGULAR
                                            USD 2023-04-19
                                                              35.0
                                                                     16.28 0.7800007
## 31 VIX230419P00036000
                              REGULAR
                                            USD 2023-04-19
                                                              36.0
                                                                    17.12 0.0000000
```

```
## 32 VIX230419P00037000
                              REGULAR
                                            USD 2023-04-19
                                                              37.0
                                                                   16.55 0.0000000
                                                              37.5
## 33 VIX230419P00037500
                              REGULAR
                                            USD 2023-04-19
                                                                    15.45 0.0000000
   34 VIX230419P00038000
                              REGULAR
                                            USD 2023-04-19
                                                              38.0
                                                                    17.96 0.0000000
  35 VIX230419P00039000
                                            USD 2023-04-19
                                                              39.0
                                                                    18.32 0.0000000
                              REGULAR
   36 VIX230419P00040000
                              REGULAR
                                            USD 2023-04-19
                                                              40.0
                                                                    20.02 0.0000000
                                                              42.5
   37 VIX230419P00042500
                              REGULAR
                                            USD 2023-04-19
                                                                    22.37 0.0000000
##
   38 VIX230419P00045000
                              REGULAR
                                            USD 2023-04-19
                                                              45.0
                                                                    22.70 0.0000000
  39 VIX230419P00047500
                              REGULAR
                                            USD 2023-04-19
                                                              47.5
                                                                    27.50 0.0000000
   40 VIX230419P00050000
                              REGULAR
                                            USD 2023-04-19
                                                              50.0
                                                                    30.65 0.0000000
  41 VIX230419P00055000
                              REGULAR
                                            USD 2023-04-19
                                                              55.0
                                                                    33.15 0.0000000
   42 VIX230419P00060000
                              REGULAR
                                            USD 2023-04-19
                                                              60.0
                                                                    38.75 0.0000000
                                            USD 2023-04-19
                                                              65.0
  43 VIX230419P00065000
                              REGULAR
                                                                    44.20 0.0000000
   44 VIX230419P00070000
                              REGULAR
                                            USD 2023-04-19
                                                              70.0
                                                                    48.75 0.0000000
   45 VIX230419P00075000
                              REGULAR
                                            USD 2023-04-19
                                                              75.0
                                                                    54.20 0.0000000
  46 VIX230419P00080000
                              REGULAR
                                            USD 2023-04-19
                                                              80.0
                                                                    59.30 0.0000000
  47 VIX230419P00085000
                              REGULAR
                                            USD 2023-04-19
                                                              85.0
                                                                    64.15 0.0000000
  48 VIX230419P00090000
                              REGULAR
                                            USD 2023-04-19
                                                              90.0
                                                                    64.95 0.0000000
   49 VIX230419P00095000
                              REGULAR
                                            USD 2023-04-19
                                                              95.0
                                                                    72.95 0.0000000
                                                                    80.48 0.0000000
  50 VIX230419P00100000
                                                             100.0
                              REGULAR
                                            USD 2023-04-19
  51 VIX230419P00110000
                              REGULAR
                                            USD 2023-04-19
                                                             110.0
                                                                    83.27 0.0000000
##
  52 VIX230419P00120000
                              REGULAR
                                            USD 2023-04-19
                                                             120.0
                                                                    98.05 0.0000000
   53 VIX230419P00130000
                                                             130.0 103.00 0.0000000
                              REGULAR
                                            USD 2023-04-19
                                                             140.0 112.65 0.0000000
  54 VIX230419P00140000
                              REGULAR
                                            USD 2023-04-19
   55 VIX230419P00150000
                              REGULAR
                                            USD 2023-04-19
                                                             150.0 122.70 0.0000000
##
   56 VIX230419P00180000
                              REGULAR
                                            USD 2023-04-19
                                                             180.0 159.90 0.0000000
##
         ChgPct
                   Bid
                           Ask
                                 Vol
                                          OI
                                                   LastTradeTime
                                                                          IV
                                                                               ITM
       0.00000
                          0.00
                                             2023-04-10 15:23:06 0.5000050 FALSE
##
   1
                  0.00
                                   3
                                          14
##
   2
       0.000000
                  0.00
                          0.02
                                  NA
                                           4
                                             2023-02-21 10:15:01 1.8125009 FALSE
   3
       0.00000
                          0.00
                                           2 2023-04-13 09:35:12 0.5000050 FALSE
##
                  0.00
                                   1
##
       0.000000
                  0.00
                          0.02
                                   4
                                          10 2023-02-21 10:15:01 1.5000025 FALSE
  4
## 5
       0.000000
                  0.00
                          0.00
                                   4
                                             2023-03-27 10:30:40 0.5000050 FALSE
##
   6
       0.00000
                  0.00
                          0.00
                                   1
                                             2023-04-06 08:52:43 0.5000050 FALSE
##
  7
       0.00000
                   0.00
                          0.00
                                   1
                                         193 2023-04-10 09:42:09 0.5000050 FALSE
                                   2
##
  8
       0.00000
                  0.00
                          0.00
                                          62 2023-04-13 11:55:30 0.5000050 FALSE
       0.00000
                                   5
                                       26195 2023-04-12 13:34:10 0.6250038 FALSE
##
   9
                  0.00
                          0.02
                  0.00
                                       25272 2023-04-14 15:27:59 0.5156298 FALSE
## 10
       0.000000
                          0.05
                                  83
  11 39.999996
                   0.03
                          0.10 12944 126785 2023-04-14 16:14:59 0.1855550 FALSE
## 12 37.931040
                  0.37
                          0.49 54270 161814 2023-04-14 16:14:59 0.0000100
                                                                              TRUE
  13 30.487812
                          1.19 35823 143573 2023-04-14 16:14:59 0.0000100
                                                                              TRUE
                   1.05
  14 20.253159
                   1.91
                          2.06 14228 129837 2023-04-14 16:07:27 0.0000100
                                                                              TRUE
##
                                                                              TRUE
  15 15.510199
                  2.79
                          3.00
                                4175
                                     177211 2023-04-14 16:01:12 0.0000100
  16 13.636366
                                       72923 2023-04-14 15:43:34 0.0000100
                                                                              TRUE
##
                  3.75
                          4.00
                                 125
##
   17
       9.647055
                  4.75
                          5.00
                                2052
                                       93901 2023-04-14 15:33:17 0.0000100
                                                                              TRUE
##
       4.448743
                          6.00
                                   6
                                      47481 2023-04-14 15:16:54 0.0000100
                                                                              TRUE
   18
                  5.70
##
   19 11.764711
                  6.70
                          6.95
                                 126
                                       61116 2023-04-14 15:12:58 0.0000100
                                                                              TRUE
  20
       6.122453
                  7.70
                          7.95
                                  69
                                       48204 2023-04-14 16:13:07 0.0000100
                                                                              TRUE
##
##
   21
       4.216861
                  8.70
                          8.95
                                1535
                                       19441 2023-04-14 15:12:27 0.0000100
                                                                              TRUE
##
   22
       6.674087
                  9.65
                          9.95
                                  37
                                       17702 2023-04-14 15:07:13 0.0000100
                                                                              TRUE
##
   23
      12.552749
                  10.65
                         10.95
                                  33
                                        9538 2023-04-14 14:58:26 0.0000100
                                                                              TRUE
##
   24
       4.215249
                  11.65
                         11.95
                                  76
                                        7631 2023-04-14 15:12:27 0.0000100
                                                                              TRUE
                  12.65
                                         975 2023-04-12 11:05:04 0.0000100
                                                                              TRUE
##
   25
       0.000000
                         12.95
                                   1
##
   26
       8.801955
                  13.65
                         13.95
                                  31
                                        1451 2023-04-14 11:27:55 0.0000100
                                                                              TRUE
##
  27
       0.000000
                         14.45
                                   5
                                         385 2023-04-05 14:41:34 0.0000100
                                                                              TRUE
                 14.15
## 28 18.056675
                 14.65
                         14.95
                                   2
                                         119 2023-04-14 15:06:07 0.0000100
                                                                              TRUE
```

```
## 29
       0.000000
                  15.65
                         15.95
                                   20
                                          292 2023-04-10 13:54:06 0.0000100
                                                                               TRUE
## 30
                                   40
                                          949 2023-04-13 09:55:25 0.0000100
                                                                               TRUE
       5.032263
                  16.65
                         16.95
       0.000000
                                          52 2023-04-13 15:38:10 0.0000100
##
   31
                  17.65
                          17.95
                                                                               TRUE
##
  32
       0.000000
                  18.65
                          18.95
                                          137 2023-04-04 16:01:32 0.0000100
                                                                               TRUE
                                    9
##
   33
       0.000000
                  16.40
                          16.55
                                    4
                                          229 2023-01-17 09:35:54 0.0000100
                                                                               TRUE
       0.000000
                  19.65
                          19.95
                                          417 2023-04-12 15:51:29 0.0000100
##
   34
                                    4
                                                                               TRUE
                                          547 2023-04-03 09:30:24 0.0000100
##
   35
       0.000000
                  20.65
                          20.95
                                    4
                                                                               TRUE
##
   36
       0.000000
                  21.65
                         21.95
                                    2
                                          146 2023-04-12 16:00:39 0.0000100
                                                                               TRUE
##
   37
       0.000000
                  24.15
                          24.45
                                    5
                                          128 2023-04-10 09:42:47 0.0000100
                                                                               TRUE
##
   38
       0.000000
                  26.65
                          26.90
                                    3
                                           36 2023-03-23 09:43:53 0.0000100
                                                                               TRUE
##
   39
       0.000000
                  29.15
                          29.40
                                   55
                                           55 2023-04-10 15:45:08 0.0000100
                                                                               TRUE
                                    6
                                          228 2023-04-12 09:31:10 0.0000100
                                                                               TRUE
##
   40
       0.000000
                  31.65
                          31.90
##
   41
       0.000000
                  36.65
                          36.90
                                    6
                                           26 2023-03-28 15:43:35 0.0000100
                                                                               TRUE
       0.000000
                          41.90
                                    3
##
   42
                  41.65
                                           43 2023-03-29 03:57:32 0.0000100
                                                                               TRUE
       0.000000
                          46.90
                                    5
                                           30 2023-03-31 11:56:53 0.0000100
                                                                               TRUE
##
  43
                  46.65
##
   44
       0.00000
                  51.65
                          51.90
                                   10
                                          105 2023-03-29 14:09:11 0.0000100
                                                                                TRUE
##
                                          130 2023-03-31 10:19:01 0.0000100
       0.000000
                  56.65
                         56.90
                                   10
                                                                               TRUE
   45
                  61.65
##
       0.000000
                          61.90
                                    5
                                            6 2023-04-03 13:02:24 0.0000100
                                                                               TRUE
   46
                                            3 2023-03-31 09:47:55 0.0000100
                                                                               TRUE
##
   47
       0.000000
                  66.65
                          66.90
                                    3
                  71.65
##
   48
       0.000000
                         71.90
                                   NA
                                              2023-03-20 23:45:40 0.0000100
                                                                               TRUE
##
   49
       0.000000
                  76.65
                         76.90
                                    3
                                            5 2023-03-28 15:43:44 0.0000100
                                                                               TRUE
       0.000000
                          81.90
                                    3
                                           29 2023-04-11 15:16:49 0.0000100
                                                                                TRUE
##
   50
                  81.65
                                            1 2022-12-29 10:43:55 0.0000100
## 51
       0.000000
                  87.85
                          88.15
                                                                               TRUE
                                    1
                                            1 2023-02-14 15:37:36 0.0000100
                                                                               TRUE
##
   52
       0.000000
                  95.70
                         96.05
                                   NA
##
   53
       0.000000 107.65 107.90
                                    1
                                            1 2022-12-29 10:57:54 0.0000100
                                                                               TRUE
   54
       0.000000 117.50 117.80
                                    1
                                            2 2022-12-30 08:19:20 0.0000100
                                                                               TRUE
       0.000000 127.40 127.70
                                          101 2022-12-29 11:09:20 0.0000100
                                                                               TRUE
##
   55
                                    1
                                          182 2023-04-10 11:08:36 0.0000100
##
   56
       0.000000 161.60 161.85
                                   10
                                                                               TRUE
##
        Price InTheMoney
## 1
        0.000
                    FALSE
##
  2
        0.010
                    FALSE
##
  3
        0.000
                    FALSE
## 4
        0.010
                    FALSE
                    FALSE
## 5
        0.000
##
   6
        0.000
                    FALSE
                    FALSE
##
  7
        0.000
## 8
        0.000
                    FALSE
## 9
        0.010
                    FALSE
        0.025
                    FALSE
## 10
## 11
        0.065
                    FALSE
##
  12
        0.430
                     TRUE
        1.120
                     TRUE
##
  13
##
  14
        1.985
                     TRUE
##
                     TRUE
  15
        2.895
## 16
        3.875
                     TRUE
        4.875
                     TRUE
## 17
##
  18
        5.850
                     TRUE
##
  19
        6.825
                     TRUE
##
  20
        7.825
                     TRUE
##
   21
        8.825
                     TRUE
##
                     TRUE
  22
        9.800
## 23
       10.800
                     TRUE
## 24
       11.800
                     TRUE
## 25
       12.800
                     TRUE
```

```
## 26
       13.800
                     TRUE
## 27
       14.300
                     TRUE
       14.800
##
  28
                     TRUE
##
  29
                     TRUE
       15.800
##
   30
       16.800
                     TRUE
   31
##
       17.800
                     TRUE
  32
       18.800
                     TRUE
## 33
       16.475
                     TRUE
##
   34
       19.800
                     TRUE
##
  35
       20.800
                     TRUE
   36
       21.800
                     TRUE
   37
##
       24.300
                     TRUE
##
   38
       26.775
                     TRUE
##
   39
       29.275
                     TRUE
##
  40
       31.775
                     TRUE
## 41
       36.775
                     TRUE
##
  42
       41.775
                     TRUE
##
   43
       46.775
                     TRUE
##
  44
       51.775
                     TRUE
##
   45
       56.775
                     TRUE
##
   46
       61.775
                     TRUE
  47
       66.775
                     TRUE
##
       71.775
##
  48
                     TRUE
##
   49
       76.775
                     TRUE
## 50
       81.775
                     TRUE
  51
       88.000
                     TRUE
  52
       95.875
                     TRUE
##
   53 107.775
                     TRUE
   54 117.650
                     TRUE
  55 127.550
                     TRUE
##
  56 161.725
                     TRUE
##
##
   $Apr.26.2023
##
   $Apr.26.2023$calls
                ContractID ConractSize Currency Expiration Strike Last
##
                                                                                    Chg
      VIXW230426C00011500
                               REGULAR
                                             USD 2023-04-26
                                                                      9.03
                                                                            0.00000000
  2
      VIXW230426C00013500
                               REGULAR
                                             USD 2023-04-26
                                                                13.5 10.00
                                                                            0.00000000
      VIXW230426C00017000
                               REGULAR
                                             USD 2023-04-26
                                                                17.0
                                                                      2.29 -0.27999997
                                             USD 2023-04-26
                                                                18.0
## 4
      VIXW230426C00018000
                               REGULAR
                                                                      1.53 -0.22000003
                                             USD 2023-04-26
      VIXW230426C00019000
                               REGULAR
                                                                19.0
                                                                      0.98 -0.22000003
      VIXW230426C00020000
                                             USD 2023-04-26
                                                                20.0
                                                                      0.75 -0.14999998
## 6
                               REGULAR
  7
      VIXW230426C00021000
                               REGULAR
                                             USD 2023-04-26
                                                               21.0
                                                                      0.51 -0.19000000
## 8
      VIXW230426C00022000
                                             USD 2023-04-26
                                                                22.0
                                                                      0.45 -0.11000001
                               REGULAR
      VIXW230426C00023000
                               REGULAR
                                             USD 2023-04-26
                                                                23.0
                                                                      0.34 -0.15000000
## 10 VIXW230426C00024000
                                             USD 2023-04-26
                                                                24.0
                                                                      0.27 -0.13000000
                               REGULAR
## 11 VIXW230426C00025000
                               REGULAR
                                             USD 2023-04-26
                                                                25.0
                                                                      0.24 -0.08000000
  12 VIXW230426C00026000
                               REGULAR
                                             USD 2023-04-26
                                                                26.0
                                                                      0.24 -0.02000000
                                             USD 2023-04-26
                                                                27.0
  13 VIXW230426C00027000
                               REGULAR
                                                                      0.18 -0.02000000
   14 VIXW230426C00028000
                               REGULAR
                                             USD 2023-04-26
                                                                28.0
                                                                      0.13 -0.02000001
                                                                29.0
  15 VIXW230426C00029000
                               REGULAR
                                             USD 2023-04-26
                                                                      0.11 -0.02000000
## 16 VIXW230426C00030000
                               REGULAR
                                             USD 2023-04-26
                                                                30.0
                                                                      0.13
                                                                           0.02000000
## 17 VIXW230426C00031000
                               REGULAR
                                             USD 2023-04-26
                                                               31.0
                                                                      0.10 0.00000000
## 18 VIXW230426C00032000
                               REGULAR
                                             USD 2023-04-26
                                                               32.0 0.06 -0.04000000
```

