# Research on Russell_2000

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```
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
```

```
## Loading required package: TTR
```

```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
library(PerformanceAnalytics)
```

```
##
## Attaching package: 'PerformanceAnalytics'
```

```
## The following object is masked from 'package:graphics':
##
##     legend
```

```
library(tibbletime)
```

```
##
## Attaching package: 'tibbletime'
```

```
## The following object is masked from 'package:stats':
##
##     filter
```

```
library(DBI)
library(RSQLite)
```

```
# 拉取数据
getSymbols("^RUT", src="yahoo",
           from=as.Date("2018-01-01"),
           to=Sys.Date(),
           auto.assign=TRUE)
```

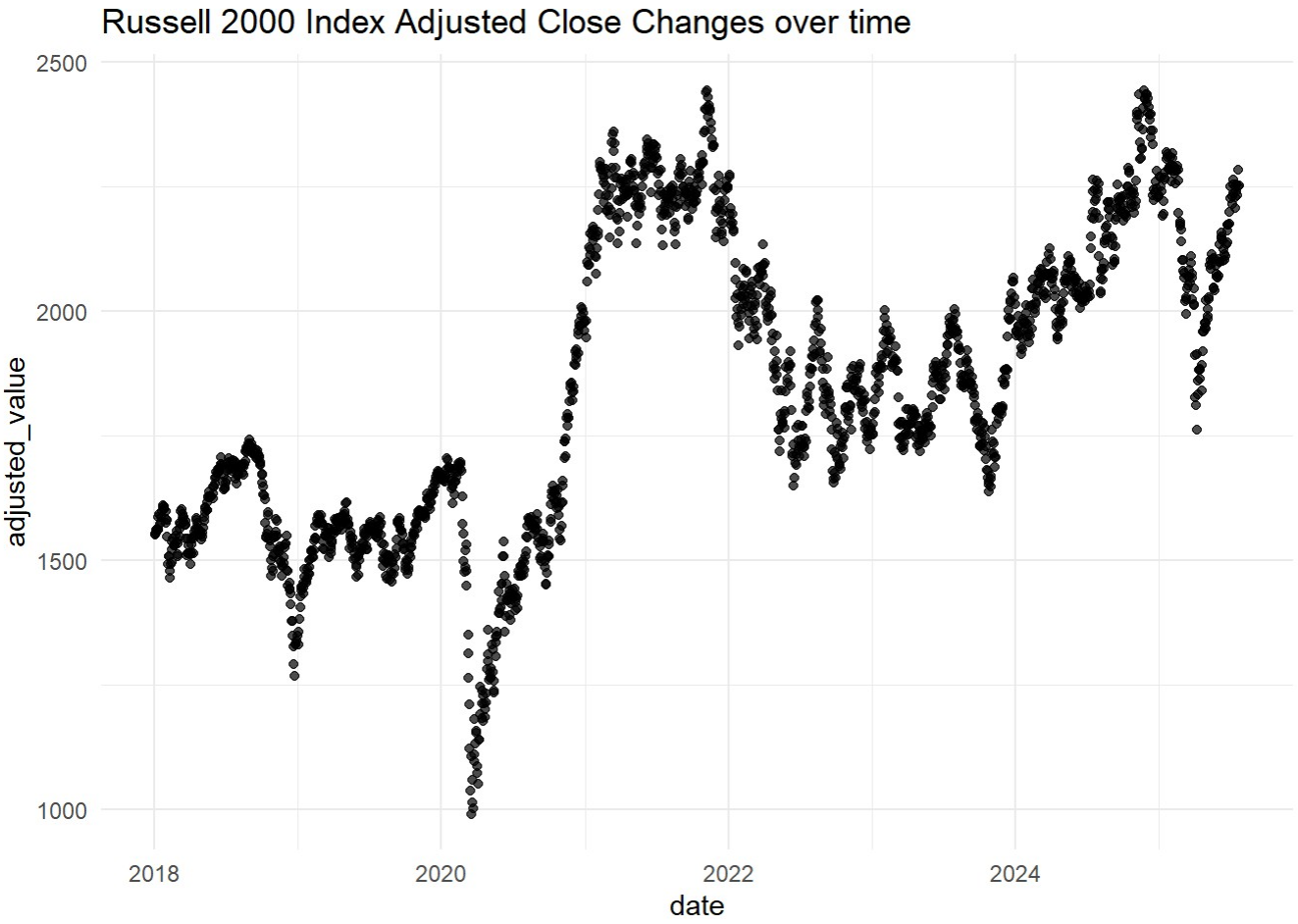
```
## [1] "RUT"
```

```
# RUT 是一个 xts 对象
head(RUT)
```

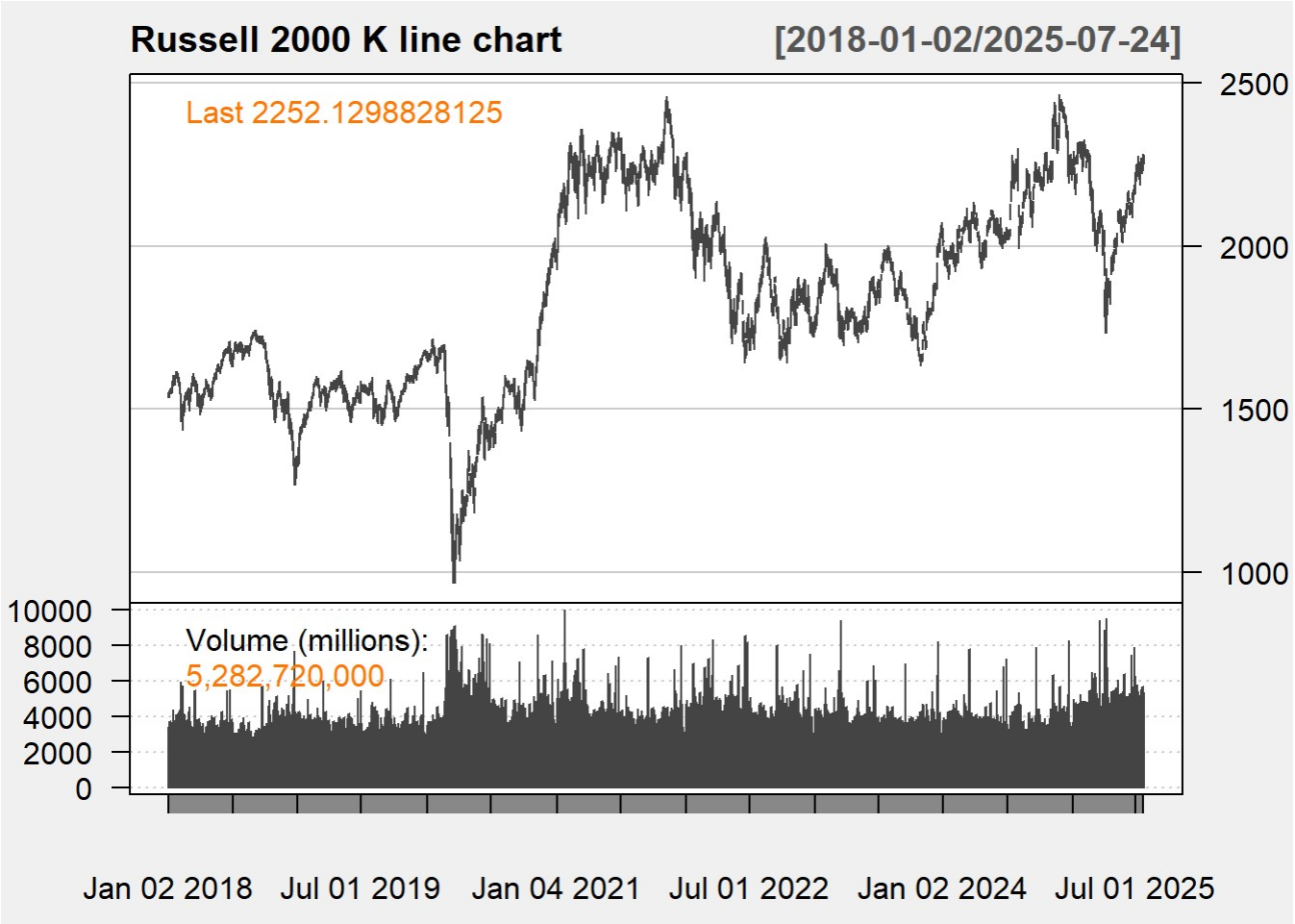
```
##            RUT.Open RUT.High RUT.Low RUT.Close RUT.Volume RUT.Adjusted
## 2018-01-02  1536.12  1550.30 1536.12   1550.01 3397430000      1550.01
## 2018-01-03  1550.28  1555.08 1547.59   1552.58 3544030000      1552.58
## 2018-01-04  1552.98  1560.84 1552.37   1555.72 3697340000      1555.72
## 2018-01-05  1555.87  1560.07 1552.13   1560.01 3239280000      1560.01
## 2018-01-08  1559.80  1562.99 1548.23   1561.81 3246160000      1561.81
## 2018-01-09  1562.22  1565.58 1558.86   1560.10 3467460000      1560.10
```