```
## 19 VIXW230426C00033000
                               REGULAR
                                            USD 2023-04-26
                                                              33.0 0.05 0.00000000
## 20 VIXW230426C00034000
                               REGULAR
                                            USD 2023-04-26
                                                              34.0 0.03 -0.02000000
## 21 VIXW230426C00035000
                               REGULAR
                                            USD 2023-04-26
                                                                    0.06
                                                                          0.00000000
## 22 VIXW230426C00036000
                                            USD 2023-04-26
                                                              36.0
                                                                    0.07
                               REGULAR
                                                                          0.00000000
## 23 VIXW230426C00037000
                               REGULAR
                                            USD 2023-04-26
                                                              37.0
                                                                    0.05
                                                                          0.00000000
## 24 VIXW230426C00038000
                                            USD 2023-04-26
                                                              38.0
                                                                    0.29
                               REGULAR
                                                                          0.00000000
## 25 VIXW230426C00039000
                               REGULAR
                                            USD 2023-04-26
                                                              39.0
                                                                    0.23
                                                                          0.00000000
## 26 VIXW230426C00040000
                               REGULAR
                                            USD 2023-04-26
                                                              40.0
                                                                    0.05
                                                                          0.01000000
## 27 VIXW230426C00042500
                               REGULAR
                                            USD 2023-04-26
                                                              42.5
                                                                    0.03
                                                                          0.00000000
## 28 VIXW230426C00045000
                               REGULAR
                                            USD 2023-04-26
                                                              45.0
                                                                    0.03
                                                                          0.00000000
  29 VIXW230426C00050000
                               REGULAR
                                            USD 2023-04-26
                                                              50.0
                                                                    0.04
                                                                          0.00000000
                                            USD 2023-04-26
                                                                    0.02
## 30 VIXW230426C00060000
                               REGULAR
                                                              60.0
                                                                          0.00000000
  31 VIXW230426C00065000
                               REGULAR
                                            USD 2023-04-26
                                                              65.0
                                                                    0.09
                                                                          0.00000000
                                                              70.0
                                                                    0.05
                                                                          0.00000000
  32 VIXW230426C00070000
                               REGULAR
                                            USD 2023-04-26
  33 VIXW230426C00075000
                                            USD 2023-04-26
                                                              75.0
                                                                    0.05
                               REGULAR
                                                                          0.00000000
## 34 VIXW230426C00080000
                               REGULAR
                                            USD 2023-04-26
                                                              80.0
                                                                    0.01
                                                                          0.0000000
  35 VIXW230426C00085000
                               REGULAR
                                            USD 2023-04-26
                                                              85.0
                                                                    0.04
                                                                          0.00000000
  36 VIXW230426C00090000
                               REGULAR
                                            USD 2023-04-26
                                                              90.0
                                                                    0.02
                                                                          0.00000000
##
  37 VIXW230426C00095000
                               REGULAR
                                            USD 2023-04-26
                                                              95.0
                                                                    0.19
                                                                          0.00000000
##
          ChgPct Bid Ask
                            Vol
                                   ΩT
                                            LastTradeTime
                                                                 ΙV
                                                                      ITM Price
## 1
        0.000000 6.42 8.59
                               2
                                    5 2023-04-10 13:17:44 4.335942
                                                                     TRUE 7.505
                             150
                                  150 2023-03-24 09:30:17 3.302736
        0.000000 4.41 6.61
                                                                     TRUE 5.510
                             353
                                   42 2023-04-14 15:59:29 1.783204
## 3
     -10.894940 0.79 3.47
                                                                     TRUE 2.130
                            521
                                 443 2023-04-14 16:06:49 1.160160 FALSE 0.990
      -12.571430 0.08 1.90
## 5
     -18.333336 0.00 2.25
                            721 2623 2023-04-14 16:00:41 1.558596 FALSE 1.125
## 6
     -16.666664 0.00 1.91 1271 3049 2023-04-14 16:08:37 1.647463 FALSE 0.955
      -27.142859 0.00 1.68
                            369 2863 2023-04-14 15:52:41 1.748048 FALSE 0.840
##
  7
## 8
      -19.642860 0.00 1.52
                            207 4020 2023-04-14 15:57:00 1.855469 FALSE 0.760
## 9
     -30.612246 0.00 1.39
                              63
                                  570 2023-04-14 16:00:41 1.953125 FALSE 0.695
## 10 -32.500000 0.00 0.30
                            230
                                  862 2023-04-14 15:58:01 1.343753 FALSE 0.150
## 11 -25.000000 0.00 1.16
                             362
                                  974 2023-04-14 15:38:24 2.115239 FALSE 0.580
## 12
       -7.692306 0.00 1.07
                              16
                                  318 2023-04-14 14:27:21 2.189458 FALSE 0.535
  13
       -9.999998 0.00 0.98
                                1288 2023-04-14 15:48:49 2.250004 FALSE 0.490
                                1410 2023-04-14 15:22:42 2.314457 FALSE 0.455
  14 -13.333340 0.00 0.91
      -15.384613 0.00 0.85
                                  106 2023-04-14 15:08:30 2.375004 FALSE 0.425
                              10
                            498 1412 2023-04-14 15:33:59 2.492191 FALSE 0.435
##
  16
       18.181814 0.08 0.79
##
        0.000000 0.00 0.75
                               2
                                   92 2023-04-13 09:57:23 2.492191 FALSE 0.375
## 18 -40.000004 0.00 0.71
                                  313 2023-04-14 12:45:49 2.546879 FALSE 0.355
                               1
        0.000000 0.00 0.67
                                   36 2023-04-13 14:32:35 2.597660 FALSE 0.335
##
  19
      -40.000004 0.00 0.64
                                   28 2023-04-14 14:57:05 2.648441 FALSE 0.320
##
  20
                               1
                                  244 2023-04-13 11:02:00 2.707034 FALSE 0.310
  21
        0.000000 0.00 0.62
                              27
        0.000000 0.00 0.60
                              20
                                   36 2023-04-13 11:11:11 2.761722 FALSE 0.300
##
  22
##
  23
        0.000000 0.00 0.58
                               3
                                   20 2023-04-12 15:33:01 2.812503 FALSE 0.290
##
        0.000000 0.00 0.56
                              10
                                   60 2023-03-30 15:15:54 2.859378 FALSE 0.280
  24
##
  25
        0.000000 0.00 0.55
                               1
                                    2 2023-03-31 15:21:23 2.917971 FALSE 0.275
       25.000006 0.00 0.53
                              28
                                  221 2023-04-14 15:56:03 2.957034 FALSE 0.265
## 26
##
  27
        0.000000 0.00 0.51
                               5 2002 2023-04-14 10:28:51 3.085940 FALSE 0.255
##
  28
        0.000000 0.00 0.48
                                  111 2023-04-14 10:31:01 3.187502 FALSE 0.240
##
  29
        0.000000 0.00 0.44
                              10
                                   78 2023-04-12 09:37:51 3.382814 FALSE 0.220
##
  30
        0.000000 0.00 0.38
                                  187 2023-04-13 15:55:13 3.707032 FALSE 0.190
                               1
##
                                   12 2023-03-30 03:11:17 3.867188 FALSE 0.185
  31
        0.000000 0.00 0.37
                              10
## 32
        0.000000 0.00 0.35
                               5
                                    7 2023-04-03 11:04:17 3.992188 FALSE 0.175
## 33
        0.000000 0.00 0.34
                               5
                                    5 2023-03-31 13:30:42 4.117192 FALSE 0.170
## 34
        0.000000 0.00 0.32
                               1
                                    1 2023-04-10 13:28:48 4.210942 FALSE 0.160
```

```
## 35
        0.000000 0.00 0.31
                              18
                                   28 2023-03-31 13:43:58 4.312505 FALSE 0.155
## 36
        0.000000 0.00 0.30
                               4
                                   33 2023-04-03 15:10:55 4.414067 FALSE 0.150
##
   37
        0.000000 0.00 0.30
                              NA
                                    3 2023-03-23 14:47:22 4.515629 FALSE 0.150
##
      InTheMoney
## 1
            TRUE
## 2
            TRUE
## 3
            TRUE
## 4
           FALSE
## 5
           FALSE
## 6
           FALSE
## 7
           FALSE
## 8
           FALSE
## 9
           FALSE
## 10
           FALSE
## 11
           FALSE
## 12
           FALSE
## 13
           FALSE
## 14
           FALSE
## 15
           FALSE
## 16
           FALSE
## 17
           FALSE
## 18
           FALSE
## 19
           FALSE
## 20
           FALSE
## 21
           FALSE
## 22
           FALSE
## 23
           FALSE
## 24
           FALSE
## 25
           FALSE
## 26
           FALSE
## 27
           FALSE
## 28
           FALSE
## 29
           FALSE
## 30
           FALSE
## 31
           FALSE
## 32
           FALSE
## 33
           FALSE
## 34
           FALSE
## 35
           FALSE
## 36
           FALSE
##
  37
           FALSE
##
## $Apr.26.2023$puts
##
               ContractID ConractSize Currency Expiration Strike
                                                                     Last
                                                                                  Chg
                                             USD 2023-04-26
                                                                     0.02 0.00000000
      VIXW230426P00013500
                               REGULAR
                                                               13.5
## 2
      VIXW230426P00014000
                               REGULAR
                                             USD 2023-04-26
                                                               14.0
                                                                     0.11 0.00000000
## 3
      VIXW230426P00015000
                               REGULAR
                                             USD 2023-04-26
                                                               15.0
                                                                     0.02 0.00000000
                                                               16.0
      VIXW230426P00016000
                               REGULAR
                                             USD 2023-04-26
                                                                     0.04 0.02000000
      VIXW230426P00017000
                               REGULAR
                                             USD 2023-04-26
                                                               17.0
                                                                     0.11 0.02000000
## 6
      VIXW230426P00018000
                               REGULAR
                                             USD 2023-04-26
                                                               18.0
                                                                     0.35 0.00000000
## 7
      VIXW230426P00019000
                                             USD 2023-04-26
                                                               19.0 0.88 0.13999999
                               REGULAR
## 8
      VIXW230426P00020000
                               REGULAR
                                             USD 2023-04-26
                                                               20.0
                                                                    1.49 0.13000000
## 9
      VIXW230426P00021000
                               REGULAR
                                             USD 2023-04-26
                                                               21.0 2.29 0.07999992
## 10 VIXW230426P00022000
                               REGULAR
                                             USD 2023-04-26
                                                               22.0 3.17 0.07000017
```

```
## 11 VIXW230426P00023000
                               REGULAR
                                             USD 2023-04-26
                                                               23.0 4.08 0.08999991
## 12 VIXW230426P00024000
                                             USD 2023-04-26
                                                               24.0 4.90 0.09000015
                               REGULAR
## 13 VIXW230426P00025000
                               REGULAR
                                             USD 2023-04-26
                                                                    5.85 0.08999968
                                                               26.0
## 14 VIXW230426P00026000
                               REGULAR
                                             USD 2023-04-26
                                                                     6.73 0.82999990
## 15 VIXW230426P00027000
                               REGULAR
                                             USD 2023-04-26
                                                               27.0
                                                                     5.15 0.00000000
## 16 VIXW230426P00028000
                                             USD 2023-04-26
                                                               28.0 8.01 0.00000000
                               REGULAR
## 17 VIXW230426P00029000
                               REGULAR
                                             USD 2023-04-26
                                                               29.0 9.11 0.00000000
## 18 VIXW230426P00030000
                               REGULAR
                                             USD 2023-04-26
                                                               30.0 10.96 1.15999980
  19 VIXW230426P00032000
                               REGULAR
                                             USD 2023-04-26
                                                               32.0 11.14 0.00000000
  20 VIXW230426P00034000
                               REGULAR
                                             USD 2023-04-26
                                                               34.0 11.59 0.00000000
   21 VIXW230426P00035000
                               REGULAR
                                             USD 2023-04-26
                                                               35.0 14.01 0.00000000
##
                                                                    IV
                                                                         ITM
          ChgPct
                    Bid
                          Ask Vol
                                    ΟI
                                              LastTradeTime
                                                                              Price
## 1
        0.000000
                  0.00
                         0.02
                               57
                                    57 2023-03-24 10:16:52 0.6406286 FALSE
                                                                              0.010
## 2
                                     23 2023-03-22 14:35:00 0.5468795 FALSE
        0.000000
                  0.00
                         0.02
                               NA
                                                                              0.010
## 3
        0.000000
                  0.00
                         0.03
                               10
                                       2023-03-30 15:15:16 0.4648491 FALSE
                                                                              0.015
                                    50
## 4
      100.000000
                  0.00
                         0.05
                                8
                                     14
                                       2023-04-14 13:10:02 0.3125069 FALSE
                                                                              0.025
                                   514 2023-04-14 15:59:43 0.1289150 FALSE
## 5
       22.222216
                  0.03
                         0.12 238
                                                                              0.075
## 6
        0.000000
                  0.30
                         1.54 309
                                   686 2023-04-14 15:58:46 0.8300798
                                                                        TRUE
                                                                              0.920
##
                  0.00 10.00 236 1420 2023-04-14 15:55:14 3.2148457
                                                                        TRUE
                                                                              5.000
  7
       18.918917
## 8
        9.558823
                  0.30
                        2.00 132
                                   493 2023-04-14 14:14:51 0.0000100
                                                                        TRUE
                                                                              1.150
## 9
        3.619906
                  0.00 10.00
                               94 1247 2023-04-14 15:31:24 1.9667970
                                                                        TRUE
                                                                              5.000
        2.258070
                  0.00 10.00
                                     38 2023-04-14 14:27:18 0.9101571
                                                                        TRUE
                                                                              5.000
## 10
                               17
        2.255637
                  2.95
                         5.70
                               18
                                     56 2023-04-14 09:47:48 0.0000100
                                                                        TRUE
                                                                              4.325
## 11
                         6.60
                                   442 2023-04-13 13:52:18 0.0000100
                                                                        TRUE
                                                                              5.240
##
  12
        1.871105
                  3.88
                                6
## 13
        1.562494
                  4.84
                         7.53
                               15
                                     32 2023-04-14 13:17:19 0.0000100
                                                                        TRUE
                                                                             6.185
  14
       14.067795
                  5.81
                         8.47
                                1
                                   421 2023-04-14 11:26:36 0.0000100
                                                                        TRUE
                                                                             7.140
        0.000000
                  6.80
                         9.41
                                     5 2023-03-28 03:22:39 0.0000100
                                                                        TRUE 8.105
##
   15
                                5
##
   16
        0.000000
                  7.78 10.37
                                1
                                    11 2023-04-12 14:00:26 0.0000100
                                                                        TRUE 9.075
##
        0.000000
                  8.78 11.33
                                4
                                    12 2023-04-11 12:30:23 0.0000100
                                                                        TRUE 10.055
   17
## 18
       11.836733
                  9.77 12.30
                                    18 2023-04-14 15:51:58 0.0000100
                                                                        TRUE 11.035
                                1
## 19
        0.000000 11.76 14.25
                                2
                                     2 2023-03-31 14:30:22 0.0000100
                                                                        TRUE 13.005
##
  20
        0.000000 13.76 16.22
                               NΑ
                                    10 2023-03-23 09:45:51 0.0000100
                                                                        TRUE 14.990
##
   21
        0.000000 14.76 17.20
                               10
                                    30 2023-04-06 10:54:33 0.0000100
                                                                        TRUE 15.980
##
      InTheMoney
## 1
           FALSE
## 2
           FALSE
## 3
           FALSE
## 4
           FALSE
## 5
           FALSE
## 6
            TRUE
## 7
            TRUE
## 8
            TRUE
## 9
            TRUE
## 10
            TRUE
## 11
            TRUE
## 12
            TRUE
## 13
            TRUE
## 14
            TRUE
## 15
            TRUE
## 16
            TRUE
## 17
            TRUE
## 18
            TRUE
## 19
            TRUE
## 20
            TRUE
```