```
df <- data.frame(
  date =index(RUT),
  coredata(RUT)
)
```

```
library(ggplot2)
ggplot(df,aes(x=date, y=RUT.Adjusted))+
  geom_point(alpha=0.7) +
  labs(x="date",y="adjusted_value", title="Russell 2000 Index Adjusted Close Changes over tim
e")+
  theme_minimal()
```




```
chartSeries(RUT, type = "candlesticks",
            name = "Russell 2000 K line chart",
            theme = chartTheme("white"))
```




```
library(quantmod)
library(TTR)

# 1.1 取数据
getSymbols("^RUT", src="yahoo", from="2020-01-01", to=Sys.Date())
```

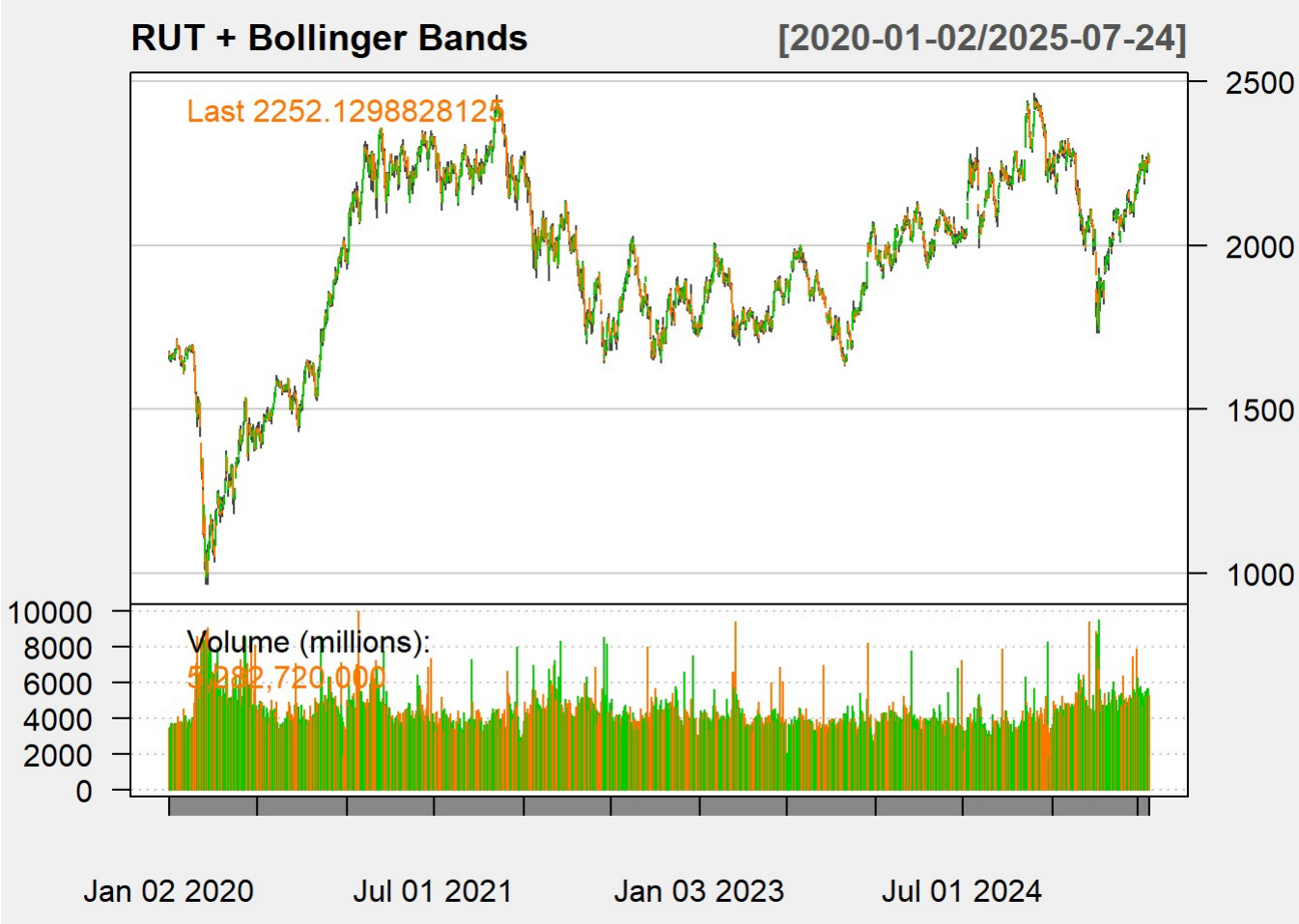
```
## [1] "RUT"
```

```
# 1.2 计算布林带，以收盘价为例
bb <- BBands(Cl(RUT), n = 20, sd = 2)
# bb$mavg 就是中轨（20 日简单移动平均）
```

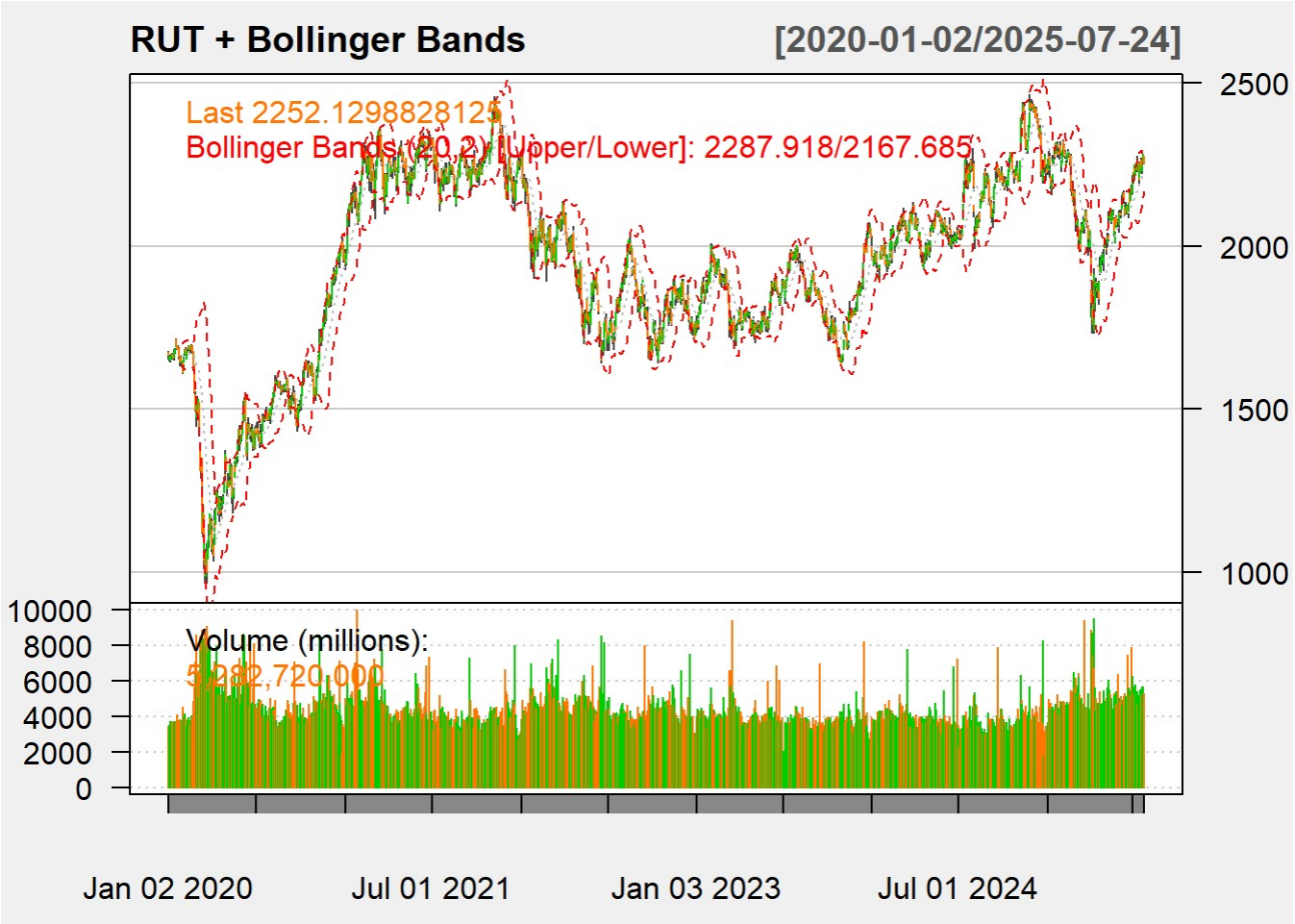
```
# 2.1 “跌至中轨买入”：当日最低价触及或跌破中轨，且前一日最低价在中轨之上
buy_touch_mid <- ifelse(
  Lag(Lo(RUT)) > bb$mavg & Lo(RUT) <= bb$mavg,
  1, 0
)