```
## 21
            TRUE
##
##
##
   $May.03.2023
##
   $May.03.2023$calls
##
               ContractID ConractSize Currency Expiration Strike Last
                                                                                  Chg
   1
      VIXW230503C00014000
                               REGULAR
                                             USD 2023-05-03
                                                               14.0 5.92
                                                                          0.000000000
                                             USD 2023-05-03
##
  2
      VIXW230503C00015000
                               REGULAR
                                                               15.0 5.27
                                                                          0.000000000
##
   3
      VIXW230503C00016000
                               REGULAR
                                             USD
                                                2023-05-03
                                                               16.0 4.07 -2.049999700
##
      VIXW230503C00018000
                               REGULAR
                                             USD
                                                 2023-05-03
                                                               18.0 2.09 -0.190000060
      VIXW230503C00019000
                               REGULAR
                                                2023-05-03
                                                               19.0 1.50 -0.210000040
##
  6
      VIXW230503C00020000
                               REGULAR
                                                2023-05-03
                                                               20.0 1.18 -0.120000005
##
   7
      VIXW230503C00021000
                               REGULAR
                                             USD 2023-05-03
                                                               21.0 1.01 -0.090000030
                               REGULAR
                                             USD 2023-05-03
## 8
      VIXW230503C00022000
                                                               22.0 0.78 -0.170000020
## 9
      VIXW230503C00023000
                               REGULAR
                                             USD 2023-05-03
                                                               23.0 0.63 -0.130000000
## 10 VIXW230503C00024000
                               REGULAR
                                                 2023-05-03
                                                               24.0 0.57 -0.019999980
  11 VIXW230503C00025000
                                             USD
                                                2023-05-03
                                                               25.0 0.40 -0.119999975
                               REGULAR
   12 VIXW230503C00026000
                                             USD 2023-05-03
                                                               26.0 0.40 -0.099999994
                               REGULAR
  13 VIXW230503C00027000
                               REGULAR
                                             USD 2023-05-03
                                                               27.0 0.35 -0.080000010
                                             USD 2023-05-03
   14 VIXW230503C00028000
                               REGULAR
                                                               28.0 0.33
                                                                          0.010000020
  15 VIXW230503C00029000
                               REGULAR
                                             USD 2023-05-03
                                                               29.0 0.23 -0.059999987
  16 VIXW230503C00030000
                               REGULAR
                                             USD 2023-05-03
                                                               30.0 0.21 -0.030000001
## 17 VIXW230503C00031000
                               REGULAR
                                             USD 2023-05-03
                                                               31.0 0.26
                                                                          0.039999990
  18 VIXW230503C00032000
                               REGULAR
                                             USD
                                                2023-05-03
                                                               32.0 0.26
                                                                          0.00000000
  19 VIXW230503C00035000
                               REGULAR
                                             USD 2023-05-03
                                                               35.0 0.12
                                                                          0.009999998
  20 VIXW230503C00037000
                               REGULAR
                                             USD 2023-05-03
                                                               37.0 0.13
                                                                          0.000000000
  21 VIXW230503C00038000
                                             USD 2023-05-03
                               REGULAR
                                                               38.0 0.14
                                                                          0.000000000
   22 VIXW230503C00040000
                               REGULAR
                                             USD 2023-05-03
                                                               40.0 0.05 -0.050000000
                                             USD 2023-05-03
  23 VIXW230503C00042500
                               REGULAR
                                                               42.5 0.05
                                                                          0.000000000
  24 VIXW230503C00045000
                               REGULAR
                                             USD 2023-05-03
                                                               45.0 0.09
                                                                          0.000000000
## 25
     VIXW230503C00050000
                               REGULAR
                                                 2023-05-03
                                                               50.0 0.08
                                                                          0.00000000
   26 VIXW230503C00055000
                               REGULAR
                                             USD
                                                2023-05-03
                                                               55.0 0.03 -0.150000000
   27 VIXW230503C00060000
                               REGULAR
                                                 2023-05-03
                                                               60.0 0.03
                                                                          0.00000000
   28 VIXW230503C00065000
                                             USD 2023-05-03
                                                               65.0 0.02
                                                                          0.00000000
                               REGULAR
      VIXW230503C00070000
                                             USD 2023-05-03
                                                               70.0 0.05
                               REGULAR
                                                                          0.000000000
   30 VIXW230503C00085000
                                                               85.0 0.04
##
                               REGULAR
                                             USD 2023-05-03
                                                                          0.000000000
##
          ChgPct
                  Bid
                         Ask
                              Vol
                                              LastTradeTime
                                                                   IV
                                                                        TTM Price
## 1
        0.000000 4.33
                               20
                                    95 2023-04-13 14:20:12 2.713870
                                                                       TRUE 5.405
                        6.48
        0.000000 3.30
                               25
                                       2023-04-13 09:51:22 2.335942
                                                                       TRUE 4.415
##
                        5.53
                        4.64
##
      -33.496727 2.25
                                1
                                     1 2023-04-14 13:39:22 1.981445
                                                                       TRUE 3.445
   .3
       -8.333336 0.67
                        3.19
                              253
                                   444 2023-04-14 16:00:25 1.531252 FALSE 1.930
                        2.67
                              262
                                   655 2023-04-14 15:58:44 1.428714 FALSE 1.435
##
  5
      -12.280705 0.20
##
   6
       -9.230770 0.00
                        3.70
                             5446
                                   788
                                       2023-04-14 15:59:51 1.904297 FALSE 1.850
##
       -8.181821 0.00
                        1.24
                             1264 1126 2023-04-14 15:57:00 1.193363 FALSE 0.620
  8
      -17.894740 0.00
                        1.82
                              458
                                   766 2023-04-14 15:58:52 1.568362 FALSE 0.910
                              102
                        0.75
                                    80 2023-04-14 15:44:21 1.466800 FALSE 0.625
## 9
      -17.105263 0.50
  10
       -3.389827 0.45
                        0.59
                              766
                                    68 2023-04-14 15:26:58 1.488284 FALSE 0.520
                              225
   11 -23.076920 0.34
                        0.55
                                   233
                                       2023-04-14 15:59:28 1.519534 FALSE 0.445
     -19.999998 0.28
                        0.48
                                2
                                       2023-04-14 09:30:02 1.544924 FALSE 0.380
   13
      -18.604654 0.23
                        0.42
                                1
                                       2023-04-14 14:32:59 1.568362 FALSE 0.325
##
                               57
   14
        3.125006 0.20
                        0.33
                                    81 2023-04-14 13:23:34 1.570315 FALSE 0.265
## 15 -20.689651 0.16
                        0.29
                                4
                                    71 2023-04-14 14:15:59 1.585940 FALSE 0.225
## 16 -12.500002 0.14
                        0.30
                              109
                                   391 2023-04-14 16:02:00 1.652345 FALSE 0.220
       18.181814 0.11
                        0.22
                                   258 2023-04-14 09:44:39 1.621096 FALSE 0.165
```

```
## 18
        0.000000 0.09 0.20
                               12
                                    42 2023-04-11 11:16:48 1.640627 FALSE 0.145
## 19
        9.090907 0.05
                                2
                                   211 2023-04-14 09:32:48 1.687502 FALSE 0.095
                       0.14
        0.000000 0.03
##
  20
                        0.12
                                    46 2023-04-13 11:09:17 1.718751 FALSE 0.075
                                    23 2023-04-12 15:49:01 2.347660 FALSE 0.350
##
  21
        0.000000 0.00
                        0.70
                                3
##
   22
      -50.000000 0.00
                        0.66
                               20
                                   509
                                       2023-04-14 10:46:59 2.421879 FALSE 0.330
  23
                        0.62
                                4
                                     8 2023-04-13 14:23:05 2.507816 FALSE 0.310
##
        0.000000 0.00
                                   622 2023-04-12 14:21:22 2.593754 FALSE 0.295
##
  24
        0.000000 0.00
                        0.59
                              200
                                    48 2023-04-12 14:43:12 2.746097 FALSE 0.270
## 25
        0.000000 0.00
                        0.54
                               13
##
   26
      -83.333330 0.00
                        0.50
                              200
                                      2 2023-04-14 16:00:42 2.878909 FALSE 0.250
##
  27
        0.000000 0.00 10.00
                                5
                                    57 2023-04-13 11:06:37 7.041017 FALSE 5.000
##
   28
        0.000000 0.00
                        0.45
                               16
                                   271 2023-04-14 13:52:10 3.117190 FALSE 0.225
        0.000000 0.00
                               20
                                    20 2023-04-06 11:30:18 3.222658 FALSE 0.215
##
   29
                        0.43
                                     3 2023-04-04 11:21:46 3.476564 FALSE 0.190
##
   30
        0.000000 0.00
                       0.38
                               NA
##
      InTheMoney
## 1
            TRUE
## 2
            TRUE
## 3
            TRUE
## 4
           FALSE
## 5
           FALSE
## 6
           FALSE
## 7
           FALSE
## 8
           FALSE
## 9
           FALSE
## 10
           FALSE
## 11
           FALSE
## 12
           FALSE
## 13
           FALSE
##
  14
           FALSE
## 15
           FALSE
## 16
           FALSE
## 17
           FALSE
## 18
           FALSE
## 19
           FALSE
## 20
           FALSE
## 21
           FALSE
## 22
           FALSE
## 23
           FALSE
## 24
           FALSE
## 25
           FALSE
## 26
           FALSE
  27
##
           FALSE
## 28
           FALSE
##
   29
           FALSE
##
   30
           FALSE
##
   $May.03.2023$puts
##
##
               ContractID ConractSize Currency Expiration Strike
                                                                    Last
                                                                                   Chg
## 1
      VIXW230503P00012000
                               REGULAR
                                             USD 2023-05-03
                                                               12.0
                                                                     0.01
                                                                           0.00000000
  2
      VIXW230503P00013000
                               REGULAR
                                             USD 2023-05-03
                                                               13.0
                                                                     0.01
                                                                           0.00000000
##
  3
      VIXW230503P00013500
                               REGULAR
                                             USD 2023-05-03
                                                               13.5
                                                                     0.01
                                                                           0.00000000
  4
      VIXW230503P00014000
                                             USD 2023-05-03
                                                               14.0
                                                                     0.04
##
                               REGULAR
                                                                           0.00000000
## 5
      VIXW230503P00015000
                               REGULAR
                                             USD 2023-05-03
                                                               15.0
                                                                     0.02
                                                                           0.00000000
## 6
      VIXW230503P00016000
                               REGULAR
                                             USD 2023-05-03
                                                               16.0
                                                                     0.05
                                                                           0.03000000
## 7
      VIXW230503P00017000
                               REGULAR
                                             USD 2023-05-03
                                                               17.0 0.14 0.05000000
```

```
## 8 VIXW230503P00018000
                               REGULAR
                                            USD 2023-05-03
                                                              18.0 0.40 0.05000001
     VIXW230503P00019000
                                            USD 2023-05-03
                                                              19.0 0.74 -0.00999999
## 9
                               REGULAR
## 10 VIXW230503P00020000
                               REGULAR
                                            USD 2023-05-03
                                                              20.0
                                                                    1.54
                                                                          0.18999994
## 11 VIXW230503P00021000
                               REGULAR
                                            USD 2023-05-03
                                                              21.0
                                                                    2.30
                                                                           0.2000005
## 12 VIXW230503P00022000
                               REGULAR
                                            USD 2023-05-03
                                                              22.0
                                                                    2.89
                                                                           0.00000000
## 13 VIXW230503P00025000
                                            USD 2023-05-03
                                                              25.0
                                                                   5.01
                               REGULAR
                                                                           0.00000000
## 14 VIXW230503P00026000
                               REGULAR
                                            USD 2023-05-03
                                                              26.0 5.86
                                                                           0.00000000
## 15 VIXW230503P00030000
                                                                           0.69999980
                               REGULAR
                                            USD 2023-05-03
                                                              30.0 10.46
## 16 VIXW230503P00032000
                               REGULAR
                                            USD 2023-05-03
                                                              32.0 10.42
                                                                           0.00000000
                                                              35.0 14.35
  17 VIXW230503P00035000
                               REGULAR
                                            USD 2023-05-03
                                                                           0.00000000
##
          ChgPct
                   Bid
                          Ask Vol
                                   ΟI
                                            LastTradeTime
                                                                  ΙV
                                                                        ITM
                                                                             Price
        0.000000
                                    4 2023-03-31 15:45:35 0.7187528 FALSE
## 1
                  0.00
                         0.02
                                4
                                                                             0.010
## 2
        0.000000
                  0.00
                         0.02
                                5
                                    5 2023-03-31 15:46:48 0.5625044 FALSE
                                                                             0.010
                         0.02
                                                                             0.010
## 3
        0.000000
                  0.00
                               90
                                   90 2023-03-31 13:54:05 0.5000050 FALSE
## 4
                  0.00
                         0.28
                                    1 2023-03-30 11:24:09 0.7382839 FALSE
        0.000000
                               NΑ
                                                                             0.140
## 5
        0.000000
                  0.00
                         0.04
                                2
                                   23 2023-04-14 09:57:18 0.3867249 FALSE
                                                                             0.020
                               13
                                   33 2023-04-14 10:03:11 0.3027413 FALSE
##
      150.000020
                  0.00
                         0.10
                                                                             0.050
  6
##
       55.55553
                  0.07
                         0.16
                               46
                                   69 2023-04-14 11:44:58 0.1279384 FALSE
                                                                             0.115
                         0.54 115 258 2023-04-14 15:58:42 0.0000100
                                                                       TRUE
## 8
       14.285718
                  0.37
                                                                             0.455
## 9
       -1.333332
                  0.79
                         1.10
                               14 173 2023-04-14 11:51:04 0.0000100
                                                                       TRUE
                                                                             0.945
## 10
       14.074069
                  0.00 10.00 127
                                   68 2023-04-14 14:39:57 2.0507861
                                                                       TRUE
                                                                             5.000
        9.523812
                  0.00 10.00
                               10 201 2023-04-14 15:58:42 1.5371117
                                                                       TRUE
## 11
                                                                             5.000
                  0.00 10.00
                               22
                                    8 2023-04-13 14:02:39 0.7109404
                                                                       TRUE
## 12
        0.000000
                                                                             5.000
                        7.29
                                4
                                      2023-04-12 10:59:53 0.0000100
                                                                       TRUE
##
  13
        0.000000
                  4.71
                                    7
                                                                             6.000
## 14
                                  15 2023-04-10 11:22:56 0.0000100
        0.000000
                  5.64
                        8.21
                                5
                                                                       TRUE
                                                                            6.925
  15
        7.172129
                  9.50 12.00
                                2
                                  12 2023-04-14 15:51:58 0.0000100
                                                                       TRUE 10.750
                                    1 2023-03-30 10:41:49 0.0000100
                                                                       TRUE 12.700
##
  16
        0.000000 11.47 13.93
                               NA
                                    1 2023-04-06 12:53:12 0.0000100
##
   17
        0.000000 14.44 16.85
                                                                       TRUE 15.645
##
      InTheMoney
## 1
           FALSE
## 2
           FALSE
## 3
           FALSE
## 4
           FALSE
## 5
           FALSE
## 6
           FALSE
## 7
           FALSE
## 8
            TRUE
## 9
            TRUE
## 10
            TRUE
## 11
            TRUE
## 12
            TRUE
## 13
            TRUE
## 14
            TRUE
## 15
            TRUE
## 16
            TRUE
## 17
            TRUE
##
##
   $May.10.2023
##
   $May.10.2023$calls
##
               ContractID ConractSize Currency Expiration Strike Last
                                                                                 Chg
      VIXW230510C00011000
                               REGULAR
                                            USD 2023-05-10
                                                                11 9.75
                                                                          0.00000000
## 2
      VIXW230510C00014000
                               REGULAR
                                            USD 2023-05-10
                                                                14 6.75
                                                                          0.0000000
     VIXW230510C00015000
                               REGULAR
                                            USD 2023-05-10
                                                                15 4.38
                                                                          0.30000020
```

```
VIXW230510C00017000
                               REGULAR
                                            USD 2023-05-10
                                                               17 2.46 -0.25000000
## 5
     VIXW230510C00018000
                                            USD 2023-05-10
                                                                18 1.89 -0.22999990
                              REGULAR
     VIXW230510C00019000
                               REGULAR
                                            USD 2023-05-10
                                                               19 1.53 -0.14999998
                                            USD 2023-05-10
      VIXW230510C00020000
                               REGULAR
                                                               20 1.26 -0.15999997
## 7
     VIXW230510C00022000
                               REGULAR
                                            USD 2023-05-10
                                                                22 0.91 -0.09999996
## 9
     VIXW230510C00023000
                                            USD 2023-05-10
                                                               23 0.77 -0.06999999
                               REGULAR
## 10 VIXW230510C00025000
                              REGULAR
                                            USD 2023-05-10
                                                               25 0.64 -0.02000004
## 11 VIXW230510C00027000
                               REGULAR
                                            USD 2023-05-10
                                                               27 0.49 0.03000000
## 12 VIXW230510C00030000
                              REGULAR
                                            USD 2023-05-10
                                                                30 0.37 -0.09000000
## 13 VIXW230510C00035000
                               REGULAR
                                            USD 2023-05-10
                                                                35 0.22 0.01000000
  14 VIXW230510C00037000
                               REGULAR
                                            USD 2023-05-10
                                                                37 0.15 -0.22999999
  15 VIXW230510C00060000
                                            USD 2023-05-10
                                                                60 0.02
                               REGULAR
                                                                         0.00000000
   16 VIXW230510C00095000
                               REGULAR
                                            USD 2023-05-10
                                                                95 0.06
                                                                         0.00000000
##
          ChgPct Bid Ask Vol
                                  OI
                                           LastTradeTime
                                                                ΙV
                                                                     ITM Price
## 1
        0.000000 6.68 9.23
                                  10 2023-04-06 10:12:47 3.021487
                                                                    TRUE 7.955
                            10
## 2
        0.000000 3.62 6.33 338
                                 338 2023-04-06 07:34:27 2.007817
                                                                    TRUE 4.975
## 3
                               4669 2023-04-14 15:20:48 1.701173
        7.352946 2.52 5.43 315
                                                                    TRUE 3.975
##
       -9.225092 0.76 3.96 343
                                 443 2023-04-14 16:10:00 1.313480
                                                                   TRUE 2.360
                                112 2023-04-14 15:59:28 1.222660 FALSE 1.795
## 5
     -10.849052 0.20 3.39 424
## 6
       -8.928570 0.00 2.96 470
                                 252 2023-04-14 16:01:09 1.238285 FALSE 1.480
## 7
      -11.267604 0.00 2.64 295
                                 502 2023-04-14 15:59:53 1.310550 FALSE 1.320
       -9.900987 0.00 2.23 214
                                 406 2023-04-14 16:10:00 1.460940 FALSE 1.115
       -8.333333 0.00 2.08
                                  50 2023-04-14 14:47:43 1.531252 FALSE 1.040
## 9
                                 344 2023-04-14 16:00:42 1.248051 FALSE 0.400
## 10
       -3.030309 0.00 0.80 197
## 11
                                  37 2023-04-14 14:55:00 1.769532 FALSE 0.830
        6.521739 0.00 1.66
                              4
  12 -19.565218 0.00 1.42
                            20
                                 352 2023-04-14 15:55:57 1.902344 FALSE 0.710
        4.761908 0.00 1.14
                                105 2023-04-14 12:58:46 2.082036 FALSE 0.570
##
  13
                             5
                                   5 2023-04-14 13:27:29 2.142583 FALSE 0.525
   14 -60.526310 0.00 1.05
                                  12 2023-04-13 13:39:25 2.714847 FALSE 0.335
  15
        0.000000 0.00 0.67
                            12
##
## 16
        0.000000 0.00 0.53
                             8
                                   8 2023-04-06 13:40:47 3.265627 FALSE 0.265
##
      InTheMoney
## 1
            TRUE
## 2
            TRUE
## 3
            TRUE
## 4
            TRUE
## 5
           FALSE
## 6
           FALSE
## 7
           FALSE
## 8
           FALSE
## 9
           FALSE
## 10
           FALSE
## 11
           FALSE
## 12
           FALSE
## 13
           FALSE
## 14
           FALSE
## 15
           FALSE
##
  16
           FALSE
##
   $May.10.2023$puts
##
               ContractID ConractSize Currency Expiration Strike
                                                                   Last
     VIXW230510P00015000
                                            USD 2023-05-10
                                                                    0.04 0.000000000
## 1
                               REGULAR
                                                               15
     VIXW230510P00016000
                               REGULAR
                                            USD 2023-05-10
                                                                16
                                                                    0.12 0.009999998
## 3
     VIXW230510P00017000
                              REGULAR
                                            USD 2023-05-10
                                                               17
                                                                    0.35 0.049999982
## 4
     VIXW230510P00018000
                              REGULAR
                                            USD 2023-05-10
                                                                18 0.75 0.040000020
```

```
## 5
      VIXW230510P00019000
                               REGULAR
                                             USD 2023-05-10
                                                                     1.40 0.159999970
                                                                 22
## 6
      VIXW230510P00022000
                               REGULAR
                                             USD 2023-05-10
                                                                     3.75 0.250000000
                                             USD 2023-05-10
      VIXW230510P00026000
                               REGULAR
                                                                     7.08 0.000000000
                                             USD 2023-05-10
      VIXW230510P00028000
                                                                 28
                                                                     9.23 0.379999160
##
  8
                               REGULAR
  9
      VIXW230510P00029000
                               REGULAR
                                             USD 2023-05-10
                                                                     8.23 0.000000000
##
  10 VIXW230510P00030000
                                                                 30 10.76 0.000000000
                               REGULAR
                                             USD 2023-05-10
##
         ChgPct Bid
                        Ask
                             Vol
                                   OI
                                             LastTradeTime
                                                                   TV
                                                                        TTM
                                                                             Price
                              14
## 1
       0.000000 0.00
                      0.72
                                  212 2023-04-14 15:54:36 0.6582065 FALSE
                                                                             0.360
##
   2
       9.090907 0.00
                       1.11 1262
                                       2023-04-14 15:48:45 0.5800823 FALSE
                                                                              0.555
##
   3
      16.666660 0.00
                       1.63 1083
                                  462 2023-04-14 15:59:17 0.9384772 FALSE
                                                                              0.815
       5.633806 0.40
                       2.22
                             218
                                  643 2023-04-14 15:59:33 0.9394537
                                                                       TRUE
                                                                             1.310
                       2.92
                             432
                                 2021 2023-04-14 15:48:45 0.9550786
                                                                       TRUE
##
  5
      12.903222 0.50
                                                                             1.710
                                   69 2023-04-14 14:49:15 1.0429735
##
   6
       7.142858 2.23
                      5.43
                              15
                                                                       TRUE
                                                                             3.830
       0.000000 5.84
                                                                       TRUE
## 7
                      9.12
                              10
                                   32 2023-04-13 11:40:45 1.0976608
                                                                             7.480
## 8
       4.293776 7.75 10.97
                             100
                                                                       TRUE
                                   61 2023-04-14 15:56:11 0.9296882
                                                                             9.360
##
  9
       0.000000 8.71 11.91
                              56
                                   56 2023-04-06 09:37:07 0.0000100
                                                                       TRUE 10.310
       0.000000 9.69 12.86
##
   10
                               1
                                   53 2023-04-13 10:28:01 0.0000100
                                                                       TRUE 11.275
##
      InTheMoney
## 1
           FALSE
##
  2
           FALSE
## 3
           FALSE
            TRUE
## 4
## 5
            TRUE
##
  6
            TRUE
## 7
            TRUE
## 8
            TRUE
            TRUE
##
  9
##
   10
            TRUE
##
##
##
   $May.17.2023
   $May.17.2023$calls
##
              ContractID ConractSize Currency Expiration Strike Last
##
      VIX230517C00010000
                              REGULAR
                                            USD 2023-05-17
                                                              10.0 10.24 -0.079999920
  1
   2
      VIX230517C00010500
                              REGULAR
                                            USD 2023-05-17
                                                              10.5 11.68
                                                                          0.00000000
##
                              REGULAR
##
  3
      VIX230517C00011000
                                            USD 2023-05-17
                                                              11.0
                                                                    9.16 -0.140000340
## 4
      VIX230517C00011500
                              REGULAR
                                            USD 2023-05-17
                                                              11.5 10.68
                                                                          0.000000000
      VIX230517C00012000
                                            USD 2023-05-17
                                                                          0.00000000
## 5
                              REGULAR
                                                              12.0
                                                                    8.62
                                            USD 2023-05-17
  6
      VIX230517C00013000
                              REGULAR
                                                              13.0
                                                                    7.25 -0.300000200
## 7
      VIX230517C00013500
                                            USD 2023-05-17
                                                              13.5
                                                                    8.60
                                                                          0.000000000
                              REGULAR
## 8
      VIX230517C00014000
                              REGULAR
                                            USD 2023-05-17
                                                              14.0
                                                                    6.35 -0.599999900
      VIX230517C00014500
                                            USD 2023-05-17
## 9
                              REGULAR
                                                              14.5
                                                                    5.95
                                                                         0.000000000
## 10 VIX230517C00015000
                              REGULAR
                                            USD 2023-05-17
                                                              15.0
                                                                    5.25 -0.099999905
## 11 VIX230517C00016000
                                            USD 2023-05-17
                                                              16.0
                                                                    4.20 -0.180000300
                              REGULAR
## 12 VIX230517C00017000
                              REGULAR
                                            USD 2023-05-17
                                                              17.0
                                                                    3.40 -0.199999810
                                                              18.0
                                                                    2.72 -0.240000010
## 13 VIX230517C00018000
                              REGULAR
                                            USD 2023-05-17
  14 VIX230517C00019000
                              REGULAR
                                            USD 2023-05-17
                                                              19.0
                                                                    2.25 -0.140000100
## 15 VIX230517C00020000
                              REGULAR
                                            USD 2023-05-17
                                                              20.0
                                                                    1.81 -0.180000070
## 16 VIX230517C00021000
                              REGULAR
                                            USD 2023-05-17
                                                              21.0
                                                                    1.56 -0.170000080
  17 VIX230517C00022000
                              REGULAR
                                            USD 2023-05-17
                                                              22.0
                                                                    1.37 -0.120000005
  18 VIX230517C00023000
                              REGULAR
                                            USD 2023-05-17
                                                              23.0
                                                                    1.18 -0.120000005
## 19 VIX230517C00024000
                              REGULAR
                                            USD 2023-05-17
                                                              24.0
                                                                    1.04 -0.090000030
## 20 VIX230517C00025000
                              REGULAR
                                            USD 2023-05-17
                                                              25.0
                                                                    0.92 -0.099999964
## 21 VIX230517C00026000
                              REGULAR
                                            USD 2023-05-17
                                                              26.0 0.83 -0.069999990
```

```
## 22 VIX230517C00027000
                              REGULAR
                                            USD 2023-05-17
                                                              27.0
                                                                    0.74 -0.060000002
## 23 VIX230517C00028000
                              REGULAR
                                            USD 2023-05-17
                                                              28.0
                                                                    0.66 -0.039999960
  24 VIX230517C00029000
                              REGULAR
                                            USD 2023-05-17
                                                              29.0
                                                                    0.59 -0.040000020
  25 VIX230517C00030000
                                            USD 2023-05-17
                                                              30.0
                              REGULAR
                                                                    0.54 -0.039999960
   26 VIX230517C00031000
                              REGULAR
                                            USD 2023-05-17
                                                              31.0
                                                                    0.51 -0.009999990
##
  27 VIX230517C00032000
                              REGULAR
                                            USD 2023-05-17
                                                              32.0
                                                                    0.45 -0.030000001
  28 VIX230517C00032500
                              REGULAR
                                            USD 2023-05-17
                                                              32.5
                                                                    0.42 -0.030000001
## 29 VIX230517C00033000
                              REGULAR
                                            USD 2023-05-17
                                                              33.0
                                                                    0.39 -0.040000020
   30 VIX230517C00034000
                              REGULAR
                                            USD 2023-05-17
                                                              34.0
                                                                    0.43
                                                                          0.03000001
   31 VIX230517C00035000
                              REGULAR
                                            USD 2023-05-17
                                                              35.0
                                                                    0.35 -0.030000001
   32 VIX230517C00036000
                              REGULAR
                                            USD 2023-05-17
                                                              36.0
                                                                    0.33
                                                                          0.00000000
                                                              37.0
                                                                    0.33
##
   33 VIX230517C00037000
                              REGULAR
                                            USD 2023-05-17
                                                                          0.010000020
   34 VIX230517C00037500
                              REGULAR
                                            USD 2023-05-17
                                                              37.5
                                                                    0.28
                                                                           0.000000000
##
   35 VIX230517C00038000
                              REGULAR
                                            USD 2023-05-17
                                                              38.0
                                                                    0.28
                                                                          0.000000000
   36 VIX230517C00039000
                              REGULAR
                                            USD 2023-05-17
                                                                    0.27
##
                                                              39.0
                                                                           0.020000010
   37
      VIX230517C00040000
                              REGULAR
                                            USD 2023-05-17
                                                              40.0
                                                                    0.24
                                                                           0.00000000
                                                                    0.18 -0.029999986
##
   38 VIX230517C00042500
                              REGULAR
                                            USD 2023-05-17
                                                              42.5
   39 VIX230517C00045000
                              REGULAR
                                            USD 2023-05-17
                                                              45.0
                                                                    0.18
                                                                          0.010000005
  40 VIX230517C00047500
                              REGULAR
                                            USD 2023-05-17
                                                              47.5
                                                                    0.13 -0.030000001
   41 VIX230517C00050000
                              REGULAR
                                            USD 2023-05-17
                                                              50.0
                                                                    0.12 -0.009999998
##
  42 VIX230517C00055000
                              REGULAR
                                            USD 2023-05-17
                                                              55.0
                                                                    0.11
                                                                          0.019999996
                                                                    0.07
  43 VIX230517C00060000
                              REGULAR
                                            USD 2023-05-17
                                                              60.0
                                                                          0.000000000
  44 VIX230517C00065000
                              REGULAR
                                            USD 2023-05-17
                                                              65.0
                                                                    0.06
                                                                          0.009999998
   45 VIX230517C00070000
                              REGULAR
                                            USD 2023-05-17
                                                              70.0
                                                                    0.05
                                                                           0.00000000
  46 VIX230517C00075000
                              REGULAR
                                            USD 2023-05-17
                                                              75.0
                                                                    0.05
                                                                          0.010000002
  47 VIX230517C00080000
                              REGULAR
                                            USD 2023-05-17
                                                              80.0
                                                                    0.03
                                                                         -0.010000000
   48 VIX230517C00085000
                                                              85.0
                                                                    0.04
                              REGULAR
                                            USD 2023-05-17
                                                                          0.000000000
   49 VIX230517C00090000
                              REGULAR
                                            USD 2023-05-17
                                                              90.0
                                                                    0.02
                                                                           0.00000000
  50 VIX230517C00095000
                                            USD 2023-05-17
                                                                    0.02
##
                              REGULAR
                                                              95.0
                                                                           0.00000000
  51 VIX230517C00100000
                              REGULAR
                                            USD 2023-05-17
                                                             100.0
                                                                    0.02
                                                                           0.000000000
## 52 VIX230517C00110000
                              REGULAR
                                            USD 2023-05-17
                                                             110.0
                                                                    0.02
                                                                           0.00000000
  53 VIX230517C00120000
                              REGULAR
                                            USD 2023-05-17
                                                             120.0
                                                                    0.02
                                                                           0.00000000
   54 VIX230517C00130000
                              REGULAR
                                            USD 2023-05-17
                                                             130.0
                                                                    0.01
                                                                           0.00000000
  55 VIX230517C00140000
                                                             140.0
##
                              REGULAR
                                            USD 2023-05-17
                                                                    0.01
                                                                           0.00000000
      VIX230517C00150000
                              REGULAR
                                            USD 2023-05-17
                                                             150.0
                                                                    0.01
                                                                           0.00000000
##
   57 VIX230517C00160000
                              REGULAR
                                            USD 2023-05-17
                                                             160.0
                                                                    0.02
                                                                           0.00000000
   58 VIX230517C00170000
                              REGULAR
                                            USD 2023-05-17
                                                             170.0
                                                                    0.02
                                                                           0.00000000
   59 VIX230517C00180000
                              REGULAR
                                            USD 2023-05-17
                                                             180.0
                                                                    0.02
                                                                           0.00000000
##
##
           ChgPct
                   Bid
                          Ask
                                Vol
                                         ΩT
                                                  LastTradeTime
                                                                        ΤV
                                                                             TTM
       -0.7751931 9.85 10.15
##
                                 54
                                        707 2023-04-14 14:22:14 3.916016
                                                                           TRUE
  1
                         9.65
##
   2
        0.0000000 9.35
                                 20
                                         20 2023-04-04 15:48:06 3.691407
                                                                            TRUE
                         9.15
                                 75
                                       1200 2023-04-14 14:57:49 3.478517
                                                                           TRUE
##
   .3
       -1.5053800 8.85
##
   4
        0.0000000 8.40
                         8.65
                                 10
                                         10 2023-04-04 15:48:08 3.294924
                                                                           TRUE
##
        0.0000000 7.90
                         8.15
                                        638 2023-04-13 09:46:39 3.103518
                                                                           TRUE
   5
                                 13
##
  6
       -3.9735124 6.90
                         7.15
                                 16
                                        803 2023-04-14 15:50:37 2.744144
                                                                            TRUE
  7
                         6.65
                                          3 2023-03-30 10:01:25 2.574222
##
        0.0000000 6.40
                                 NA
                                                                            TRUE
##
   8
       -8.6330920 5.90
                         6.15
                                   3
                                        525 2023-04-14 10:08:09 2.410160
                                                                           TRUE
##
  9
        0.0000000 5.40
                         5.65
                                   1
                                        621 2023-04-13 15:07:59 2.251957
                                                                           TRUE
       -1.8691572 4.90
##
   10
                         5.20
                                790
                                       3324 2023-04-14 15:55:59 2.111333
                                                                           TRUE
##
       -4.1095960 4.00
                         4.25
                                205
                                       2467 2023-04-14 15:59:58 1.848634
                                                                            TRUE
##
   12
       -5.5555506 3.15
                         3.40
                                199
                                       2137 2023-04-14 16:14:13 1.625978
                                                                           TRUE
  13
##
       -8.1081085 2.53
                         2.69
                              10861
                                      12478 2023-04-14 16:14:34 1.486331 FALSE
## 14
       -5.8577447 2.06
                         2.20
                                905
                                      10313 2023-04-14 16:09:39 1.417972 FALSE
## 15
       -9.0452290 1.80
                         1.85
                               9627
                                      27611 2023-04-14 16:14:33 1.415042 FALSE
```