# 2.2 “站稳中轨买入”：当日收盘价突破中轨，且前一日收盘在中轨之下
buy_break_mid <- ifelse(
  Lag(Cl(RUT)) < bb$mavg & Cl(RUT) >= bb$mavg,
  1, 0
)

# 合并信号：任一条件成立即买
buy_signal <- (buy_touch_mid + buy_break_mid) > 0

# 把信号并入一个 xts，对齐到 RUT
signals <- merge(
  RUT,
  bb$mavg,
  buy_touch_mid,
  buy_break_mid,
  buy_signal
)
colnames(signals)[4:7] <- c("MidBand","TouchMid","BreakMid","Buy")
head(signals, 10)
```

```
##            RUT.Open RUT.High RUT.Low MidBand   TouchMid BreakMid Buy Lag.1
## 2020-01-02  1675.90  1678.14 1653.52 1666.77 3459930000  1666.77  NA    NA
## 2020-01-03  1655.02  1664.04 1648.54 1660.87 3484700000  1660.87  NA    NA
## 2020-01-06  1650.66  1664.85 1645.51 1663.26 3702460000  1663.26  NA    NA
## 2020-01-07  1659.73  1662.10 1653.33 1658.31 3435910000  1658.31  NA    NA
## 2020-01-08  1658.47  1669.29 1658.23 1663.59 