```
-9.8265930 1.46 1.58 1293
                                     91352 2023-04-14 16:06:48 1.391605 FALSE
## 17
                        1.37 28547
                                     95736 2023-04-14 16:14:59 1.412112 FALSE
       -8.0536920 1.30
       -9.2307700 1.12
## 18
                         1.19 10053
                                     44949 2023-04-14 15:59:42 1.418948 FALSE
##
       -7.9646053 0.98
                         1.05
                               1938 182925 2023-04-14 16:11:01 1.433597 FALSE
  19
##
   20
       -9.8039180 0.86
                         0.92 30699 126151 2023-04-14 16:11:01 1.445315 FALSE
       -7.7777770 0.76
                         0.82
                                     66736 2023-04-14 16:05:16 1.462893 FALSE
##
  21
                                852
## 22
       -7.5000005 0.67
                         0.74
                               1250
                                     48661 2023-04-14 16:10:14 1.479495 FALSE
## 23
       -5.7142806 0.61
                         0.66
                                467
                                     42949 2023-04-14 16:01:54 1.498049 FALSE
##
  24
       -6.3492100 0.54
                         0.60
                                308
                                     16121 2023-04-14 15:55:24 1.513674 FALSE
##
  25
       -6.8965450 0.50
                         0.54 31560 207556 2023-04-14 16:14:59 1.533205 FALSE
  26
       -1.9230751 0.45
                         0.49
                                631
                                     12358 2023-04-14 15:27:30 1.548830 FALSE
       -6.2500010 0.41
                               5099 139905 2023-04-14 15:58:36 1.566408 FALSE
##
   27
                         0.45
##
   28
       -6.6666670 0.39
                         0.43
                                229
                                     28028 2023-04-14 16:11:01 1.572268 FALSE
       -9.3023310 0.37
##
   29
                         0.41
                                 26
                                     10357 2023-04-14 16:08:47 1.578127 FALSE
##
        7.5000005 0.34
                         0.38
                               2057
                                     16510 2023-04-14 10:45:55 1.595705 FALSE
  30
##
  31
       -7.8947372 0.30
                         0.35
                               9668
                                     58551 2023-04-14 16:01:43 1.605471 FALSE
        0.0000000 0.28
                         0.32
                                     20237 2023-04-14 11:47:26 1.619143 FALSE
##
  32
                               6701
##
   33
        3.1250064 0.26
                         0.30
                               2767
                                      8969 2023-04-14 11:42:02 1.636721 FALSE
        0.0000000 0.25
                         0.29
                                     12423 2023-04-13 15:12:03 1.644533 FALSE
##
   34
                                 10
##
   35
        0.0000000 0.24
                         0.28
                                 15
                                      5744 2023-04-14 09:57:06 1.652345 FALSE
##
  36
        8.0000040 0.22
                         0.26
                                  4
                                      8646 2023-04-14 14:56:22 1.664064 FALSE
        0.0000000 0.20
                         0.24
                               9501
                                     91675 2023-04-14 16:03:56 1.671877 FALSE
##
  37
                         0.20
                                     38521 2023-04-14 16:06:24 1.695314 FALSE
## 38
      -14.2857070 0.16
                               3888
                               6408
                                     50589 2023-04-14 15:53:17 1.726564 FALSE
## 39
        5.8823560 0.14
                         0.17
                                     31977 2023-04-14 16:06:18 1.750001 FALSE
## 40
      -18.7500020 0.11
                         0.15
                                 27
  41
       -7.6923065 0.10
                         0.13 15535 253665 2023-04-14 15:59:50 1.781251 FALSE
##
       22.2222160 0.07
                                155 107093 2023-04-14 15:58:35 1.835938 FALSE
  42
                         0.11
##
   43
        0.0000000 0.05
                         0.09
                               4156
                                     45785 2023-04-14 15:38:43 1.875001 FALSE
       19.9999960 0.04
                         0.07
                               1408
                                     79968 2023-04-14 15:00:22 1.906250 FALSE
##
   44
## 45
        0.0000000 0.03
                         0.06
                                 15
                                     42751 2023-04-14 09:57:32 1.945313 FALSE
## 46
       25.0000060 0.02
                         0.05
                                773
                                     43042 2023-04-14 14:23:31 1.968750 FALSE
##
  47
      -25.0000000 0.01
                         0.04 10675
                                     33646 2023-04-14 15:59:03 1.968750 FALSE
## 48
        0.0000000 0.00
                         0.04
                                  3
                                     75788 2023-04-12 11:46:02 1.968750 FALSE
        0.0000000 0.00
                                401 102891 2023-04-14 13:20:09 2.031255 FALSE
##
  49
                         0.04
## 50
        0.0000000 0.00
                         0.05
                                  4
                                      3090 2023-04-11 11:55:28 2.140630 FALSE
## 51
        0.0000000 0.00
                                     19904 2023-04-11 14:39:25 2.187505 FALSE
                         0.05
                                  1
## 52
        0.0000000 0.00
                         0.05
                                 10
                                      1233 2023-04-06 14:05:01 2.281254 FALSE
## 53
        0.0000000 0.00
                         0.04
                                100
                                       788 2023-04-04 11:05:43 2.312504 FALSE
        0.0000000 0.00
                         0.04
                                720
                                      2363 2023-04-04 11:07:23 2.406254 FALSE
## 54
        0.0000000 0.00
                         0.03
                                370
                                      2801 2023-04-04 11:06:17 2.406254 FALSE
## 55
        0.0000000 0.00
                         0.03
                                     10131 2023-04-12 09:48:58 2.468754 FALSE
  56
                                 10
## 57
        0.0000000 0.00
                        0.03
                                250
                                      3059 2023-03-31 14:09:29 2.531254 FALSE
        0.0000000 0.00
##
  58
                         0.03
                                120
                                      3061 2023-03-29 15:20:00 2.593754 FALSE
        0.0000000 0.00
                         0.03
                                100
                                      5507 2023-03-29 10:47:18 2.656253 FALSE
##
  59
##
       Price InTheMoney
                   TRUE
      10.000
## 1
## 2
       9.500
                   TRUE
## 3
       9.000
                   TRUE
## 4
       8.525
                   TRUE
## 5
       8.025
                   TRUE
## 6
       7.025
                   TRUE
## 7
       6.525
                   TRUE
## 8
       6.025
                   TRUE
## 9
       5.525
                   TRUE
```

```
## 10 5.050
                   TRUE
## 11 4.125
                   TRUE
## 12 3.275
                   TRUE
## 13 2.610
                  FALSE
## 14
       2.130
                  FALSE
## 15
      1.825
                  FALSE
## 16
      1.520
                  FALSE
## 17
      1.335
                  FALSE
## 18
      1.155
                  FALSE
## 19
      1.015
                  FALSE
## 20
      0.890
                  FALSE
## 21
      0.790
                  FALSE
## 22
      0.705
                  FALSE
## 23
      0.635
                  FALSE
## 24
      0.570
                  FALSE
## 25
       0.520
                  FALSE
## 26 0.470
                  FALSE
## 27
      0.430
                  FALSE
## 28
      0.410
                  FALSE
## 29
       0.390
                  FALSE
## 30
     0.360
                  FALSE
## 31 0.325
                  FALSE
## 32 0.300
                  FALSE
## 33
       0.280
                  FALSE
## 34
     0.270
                  FALSE
## 35
      0.260
                  FALSE
## 36 0.240
                  FALSE
## 37
       0.220
                  FALSE
## 38
     0.180
                  FALSE
## 39
      0.155
                  FALSE
## 40
       0.130
                  FALSE
## 41
      0.115
                  FALSE
## 42
      0.090
                  FALSE
## 43
      0.070
                  FALSE
## 44
       0.055
                  FALSE
## 45 0.045
                  FALSE
## 46 0.035
                  FALSE
## 47 0.025
                  FALSE
## 48 0.020
                  FALSE
## 49 0.020
                  FALSE
## 50
      0.025
                  FALSE
## 51 0.025
                  FALSE
## 52 0.025
                  FALSE
## 53 0.020
                  FALSE
## 54 0.020
                  FALSE
## 55
      0.015
                  FALSE
## 56
      0.015
                  FALSE
## 57
       0.015
                  FALSE
## 58
       0.015
                  FALSE
## 59
       0.015
                  FALSE
##
## $May.17.2023$puts
              ContractID ConractSize Currency Expiration Strike
##
                                                                   Last
## 1 VIX230517P00010000
                             REGULAR
                                           USD 2023-05-17
                                                            10.0
                                                                   0.01
```

```
## 2
      VIX230517P00011000
                              REGULAR
                                             USD 2023-05-17
                                                               11.0
                                                                      0.01
##
                                                                      0.01
  3
      VIX230517P00012000
                              REGULAR
                                            USD 2023-05-17
                                                               12.0
##
      VIX230517P00013000
                              REGULAR
                                             USD 2023-05-17
                                                               13.0
                                                                      0.01
      VIX230517P00014000
                                            USD 2023-05-17
                                                               14.0
                                                                      0.01
##
  5
                              REGULAR
##
   6
      VIX230517P00014500
                              REGULAR
                                             USD 2023-05-17
                                                               14.5
                                                                      0.01
##
  7
      VIX230517P00015000
                              REGULAR
                                            USD 2023-05-17
                                                               15.0
                                                                      0.04
##
  8
      VIX230517P00016000
                              REGULAR
                                            USD 2023-05-17
                                                               16.0
                                                                      0.08
## 9
      VIX230517P00017000
                              REGULAR
                                            USD 2023-05-17
                                                               17.0
                                                                      0.23
  10 VIX230517P00018000
                              REGULAR
                                            USD 2023-05-17
                                                               18.0
                                                                      0.54
  11 VIX230517P00019000
                              REGULAR
                                             USD 2023-05-17
                                                               19.0
                                                                      1.06
   12 VIX230517P00020000
                              REGULAR
                                             USD 2023-05-17
                                                               20.0
                                                                      1.68
   13 VIX230517P00021000
                              REGULAR
                                             USD 2023-05-17
                                                              21.0
                                                                      2.44
   14 VIX230517P00022000
                              REGULAR
                                            USD 2023-05-17
                                                               22.0
                                                                      3.23
##
   15 VIX230517P00023000
                              REGULAR
                                            USD 2023-05-17
                                                               23.0
                                                                      4.06
  16 VIX230517P00024000
                                            USD 2023-05-17
                                                                      4.90
                              REGULAR
                                                               24.0
      VIX230517P00025000
                              REGULAR
                                             USD 2023-05-17
                                                               25.0
                                                                      5.65
   18 VIX230517P00026000
                              REGULAR
                                            USD 2023-05-17
                                                              26.0
                                                                      6.65
   19 VIX230517P00027000
                              REGULAR
                                             USD 2023-05-17
                                                                      7.60
                                                               27.0
  20 VIX230517P00028000
                                                                      8.20
                              REGULAR
                                            USD 2023-05-17
                                                              28.0
   21 VIX230517P00029000
                              REGULAR
                                             USD 2023-05-17
                                                               29.0
                                                                      9.35
##
  22 VIX230517P00030000
                              REGULAR
                                            USD 2023-05-17
                                                              30.0
                                                                     10.30
   23 VIX230517P00031000
                              REGULAR
                                             USD 2023-05-17
                                                              31.0
                                                                     11.22
## 24 VIX230517P00032000
                              REGULAR
                                            USD 2023-05-17
                                                              32.0
                                                                     11.97
  25 VIX230517P00032500
                              REGULAR
                                            USD 2023-05-17
                                                              32.5
                                                                     12.65
##
  26 VIX230517P00033000
                              REGULAR
                                            USD 2023-05-17
                                                               33.0
                                                                     11.05
  27 VIX230517P00034000
                              REGULAR
                                            USD 2023-05-17
                                                               34.0
                                                                     14.08
   28 VIX230517P00035000
##
                              REGULAR
                                             USD 2023-05-17
                                                              35.0
                                                                     14.80
   29 VIX230517P00036000
                              REGULAR
                                             USD 2023-05-17
                                                              36.0
                                                                     14.65
##
   30 VIX230517P00037000
                              REGULAR
                                            USD 2023-05-17
                                                               37.0
                                                                     16.90
   31 VIX230517P00037500
                              REGULAR
                                            USD 2023-05-17
                                                               37.5
                                                                     16.10
##
   32 VIX230517P00040000
                              REGULAR
                                            USD 2023-05-17
                                                               40.0
                                                                     19.80
##
   33 VIX230517P00042500
                              REGULAR
                                            USD 2023-05-17
                                                              42.5
                                                                     22.25
##
   34 VIX230517P00045000
                              REGULAR
                                             USD 2023-05-17
                                                               45.0
                                                                     23.22
   35 VIX230517P00047500
##
                              REGULAR
                                             USD 2023-05-17
                                                               47.5
                                                                     25.77
     VIX230517P00050000
                              REGULAR
                                             USD 2023-05-17
                                                                     29.60
                                                              50.0
##
   37 VIX230517P00055000
                              REGULAR
                                            USD 2023-05-17
                                                              55.0
                                                                     32.80
   38 VIX230517P00060000
                              REGULAR
                                            USD 2023-05-17
                                                               60.0
                                                                     38.96
  39 VIX230517P00065000
                              REGULAR
                                            USD 2023-05-17
                                                                     42.67
##
                                                               65.0
   40 VIX230517P00070000
                                             USD 2023-05-17
                              REGULAR
                                                              70.0
                                                                     46.11
##
  41 VIX230517P00075000
                                            USD 2023-05-17
                                                              75.0
                                                                     54.30
                              REGULAR
   42 VIX230517P00080000
                              REGULAR
                                             USD 2023-05-17
                                                              80.0
                                                                     59.30
   43 VIX230517P00090000
                                                              90.0
##
                              REGULAR
                                            USD 2023-05-17
                                                                     61.25
   44 VIX230517P00100000
                              REGULAR
                                            USD 2023-05-17
                                                              100.0
                                                                     74.00
##
   45 VIX230517P00110000
                                            USD 2023-05-17
                              REGULAR
                                                              110.0
                                                                     86.62
   46 VIX230517P00130000
                              REGULAR
                                             USD 2023-05-17
                                                              130.0 106.00
##
  47 VIX230517P00140000
                              REGULAR
                                            USD
                                                2023-05-17
                                                              140.0 116.21
   48 VIX230517P00150000
                              REGULAR
                                            USD 2023-05-17
                                                              150.0 123.30
##
   49 VIX230517P00180000
                               REGULAR
                                            USD 2023-05-17
                                                              180.0 157.55
##
               Chg
                        ChgPct
                                   Bid
                                                 Vol
                                                        NΤ
                                          Ask
                                                                  LastTradeTime
##
       0.00000000
                      0.000000
                                  0.00
                                         0.02
                                                   1
                                                        32 2023-03-29 10:52:29
   1
##
   2
                                                   3
       0.00000000
                      0.000000
                                  0.00
                                         0.02
                                                         7
                                                           2023-04-12 10:55:11
##
  3
       0.00000000
                      0.000000
                                  0.00
                                         0.02
                                                  43
                                                        43 2023-04-13 09:45:31
## 4
       0.00000000
                      0.000000
                                  0.00
                                         0.02
                                                   5
                                                         8 2023-03-10 14:15:30
## 5
       0.00000000
                      0.000000
                                  0.00
                                         0.03
                                                 212
                                                      2777 2023-04-14 11:23:10
```

```
-0.010000000 -50.000000
                                  0.00
                                         0.04
                                                  11 1421 2023-04-14 16:14:11
                                  0.01
## 7
       0.020000000 100.000000
                                               1637 12914 2023-04-14 14:59:27
                                         0.05
                                         0.10
## 8
       0.009999998
                     14.285712
                                  0.06
                                                436 31695 2023-04-14 16:04:48
## 9
       0.03000001
                     15.000001
                                  0.23
                                               2967 71617 2023-04-14 16:14:11
                                         0.26
## 10
       0.050000012
                     10.204084
                                  0.55
                                         0.60 21773 60128 2023-04-14 16:09:35
## 11
       0.079999920
                      8.163258
                                  1.06
                                         1.13 10532 61157 2023-04-14 16:14:15
## 12
       0.099999905
                      6.329108
                                  1.70
                                         1.77 13978 63630 2023-04-14 16:14:15
## 13
       0.160000090
                      7.017548
                                  2.42
                                         2.50
                                               1146 75363 2023-04-14 16:13:36
##
  14
       0.20000050
                      6.600662
                                  3.20
                                         3.30
                                                 133 64265 2023-04-14 16:00:11
## 15
       0.260000000
                      6.842105
                                  4.00
                                         4.15
                                                  73 49828 2023-04-14 15:59:57
  16
       0.200000290
                      4.255325
                                  4.85
                                         5.00
                                                116 48555 2023-04-14 15:59:50
##
   17
       0.099999905
                      1.801800
                                  5.75
                                         5.90
                                                  24 42157 2023-04-14 15:53:17
##
   18
       0.210000040
                      3.260870
                                  6.60
                                         6.80
                                                 104 31453 2023-04-14 15:58:30
       0.250000000
                                                     23397 2023-04-14 16:00:00
##
   19
                      3.401361
                                  7.55
                                         7.70
                     -1.204824
## 20
      -0.100000380
                                  8.45
                                         8.65
                                                  93
                                                      9900 2023-04-14 13:43:13
##
  21
       0.370000840
                      4.120277
                                  9.40
                                         9.60
                                                  68
                                                      1795 2023-04-14 15:11:47
                                 10.30
##
  22
       0.180000300
                      1.778659
                                        10.55
                                                  56
                                                      1891 2023-04-14 15:46:01
##
   23
       0.170000080
                      1.538462
                                 11.30
                                        11.50
                                                      1635 2023-04-14 15:06:38
                                                  72
                                 12.25
##
  24
       0.430000300
                      3.726172
                                        12.45
                                                   2
                                                       269 2023-04-14 13:24:59
##
   25
       0.449999800
                      3.688523
                                 12.70
                                        12.90
                                                   5
                                                        95 2023-04-14 14:39:35
##
  26
       0.00000000
                      0.000000
                                 13.20
                                        13.40
                                                  30
                                                        51 2023-03-28 09:37:46
  27
                     11.746028
                                                        89 2023-04-14 15:06:07
##
       1.479999500
                                 14.15
                                        14.35
                                                   1
                                 15.10
## 28
       0.00000000
                      0.000000
                                        15.35
                                                       209 2023-04-13 10:35:52
                                                   1
                                 16.05
                                                        98 2023-04-03 13:13:37
##
  29
       0.00000000
                      0.000000
                                        16.30
                                                   1
##
  30
       0.00000000
                      0.000000
                                 17.05
                                        17.30
                                                   3
                                                        77 2023-04-13 11:29:21
   31
       0.00000000
                      0.000000
                                 17.50
                                        17.75
                                                   1
                                                       245 2023-04-03 12:50:34
##
   32
                      0.000000
                                 19.95
                                                        39 2023-04-13 11:34:17
       0.00000000
                                        20.20
                                                   1
##
   33
       0.00000000
                      0.000000
                                 22.40
                                        22.65
                                                   3
                                                        20 2023-04-13 11:43:36
##
                      0.000000
                                 24.85
   34
       0.00000000
                                        25.15
                                                  10
                                                        12 2023-03-29 15:47:25
##
   35
       0.00000000
                      0.000000
                                 22.65
                                        23.00
                                                         2 2023-02-16 15:39:46
                                                  NA
##
   36
       0.00000000
                      0.000000
                                 29.80
                                        30.05
                                                  39
                                                       282 2023-04-13 11:24:10
##
   37
       0.00000000
                      0.000000
                                 34.75
                                        35.00
                                                   2
                                                        29 2023-03-30 15:02:43
##
   38
       0.00000000
                      0.000000
                                 39.70
                                        40.00
                                                   2
                                                           2023-04-11 10:26:21
                                 44.70
                                                   2
##
   39
       0.00000000
                      0.000000
                                        44.95
                                                        39 2023-03-30 15:02:43
                                        49.90
##
       0.00000000
                      0.000000
                                 49.65
                                                   2
                                                           2023-03-21 10:36:05
   40
                                                   5
##
  41
       5.799999000
                     11.958761
                                54.60
                                        54.90
                                                         1 2023-04-14 12:21:36
## 42
       0.00000000
                      0.000000
                                 59.60
                                        59.85
                                                  10
                                                        13 2023-04-13 14:30:47
## 43
       0.00000000
                      0.000000
                                 63.30
                                                  20
                                                        20 2022-11-14 13:32:40
                                        63.55
       0.00000000
                      0.000000
                                79.50
                                        79.75
                                                       112 2023-03-24 10:48:50
##
  44
                                                   1
                                                         2 2023-02-13 11:59:04
##
  45
       0.00000000
                      0.000000
                                 83.75
                                        84.25
                                                   3
   46
       0.00000000
                      0.000000
                                 0.00
                                         0.00
                                                  34
                                                        39 2023-02-21 05:26:08
       0.00000000
                      0.000000 113.35 113.90
##
   47
                                                   3
                                                         3 2023-02-13 11:59:04
##
   48
       0.00000000
                      0.000000 128.70 128.85
                                                   1
                                                       119 2023-03-13 09:37:17
##
       0.00000000
                      0.000000 159.15 159.40
                                                   8
                                                        19 2023-04-06 12:09:29
   49
##
             ΙV
                   ITM
                         Price InTheMoney
                         0.010
## 1
      0.7812522 FALSE
                                     FALSE
##
  2
      0.6562534 FALSE
                         0.010
                                     FALSE
## 3
      0.5312547 FALSE
                         0.010
                                     FALSE
## 4
      0.4687553 FALSE
                         0.010
                                     FALSE
## 5
      0.3867249 FALSE
                         0.015
                                     FALSE
##
  6
      0.3496159 FALSE
                         0.020
                                     FALSE
## 7
      0.3046945 FALSE
                         0.030
                                     FALSE
## 8
      0.2275468 FALSE
                         0.080
                                     FALSE
## 9
      0.1455164 FALSE
                         0.245
                                     FALSE
```

```
## 10 0.0000100
                  TRUE
                         0.575
                                      TRUE
## 11 0.0000100
                  TRUE
                         1.095
                                      TRUE
  12 0.0000100
                  TRUE
                         1.735
                                      TRUE
                  TRUE
                         2.460
## 13 0.0000100
                                      TRUE
  14 0.0000100
                  TRUE
                         3.250
                                      TRUE
## 15 0.0000100
                  TRUE
                         4.075
                                      TRUE
## 16 0.0000100
                  TRUE
                         4.925
                                      TRUE
## 17 0.0000100
                  TRUE
                         5.825
                                      TRUE
## 18 0.0000100
                  TRUE
                         6.700
                                      TRUE
## 19 0.0000100
                  TRUE
                         7.625
                                      TRUE
  20 0.0000100
                  TRUE
                         8.550
                                      TRUE
##
  21 0.0000100
                  TRUE
                         9.500
                                      TRUE
  22 0.0000100
                  TRUE
                        10.425
                                      TRUE
  23 0.0000100
##
                  TRUE
                        11.400
                                      TRUE
## 24 0.0000100
                  TRUE
                        12.350
                                      TRUE
## 25 0.0000100
                  TRUE
                        12.800
                                      TRUE
## 26 0.0000100
                  TRUE
                        13.300
                                      TRUE
  27 0.0000100
                  TRUE
                        14.250
                                      TRUE
  28 0.0000100
                  TRUE
                        15.225
                                      TRUE
  29 0.0000100
                  TRUE
                        16.175
                                      TRUE
##
  30 0.0000100
                  TRUE
                        17.175
                                      TRUE
  31 0.0000100
                  TRUE
                        17.625
                                      TRUE
## 32 0.0000100
                  TRUE
                        20.075
                                      TRUE
                  TRUE
  33 0.0000100
                        22.525
                                      TRUE
## 34 0.0000100
                  TRUE
                        25.000
                                      TRUE
   35 0.0000100
                  TRUE
                        22.825
                                      TRUE
                  TRUE
                        29.925
                                      TRUE
##
  36 0.0000100
##
   37 0.0000100
                  TRUE
                        34.875
                                      TRUE
                  TRUE
   38 0.0000100
                        39.850
                                      TRUE
   39 0.0000100
                  TRUE
                                      TRUE
                        44.825
## 40 0.0000100
                  TRUE
                        49.775
                                      TRUE
## 41 0.0000100
                  TRUE
                        54.750
                                      TRUE
## 42 0.0000100
                  TRUE
                        59.725
                                      TRUE
  43 0.0000100
                  TRUE
                        63.425
                                      TRUE
   44 0.0000100
                  TRUE
                        79.625
                                      TRUE
                  TRUE
##
  45 0.0000100
                        84.000
                                      TRUE
  46 0.0000100
                  TRUE
                         0.000
                                      TRUE
  47 0.0000100
                  TRUE 113.625
                                      TRUE
   48 0.0000100
                  TRUE 128.775
                                      TRUE
   49 0.0000100
##
                  TRUE 159.275
                                      TRUE
##
##
##
   $Jun.21.2023
##
   $Jun.21.2023$calls
##
               ContractID ConractSize Currency Expiration Strike
                                                                                   Chg
                                                                    Last
## 1
      VIX230621C00010000
                               REGULAR
                                             USD 2023-06-21
                                                               10.0 11.67 -0.01000023
##
  2
      VIX230621C00011000
                               REGULAR
                                            USD 2023-06-21
                                                               11.0 10.62
                                                                           0.01999950
##
  3
      VIX230621C00012000
                               REGULAR
                                            USD 2023-06-21
                                                               12.0
                                                                     9.82 -0.57999990
                                                               13.0
                                                                     9.00
##
  4
      VIX230621C00013000
                               REGULAR
                                            USD 2023-06-21
                                                                           0.0000000
##
  5
      VIX230621C00014000
                               REGULAR
                                            USD 2023-06-21
                                                               14.0
                                                                     9.00
                                                                           0.0000000
  6
##
      VIX230621C00015000
                               REGULAR
                                            USD 2023-06-21
                                                               15.0
                                                                     6.80
                                                                           0.10000038
##
  7
      VIX230621C00016000
                               REGULAR
                                            USD 2023-06-21
                                                               16.0
                                                                     5.80 -0.04999971
## 8
      VIX230621C00017000
                               REGULAR
                                            USD 2023-06-21
                                                               17.0
                                                                     5.00 -0.01999998
## 9
      VIX230621C00018000
                               REGULAR
                                            USD 2023-06-21
                                                               18.0
                                                                    4.25 -0.07000017
```