3726840000  1663.59  NA    NA
## 2020-01-09  1669.86  1671.82 1663.78 1664.99 3641230000  1664.99  NA    NA
## 2020-01-10  1665.47  1666.75 1654.01 1657.64 3214580000  1657.64  NA    NA
## 2020-01-13  1658.98  1669.61 1652.32 1669.61 3459390000  1669.61  NA    NA
## 2020-01-14  1668.39  1684.34 1662.86 1675.74 3687620000  1675.74  NA    NA
## 2020-01-15  1673.69  1688.12 1673.40 1682.40 3721490000  1682.40  NA    NA
##            Lag.1.1 Lag.1.2
## 2020-01-02      NA      NA
## 2020-01-03      NA      NA
## 2020-01-06      NA      NA
## 2020-01-07      NA      NA
## 2020-01-08      NA      NA
## 2020-01-09      NA      NA
## 2020-01-10      NA      NA
## 2020-01-13      NA      NA
## 2020-01-14      NA      NA
## 2020-01-15      NA      NA
```

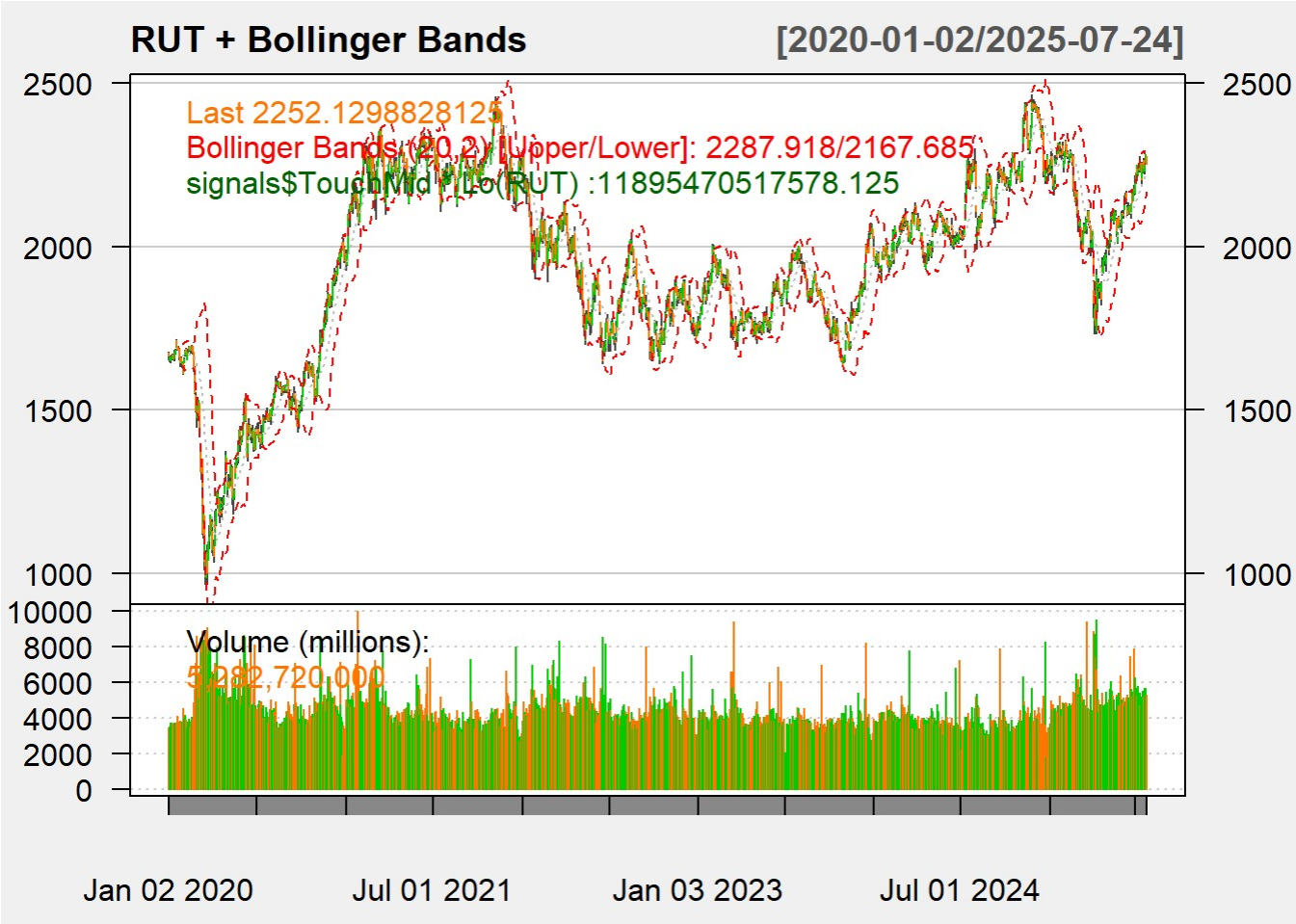
```
library(quantmod)