```
## 10 VIX230621C00019000
                              REGULAR
                                            USD 2023-06-21
                                                              19.0
                                                                    3.70 -0.04999995
                                            USD 2023-06-21
  11 VIX230621C00020000
                              REGULAR
                                                              20.0
                                                                    3.30 -0.04999995
  12 VIX230621C00021000
                              REGULAR
                                            USD 2023-06-21
                                                              21.0
                                                                    2.88 -0.01999998
  13 VIX230621C00022000
                                            USD 2023-06-21
                                                              22.0
                                                                    2.60 -0.04000020
                              REGULAR
   14 VIX230621C00023000
                              REGULAR
                                            USD 2023-06-21
                                                              23.0
                                                                    2.32 -0.04999995
##
                                            USD 2023-06-21
                                                              24.0
  15 VIX230621C00024000
                              REGULAR
                                                                    2.08 -0.05000019
  16 VIX230621C00025000
                              REGULAR
                                            USD 2023-06-21
                                                              25.0
                                                                    1.90 -0.05000007
## 17 VIX230621C00026000
                              REGULAR
                                            USD 2023-06-21
                                                              26.0
                                                                    1.74
                                                                         0.03999996
   18 VIX230621C00027000
                              REGULAR
                                            USD 2023-06-21
                                                              27.0
                                                                    1.60 -0.02999997
   19 VIX230621C00028000
                              REGULAR
                                            USD 2023-06-21
                                                              28.0
                                                                    1.47 -0.02999997
   20 VIX230621C00029000
                              REGULAR
                                            USD 2023-06-21
                                                              29.0
                                                                    1.35 -0.01999998
                                            USD 2023-06-21
                                                                    1.25 -0.01999998
##
   21 VIX230621C00030000
                              REGULAR
                                                              30.0
   22 VIX230621C00031000
                              REGULAR
                                            USD 2023-06-21
                                                              31.0
                                                                    1.15 -0.00999999
   23 VIX230621C00032000
##
                              REGULAR
                                            USD 2023-06-21
                                                              32.0
                                                                    1.10
                                                                           0.06000006
  24 VIX230621C00032500
                              REGULAR
                                            USD 2023-06-21
                                                                    1.05
##
                                                              32.5
                                                                           0.00000000
   25
      VIX230621C00033000
                              REGULAR
                                            USD
                                                2023-06-21
                                                              33.0
                                                                    1.00 -0.01999998
                                                                           0.02999997
##
   26 VIX230621C00034000
                              REGULAR
                                            USD 2023-06-21
                                                              34.0
                                                                    0.95
   27 VIX230621C00035000
                              REGULAR
                                            USD 2023-06-21
                                                              35.0
                                                                    0.89
                                                                           0.0000000
  28 VIX230621C00036000
                                            USD 2023-06-21
##
                              REGULAR
                                                              36.0
                                                                    0.84 -0.08000004
   29 VIX230621C00037000
                              REGULAR
                                            USD 2023-06-21
                                                              37.0
                                                                    0.80
                                                                           0.04000002
##
   30 VIX230621C00037500
                              REGULAR
                                            USD 2023-06-21
                                                              37.5
                                                                    0.83
                                                                           0.07999998
   31 VIX230621C00038000
                                            USD 2023-06-21
                              REGULAR
                                                              38.0
                                                                    0.72
                                                                           0.01000005
  32 VIX230621C00039000
                              REGULAR
                                            USD 2023-06-21
                                                              39.0
                                                                    0.67
                                                                           0.00999999
##
   33 VIX230621C00040000
                              REGULAR
                                            USD 2023-06-21
                                                              40.0
                                                                    0.65
                                                                           0.01999998
##
   34 VIX230621C00042500
                              REGULAR
                                            USD 2023-06-21
                                                              42.5
                                                                    0.56
                                                                           0.03000003
   35 VIX230621C00045000
                              REGULAR
                                            USD 2023-06-21
                                                              45.0
                                                                    0.50
                                                                           0.00999999
   36 VIX230621C00047500
                                                2023-06-21
                                                              47.5
                                                                    0.44
##
                              REGULAR
                                            USD
                                                                           0.02000001
   37
     VIX230621C00050000
                              REGULAR
                                            USD 2023-06-21
                                                              50.0
                                                                    0.38
                                                                           0.0000000
                                            USD 2023-06-21
##
   38 VIX230621C00055000
                              REGULAR
                                                              55.0
                                                                    0.32
                                                                           0.03000000
   39 VIX230621C00060000
                              REGULAR
                                            USD 2023-06-21
                                                              60.0
                                                                    0.22 -0.03000000
##
  40 VIX230621C00065000
                              REGULAR
                                            USD 2023-06-21
                                                              65.0
                                                                    0.21
                                                                           0.00000000
   41 VIX230621C00070000
                              REGULAR
                                            USD 2023-06-21
                                                              70.0
                                                                    0.16 -0.01000000
   42 VIX230621C00075000
                              REGULAR
                                            USD 2023-06-21
                                                              75.0
                                                                    0.14
                                                                           0.00000000
                                            USD 2023-06-21
                                                                    0.10 -0.04000000
##
  43 VIX230621C00080000
                              REGULAR
                                                              80.0
     VIX230621C00085000
                              REGULAR
                                            USD 2023-06-21
                                                              85.0
                                                                    0.12
                                                                           0.0000000
                                            USD 2023-06-21
##
   45 VIX230621C00090000
                              REGULAR
                                                              90.0
                                                                    0.10
                                                                           0.02000000
  46 VIX230621C00095000
                              REGULAR
                                            USD 2023-06-21
                                                              95.0
                                                                    0.10
                                                                           0.0000000
  47 VIX230621C00100000
                              REGULAR
                                            USD 2023-06-21
                                                             100.0
                                                                    0.06
                                                                           0.0000000
##
   48 VIX230621C00110000
                                            USD 2023-06-21
                                                             110.0
                                                                    0.04 -0.01000000
                              REGULAR
##
                                            USD 2023-06-21
                                                                    0.04
  49 VIX230621C00120000
                                                             120.0
                                                                           0.00000000
                              REGULAR
   50 VIX230621C00130000
                              REGULAR
                                            USD 2023-06-21
                                                             130.0
                                                                    0.05
                                                                           0.00000000
  51 VIX230621C00140000
                                            USD 2023-06-21
                                                             140.0
                                                                    0.03
                              REGULAR
                                                                           0.00000000
   52 VIX230621C00150000
                              REGULAR
                                            USD 2023-06-21
                                                             150.0
                                                                    0.03
                                                                           0.0000000
##
   53 VIX230621C00160000
                                            USD 2023-06-21
                                                                    0.02 -0.01000000
                              REGULAR
                                                             160.0
   54 VIX230621C00170000
                              REGULAR
                                            USD 2023-06-21
                                                             170.0
                                                                    0.02
                                                                           0.0000000
   55 VIX230621C00180000
                              REGULAR
                                            USD 2023-06-21
                                                             180.0
                                                                    0.04
                                                                           0.0000000
##
##
            ChgPct
                      Bid
                            Ask
                                 Vol
                                          OI
                                                   LastTradeTime
                                                                         ΙV
                                                                              ITM
##
   1
       -0.08561839 11.35
                          11.65
                                   42
                                         993 2023-04-14 16:06:40 3.623048
                                                                             TRUE
                                 109
##
   2
        0.18867455 10.40
                          10.65
                                        1089
                                             2023-04-14 14:57:49 3.240236
                                                                             TRUE
##
   3
       -5.57692240
                     9.40
                           9.65
                                   25
                                             2023-04-10 13:06:44 2.894534
                                                                             TRUE
                    8.40
                                    2
                                         813 2023-04-12 12:01:16 2.585941
##
   4
        0.00000000
                           8.65
                                                                             TRUE
                                    2
## 5
        0.00000000
                    7.45
                           7.70
                                          53 2023-04-04 15:50:06 2.327153
                                                                             TRUE
## 6
        1.49254310
                     6.50
                           6.75
                                 976
                                        2694 2023-04-14 15:53:27 2.087407
                                                                             TRUE
## 7
       -0.85469600
                    5.55
                           5.80
                                   85
                                         542 2023-04-14 16:13:12 1.861329
                                                                             TRUE
```

```
## 8
       -0.39840603
                    4.75
                          5.00
                                 143
                                        620 2023-04-14 16:13:27 1.699220 TRUE
## 9
                    4.20
                           4.30
                                 510
                                       1563 2023-04-14 16:11:48 1.599611 FALSE
       -1.62037420
       -1.33333210
##
  10
                    3.55
                           3.75
                                 509
                                       8498 2023-04-14 16:12:45 1.502932 FALSE
##
       -1.49253600
                    3.10
                           3.30 1188
                                      29282 2023-04-14 16:09:01 1.451175 FALSE
  11
                                 241
##
   12
       -0.68965447
                    2.75
                           2.89
                                       8305 2023-04-14 16:14:26 1.414065 FALSE
       -1.51515900
                    2.45
                           2.58
                                 326
                                      82354 2023-04-14 15:57:36 1.394046 FALSE
##
  13
                                 543 145006 2023-04-14 15:59:16 1.384769 FALSE
  14
       -2.10970260
                    2.20
                           2.33
## 15
       -2.34742670
                    1.99
                           2.11 1092
                                      62411 2023-04-14 15:59:55 1.379886 FALSE
##
  16
       -2.56410620
                    1.81
                           1.92 1163
                                      84428 2023-04-14 16:11:50 1.378909 FALSE
## 17
        2.35293900
                    1.65
                           1.75
                                  65
                                      25556 2023-04-14 16:14:15 1.378909 FALSE
  18
       -1.84048900
                    1.53
                           1.61
                                 165
                                      81169 2023-04-14 15:57:36 1.386722 FALSE
       -1.99999810
                    1.38
                                 390
                                      57525 2023-04-14 15:58:29 1.384769 FALSE
##
   19
                           1.48
##
   20
       -1.45985260
                    1.30
                           1.37
                                 129
                                      12587 2023-04-14 16:02:49 1.396487 FALSE
                                3988
                                     488245 2023-04-14 16:11:01 1.401370 FALSE
##
   21
       -1.57480170
                    1.20
                           1.27
##
  22
       -0.86206810
                                   6
                                        1815 2023-04-14 15:47:35 1.405276 FALSE
                    1.11
                           1.17
##
  23
        5.76923660
                    1.03
                           1.09
                                 573
                                      96068 2023-04-14 15:17:24 1.411136 FALSE
##
        0.00000000
                    0.97
                           1.06
                                   7
                                       4449 2023-04-14 15:53:28 1.410159 FALSE
   24
##
   25
       -1.96078250
                    0.96
                           1.02
                                 115
                                        3169 2023-04-14 16:04:00 1.418460 FALSE
##
        3.26086660
                    0.87
                           0.95
                                      94074 2023-04-14 15:56:40 1.417972 FALSE
  26
                                  15
##
   27
        0.00000000
                    0.84
                           0.89
                                 976
                                      74027 2023-04-14 15:23:27 1.431643 FALSE
                                       2127 2023-04-14 10:11:18 1.437503 FALSE
##
   28
       -8.69565700
                    0.78
                           0.84
                                   6
##
   29
        5.26316070
                    0.73
                           0.79
                                 286
                                      27070 2023-04-14 11:41:15 1.443362 FALSE
                           0.76
                                      13650 2023-04-14 12:54:59 1.445315 FALSE
##
  30
       10.6666500
                    0.71
                                   1
                                        3391 2023-04-14 16:06:48 1.441409 FALSE
##
   31
        1.40845780
                    0.67
                           0.73
                                  53
                                       1738 2023-04-14 15:58:24 1.455081 FALSE
                    0.65
                           0.69 1003
##
   32
        1.51515000
   33
        3.17460010
                    0.61
                           0.66 6747 438741 2023-04-14 15:59:38 1.462893 FALSE
##
   34
        5.66038300
                    0.53
                           0.57
                                 160
                                      10997 2023-04-14 14:56:50 1.476565 FALSE
##
   35
        2.04081440
                    0.46
                           0.50
                                 409
                                      34171 2023-04-14 15:58:50 1.490237 FALSE
##
   36
        4.76190760
                    0.40
                           0.45
                                  40
                                        2548 2023-04-14 13:48:46 1.505862 FALSE
##
   37
        0.00000000
                    0.36
                           0.40
                                 529 106388 2023-04-14 16:06:18 1.521487 FALSE
##
   38
       10.34482900
                    0.28
                           0.32 1108
                                      31372 2023-04-14 12:00:46 1.542971 FALSE
##
   39
      -12.00000000
                    0.22
                           0.26 4952 104312 2023-04-14 16:14:50 1.562502 FALSE
                           0.21 8628
##
   40
        0.00000000
                    0.18
                                      25961 2023-04-13 15:48:11 1.578127 FALSE
                           0.18
                                      53127 2023-04-14 16:06:48 1.593752 FALSE
##
       -5.88235600
                    0.14
                                   1
   41
##
        0.00000000
                    0.12
                           0.16 4540
                                      34986 2023-04-14 15:56:32 1.621096 FALSE
   42
      -28.57142600
                    0.10
                           0.14
                                 101
                                      25187 2023-04-14 14:19:18 1.636721 FALSE
##
   43
##
   44
        0.00000000
                    0.08
                           0.12
                                  16
                                      53198 2023-04-12 15:00:24 1.644533 FALSE
       25.00000600
                    0.07
                           0.10 1101
                                      16815 2023-04-14 13:21:24 1.656252 FALSE
##
   45
        0.00000000
                    0.05
                           0.09 6000
                                      15845 2023-04-05 15:55:31 1.656252 FALSE
##
   46
        0.00000000
                    0.04
                           0.08 1060
                                       7855 2023-04-13 15:11:45 1.664064 FALSE
##
  47
      -20.00000400
                           0.07 4600
                                      12626 2023-04-14 10:45:54 1.703126 FALSE
   48
                    0.03
        0.00000000
                    0.02
                           0.06
                                       3448 2023-04-14 16:14:20 1.718751 FALSE
##
   49
                                   1
        0.00000000
##
   50
                    0.01
                           0.05
                                  45
                                       4025 2023-04-06 10:08:54 1.726564 FALSE
        0.00000000
##
  51
                    0.01
                           0.04
                                   1
                                        985 2023-04-14 16:01:44 1.750001 FALSE
        0.00000000
                                        3870 2023-04-10 09:41:36 1.796876 FALSE
## 52
                    0.00
                           0.05
                                   1
      -33.33333600
                    0.00
                           0.05
                                        1041 2023-04-14 15:59:40 1.828126 FALSE
## 53
                                   1
##
  54
        0.00000000
                    0.00
                           0.05
                                   5
                                        3976 2023-04-14 14:48:31 1.875001 FALSE
## 55
        0.0000000 0.00
                           0.05
                                      17766 2023-03-31 15:48:38 1.906250 FALSE
##
       Price InTheMoney
##
  1
      11.500
                    TRUE
##
  2
      10.525
                    TRUE
## 3
       9.525
                   TRUE
## 4
       8.525
                   TRUE
## 5
       7.575
                    TRUE
```

```
## 6
       6.625
                   TRUE
## 7
       5.675
                   TRUE
## 8
       4.875
                   TRUE
## 9
       4.250
                  FALSE
## 10 3.650
                  FALSE
## 11 3.200
                  FALSE
## 12 2.820
                  FALSE
## 13
      2.515
                  FALSE
## 14
       2.265
                  FALSE
## 15
      2.050
                  FALSE
## 16
      1.865
                  FALSE
       1.700
                  FALSE
## 17
## 18
       1.570
                  FALSE
## 19
      1.430
                  FALSE
## 20
      1.335
                  FALSE
## 21
       1.235
                  FALSE
## 22
      1.140
                  FALSE
## 23
      1.060
                  FALSE
## 24
      1.015
                  FALSE
## 25
       0.990
                  FALSE
## 26 0.910
                  FALSE
## 27
      0.865
                  FALSE
## 28
      0.810
                  FALSE
## 29
       0.760
                  FALSE
## 30
      0.735
                  FALSE
## 31
      0.700
                  FALSE
## 32
       0.670
                  FALSE
##
  33
       0.635
                  FALSE
## 34
      0.550
                  FALSE
## 35
       0.480
                  FALSE
## 36
       0.425
                  FALSE
## 37
       0.380
                  FALSE
## 38
       0.300
                  FALSE
## 39
       0.240
                  FALSE
## 40
       0.195
                  FALSE
## 41 0.160
                  FALSE
## 42 0.140
                  FALSE
## 43 0.120
                  FALSE
## 44 0.100
                  FALSE
## 45 0.085
                  FALSE
## 46
      0.070
                  FALSE
## 47
      0.060
                  FALSE
## 48
      0.050
                  FALSE
## 49 0.040
                  FALSE
## 50
      0.030
                  FALSE
## 51
      0.025
                  FALSE
## 52
       0.025
                  FALSE
## 53
       0.025
                  FALSE
                  FALSE
## 54
       0.025
## 55
       0.025
                  FALSE
##
## $Jun.21.2023$puts
              ContractID ConractSize Currency Expiration Strike
##
                                                                    Last
                                                                                  Chg
## 1 VIX230621P00010000
                              REGULAR
                                           USD 2023-06-21
                                                                    0.01 0.00000000
                                                             10.0
```

```
## 2
      VIX230621P00011000
                              REGULAR
                                            USD 2023-06-21
                                                              11.0
                                                                      0.01
                                                                            0.00000000
##
                                            USD 2023-06-21
                                                                      0.01
  3
      VIX230621P00012000
                              REGULAR
                                                              12.0
                                                                            0.00000000
##
  4
      VIX230621P00013000
                              REGULAR
                                            USD 2023-06-21
                                                              13.0
                                                                      0.01
                                                                            0.00000000
      VIX230621P00014000
                              REGULAR
                                            USD 2023-06-21
                                                              14.0
                                                                      0.02
                                                                           -0.01000000
##
  5
##
   6
      VIX230621P00015000
                              REGULAR
                                            USD 2023-06-21
                                                              15.0
                                                                      0.06
                                                                            0.02000000
  7
                                            USD 2023-06-21
                                                                      0.12
##
      VIX230621P00016000
                              REGULAR
                                                              16.0
                                                                            0.02999999
##
  8
      VIX230621P00017000
                              REGULAR
                                            USD 2023-06-21
                                                              17.0
                                                                      0.29
                                                                            0.03000000
## 9
      VIX230621P00018000
                              REGULAR
                                            USD 2023-06-21
                                                               18.0
                                                                      0.59
                                                                            0.03999996
  10 VIX230621P00019000
                              REGULAR
                                            USD 2023-06-21
                                                              19.0
                                                                      1.00
                                                                            0.02999997
##
   11 VIX230621P00020000
                              REGULAR
                                            USD 2023-06-21
                                                              20.0
                                                                      1.52
                                                                            0.00999999
   12 VIX230621P00021000
                              REGULAR
                                            USD 2023-06-21
                                                               21.0
                                                                      2.13
                                                                            0.01000023
                                                2023-06-21
                                                              22.0
                                                                      2.84
##
   13 VIX230621P00022000
                              REGULAR
                                            USD
                                                                            0.03999996
   14 VIX230621P00023000
                              REGULAR
                                            USD 2023-06-21
                                                              23.0
                                                                      3.57
                                                                            0.01999998
                                                                      4.35
                                                                            0.0000000
##
   15 VIX230621P00024000
                              REGULAR
                                            USD 2023-06-21
                                                              24.0
  16 VIX230621P00025000
                              REGULAR
                                            USD 2023-06-21
##
                                                               25.0
                                                                      5.15
                                                                            0.00000000
     VIX230621P00026000
                              REGULAR
                                            USD
                                                2023-06-21
                                                               26.0
                                                                      5.85
                                                                           -0.15000010
                                            USD 2023-06-21
                                                                      6.85
   18 VIX230621P00027000
                              REGULAR
                                                              27.0
                                                                            0.04999971
   19 VIX230621P00028000
                              REGULAR
                                            USD 2023-06-21
                                                               28.0
                                                                      7.70
                                                                            0.04999971
  20 VIX230621P00029000
                                            USD 2023-06-21
                                                              29.0
                                                                      8.57
                              REGULAR
                                                                            0.11999989
   21 VIX230621P00030000
                              REGULAR
                                            USD 2023-06-21
                                                              30.0
                                                                      9.44
                                                                            0.33999920
##
  22 VIX230621P00031000
                              REGULAR
                                            USD 2023-06-21
                                                              31.0
                                                                      9.63
                                                                            0.0000000
   23 VIX230621P00032000
                              REGULAR
                                            USD 2023-06-21
                                                                     11.09
                                                              32.0
                                                                            0.14000034
                                            USD 2023-06-21
                                                                     11.46
## 24 VIX230621P00032500
                              REGULAR
                                                              32.5
                                                                            0.00000000
  25 VIX230621P00033000
                              REGULAR
                                            USD 2023-06-21
                                                              33.0
                                                                     12.17
                                                                            0.02000046
##
  26 VIX230621P00034000
                              REGULAR
                                            USD 2023-06-21
                                                               34.0
                                                                    12.25
                                                                            0.0000000
  27 VIX230621P00035000
                              REGULAR
                                            USD 2023-06-21
                                                              35.0
                                                                     14.00
                                                                            0.0000000
   28
     VIX230621P00036000
                              REGULAR
                                                2023-06-21
                                                              36.0
                                                                     14.90
##
                                            USD
                                                                            0.00000000
   29
     VIX230621P00037000
                              REGULAR
                                            USD 2023-06-21
                                                              37.0
                                                                     15.60
                                                                            1.00000000
   30 VIX230621P00037500
                              REGULAR
                                            USD 2023-06-21
                                                              37.5
                                                                     15.30
##
                                                                            0.00000000
   31 VIX230621P00038000
                              REGULAR
                                            USD 2023-06-21
                                                              38.0
                                                                     14.75
                                                                            0.0000000
##
   32 VIX230621P00039000
                              REGULAR
                                            USD 2023-06-21
                                                              39.0
                                                                     15.15
                                                                            0.00000000
##
   33 VIX230621P00040000
                              REGULAR
                                            USD 2023-06-21
                                                              40.0
                                                                     18.55
                                                                            0.0000000
##
   34 VIX230621P00042500
                              REGULAR
                                            USD 2023-06-21
                                                               42.5
                                                                     19.25
                                                                            0.0000000
                                            USD 2023-06-21
                                                                     22.45
##
   35 VIX230621P00045000
                              REGULAR
                                                              45.0
                                                                            0.0000000
   36
     VIX230621P00047500
                              REGULAR
                                            USD
                                                2023-06-21
                                                              47.5
                                                                     24.70
                                                                            0.00000000
   37 VIX230621P00050000
                              REGULAR
                                            USD 2023-06-21
                                                              50.0
                                                                     28.24
##
                                                                           -0.07999992
   38 VIX230621P00055000
                              REGULAR
                                            USD 2023-06-21
                                                              55.0
                                                                     31.82
                                                                            0.00000000
  39 VIX230621P00060000
                              REGULAR
                                            USD 2023-06-21
                                                              60.0
                                                                     38.02 -0.09000015
##
   40 VIX230621P00065000
                                            USD 2023-06-21
                                                                     41.60
                                                                            0.0000000
                              REGULAR
                                                              65.0
                                            USD 2023-06-21
                                                                     44.65
##
  41 VIX230621P00070000
                                                              70.0
                                                                            0.00000000
                              REGULAR
   42 VIX230621P00080000
                              REGULAR
                                            USD 2023-06-21
                                                              80.0
                                                                     57.80
                                                                            0.00000000
   43 VIX230621P00100000
                                            USD 2023-06-21
                                                             100.0
                                                                     76.25
##
                              REGULAR
                                                                            0.00000000
   44 VIX230621P00110000
                              REGULAR
                                            USD 2023-06-21
                                                             110.0
                                                                     85.00
                                                                            0.0000000
##
   45 VIX230621P00130000
                                                2023-06-21
                                                             130.0 105.12
                                                                            0.0000000
                              REGULAR
                                            USD
##
   46 VIX230621P00150000
                              REGULAR
                                            USD
                                                2023-06-21
                                                             150.0 124.88
                                                                            0.00000000
##
                                            OI
           ChgPct
                      Bid
                             Ask
                                    Vol
                                                      LastTradeTime
                                                                            IV
                                                                                  ITM
## 1
        0.0000000
                     0.00
                            0.02
                                      2
                                             5 2023-03-31 11:20:31 0.5312547 FALSE
                                      4
##
   2
        0.0000000
                     0.00
                            0.02
                                             5 2023-03-15 12:24:09 0.4921926 FALSE
##
   3
        0.000000
                     0.00
                            0.02
                                      5
                                            10 2023-03-21 09:52:01 0.4062559 FALSE
##
        0.000000
                     0.00
                            0.03
                                      4
                                           165 2023-04-14 13:49:20 0.3476628 FALSE
   4
                     0.00
                                           672 2023-04-14 14:17:17 0.2968820 FALSE
##
   5
      -33.3333360
                            0.05
                                     14
##
  6
       50.0000000
                     0.03
                            0.07 29256
                                        105444 2023-04-14 16:00:07 0.2304764 FALSE
## 7
       33.333240
                     0.11
                            0.15
                                     89
                                         20089 2023-04-14 16:10:46 0.1836019 FALSE
## 8
       11.5384630
                     0.28
                            0.31
                                    240
                                         33439 2023-04-14 16:00:07 0.1181729 FALSE
```

```
## 9
        7.2727203
                     0.57
                            0.63 12961
                                         51502 2023-04-14 16:10:46 0.0000100
## 10
        3.0927806
                     0.99
                                   7388
                                         84123 2023-04-14 16:11:07 0.0000100
                                                                                 TRUE
                            1.06
##
  11
        0.6622511
                     1.53
                            1.60
                                    219
                                         53122 2023-04-14 15:34:49 0.0000100
                                                                                 TRUE
##
  12
        0.4717089
                            2.23
                                   5016
                                         24674 2023-04-14 15:17:07 0.0000100
                                                                                 TRUE
                     2.15
##
  13
        1.4285702
                     2.84
                            2.95
                                    169
                                         92716 2023-04-14 15:51:08 0.0000100
                                                                                 TRUE
        0.5633798
                                    249
                                         57548 2023-04-14 15:32:31 0.0000100
                                                                                 TRUE
## 14
                     3.55
                            3.70
        0.000000
                                         61923 2023-04-14 15:53:16 0.0000100
## 15
                     4.30
                            4.45
                                      7
                                                                                 TRUE
                                         19142 2023-04-14 15:56:35 0.0000100
## 16
        0.000000
                     5.15
                            5.30
                                     69
                                                                                 TRUE
##
  17
       -2.5000014
                     5.95
                            6.10
                                     61
                                         14132 2023-04-14 13:26:03 0.0000100
                                                                                 TRUE
##
  18
        0.7352899
                     6.80
                            6.95
                                     36
                                           9858 2023-04-14 15:20:29 0.0000100
                                                                                 TRUE
##
  19
        0.6535910
                     7.65
                            7.85
                                    216
                                           6880 2023-04-14 15:42:20 0.0000100
                                                                                 TRUE
  20
        1.4201170
                     8.55
                            8.70
                                   2000
                                           929 2023-04-14 16:11:07 0.0000100
                                                                                 TRUE
##
##
  21
        3.7362550
                     9.45
                            9.60
                                      6
                                           598 2023-04-14 15:56:35 0.0000100
                                                                                 TRUE
        0.000000
                    10.35
                           10.50
                                           329 2023-04-06 14:43:13 0.0000100
                                                                                 TRUE
##
  22
                                     20
## 23
        1.2785420
                    11.25
                                      2
                                           217 2023-04-14 13:24:59 0.0000100
                                                                                 TRUE
                           11.45
##
  24
        0.000000
                    11.70
                           11.85
                                    154
                                           403 2023-04-12 13:06:53 0.0000100
                                                                                 TRUE
##
  25
        0.1646128
                                            78 2023-04-14 15:31:58 0.0000100
                    12.15
                           12.35
                                     12
                                                                                 TRUE
##
   26
        0.000000
                    13.10
                           13.25
                                     10
                                             55 2023-04-04 09:36:42 0.0000100
                                                                                 TRUE
##
        0.000000
                    14.00
                                           115 2023-04-13 13:51:23 0.0000100
                                                                                 TRUE
  27
                           14.25
                                     30
##
   28
        0.000000
                    14.95
                           15.15
                                      2
                                           102 2023-04-13 13:36:59 0.0000100
                                                                                 TRUE
##
  29
        6.8493150
                    15.90
                           16.10
                                     40
                                           701 2023-04-04 11:15:38 0.0000100
                                                                                 TRUE
##
  30
        0.000000
                    16.35
                                      3
                                              8 2023-03-31 10:02:01 0.0000100
                                                                                 TRUE
                           16.60
                                           565 2023-01-10 11:45:50 0.0000100
        0.000000
                    16.25
                           16.35
                                                                                 TRUE
## 31
                                      1
        0.0000000
                    16.80
                           17.05
                                              1 2023-03-10 13:45:23 0.0000100
##
   32
                                     NA
                                                                                 TRUE
                                             91 2023-04-13 09:46:02 0.0000100
                                      2
##
  33
        0.000000
                    18.75
                           18.95
                                                                                 TRUE
##
   34
        0.000000
                     0.00
                            0.00
                                      5
                                             20 2023-01-12 09:40:52 0.0000100
                                                                                 TRUE
##
   35
        0.000000
                    23.55
                           23.75
                                             17 2023-03-31 10:26:36 0.0000100
                                                                                 TRUE
                                      1
                                           215 2023-03-22 14:08:44 0.0000100
##
   36
        0.000000
                    25.95
                           26.20
                                    205
                                                                                 TRUE
##
   37
       -0.2824856
                    28.35
                           28.65
                                      5
                                             85 2023-04-14 10:39:37 0.0000100
                                                                                 TRUE
##
   38
        0.000000
                    33.25
                           33.50
                                      2
                                             44 2023-04-04 11:29:33 0.0000100
                                                                                 TRUE
##
   39
       -0.2361589
                    38.15
                           38.40
                                      5
                                             17 2023-04-14 10:39:37 0.0000100
                                                                                 TRUE
##
   40
        0.000000
                    43.05
                           43.30
                                      2
                                             54 2023-04-04 11:29:33 0.0000100
                                                                                 TRUE
##
   41
        0.000000
                    47.95
                           48.25
                                      6
                                             54 2023-03-24 10:34:58 0.0000100
                                                                                 TRUE
        0.000000
                    56.55
                                              0 2023-03-06 10:35:55 0.0000100
                                                                                 TRUE
##
   42
                           56.75
                                      1
##
        0.0000000
                    77.60
                           77.85
                                      8
                                           329 2023-03-30 10:34:02 0.0000100
                                                                                 TRUE
   43
        0.0000000
                   87.50
                                              4 2023-03-21 12:23:21 0.0000100
                                                                                 TRUE
##
   44
                           87.75
                                      1
##
  45
        0.0000000 104.20 104.55
                                      1
                                              0 2023-02-22 12:14:42 0.0000100
                                                                                 TRUE
##
        0.0000000 116.20
                            0.00
                                    100
                                           324 2023-02-10 09:30:09 0.0000100
                                                                                 TRUE
  46
##
        Price InTheMoney
        0.010
                    FALSE
## 1
## 2
        0.010
                    FALSE
##
  3
        0.010
                    FALSE
## 4
        0.015
                    FALSE
## 5
        0.025
                    FALSE
## 6
        0.050
                    FALSE
## 7
        0.130
                    FALSE
## 8
        0.295
                    FALSE
## 9
        0.600
                     TRUE
## 10
        1.025
                     TRUE
## 11
        1.565
                     TRUE
## 12
                     TRUE
        2.190
## 13
        2.895
                     TRUE
## 14
        3.625
                     TRUE
## 15
        4.375
                     TRUE
```

```
## 17
        6.025
                     TRUF.
## 18
        6.875
                     TRUE
## 19
        7.750
                     TRUE
## 20
        8.625
                     TRUE
## 21
        9.525
                     TRUE
## 22 10.425
                     TRUE
## 23 11.350
                     TRUE
## 24
       11.775
                     TRUE
## 25
      12.250
                     TRUE
## 26 13.175
                     TRUE
                     TRUE
## 27
      14.125
## 28
      15.050
                     TRUE
## 29
      16.000
                     TRUE
## 30
      16.475
                     TRUE
## 31
      16.300
                     TRUE
## 32
      16.925
                     TRUE
## 33
      18.850
                     TRUE
## 34
        0.000
                     TRUE
## 35 23.650
                     TRUE
## 36 26.075
                     TRUE
## 37
      28.500
                     TRUE
                     TRUE
## 38 33.375
## 39
       38.275
                     TRUE
## 40 43.175
                     TRUE
## 41 48.100
                     TRUE
## 42
       56.650
                     TRUE
## 43
       77.725
                     TRUE
## 44 87.625
                     TRUE
## 45 104.375
                     TRUE
## 46 58.100
                     TRUE
#5. For calls and puts of VIX at each expiration, delete all the fields except Strike, Bid, Ask, Price,
VIX.options <- VIX.options.all</pre>
for (i in 1:length(VIX.options)){
  VIX.options[[i]]$calls <- VIX.options[[i]]$calls[c('Strike', 'Bid', 'Ask', 'Price', 'InTheMoney' )]</pre>
  VIX.options[[i]] $puts <- VIX.options[[i]] $puts[c('Strike', 'Bid', 'Ask', 'Price', 'InTheMoney')] }
Exp <- names(VIX.options)</pre>
Exp2 < -c()
for(i in 1:length(Exp)){
  Exp1 \leftarrow format(as.Date(Exp[i], "%B.%d.%Y"), "%Y-%m-%d")
  Exp2[i]<-Exp1 }</pre>
today <- format(Sys.Date())</pre>
for(i in 1:length(Exp)){
  write.csv(VIX.options[[i]]$calls, file=paste("VIXdata",today,"Exp",Exp2[i],"calls.csv",sep=""))
  write.csv(VIX.options[[i]]$puts, file=paste("VIXdata",today,"Exp",Exp2[i],"puts.csv",sep="")) }
```

TRUE

16

5.225