# 3.1 画 K 线 + 布林带
chartSeries(RUT, theme = chartTheme("white"), name = "RUT + Bollinger Bands")
```



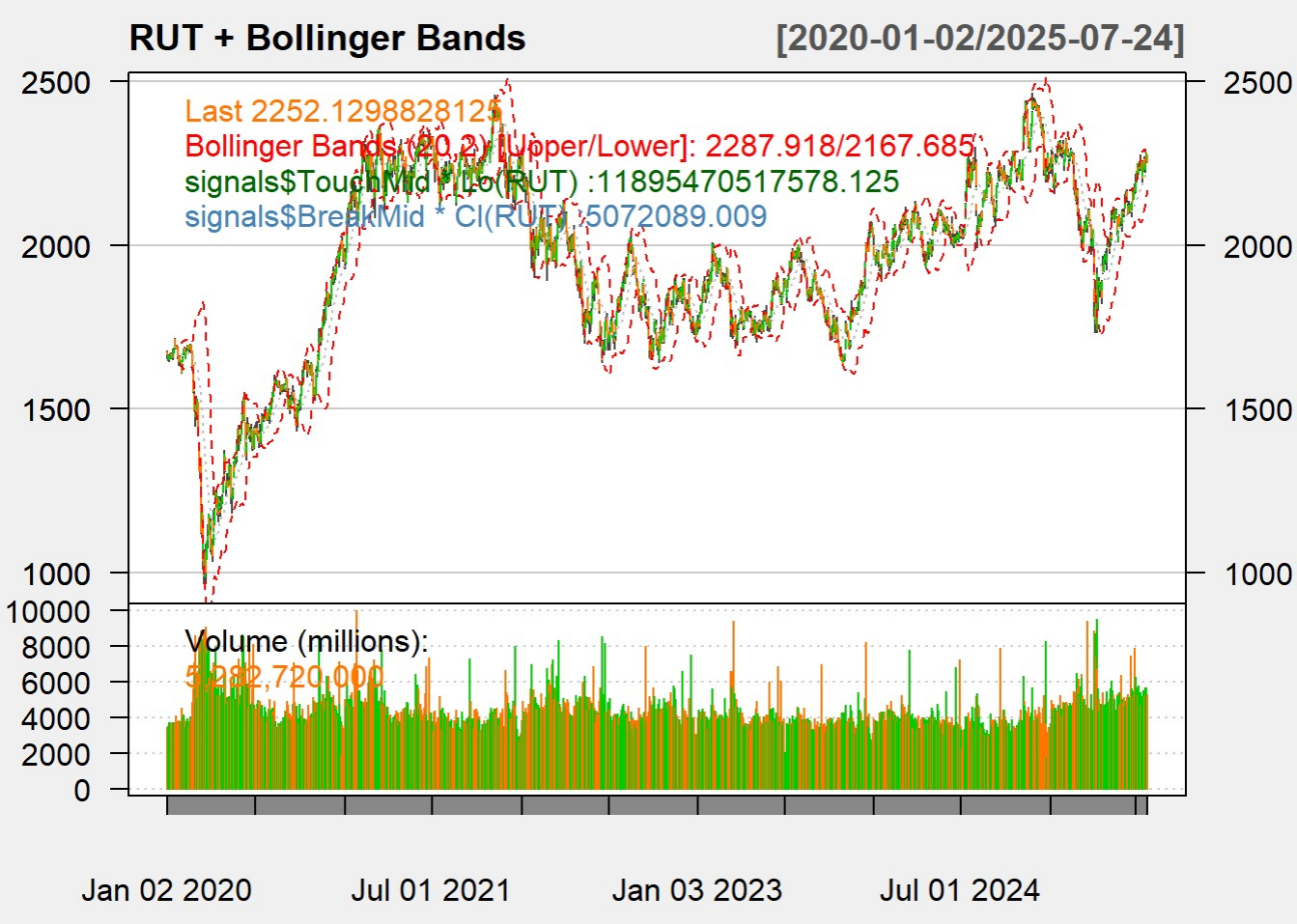

```
addBBands(n = 20, sd = 2, on = 1)
```



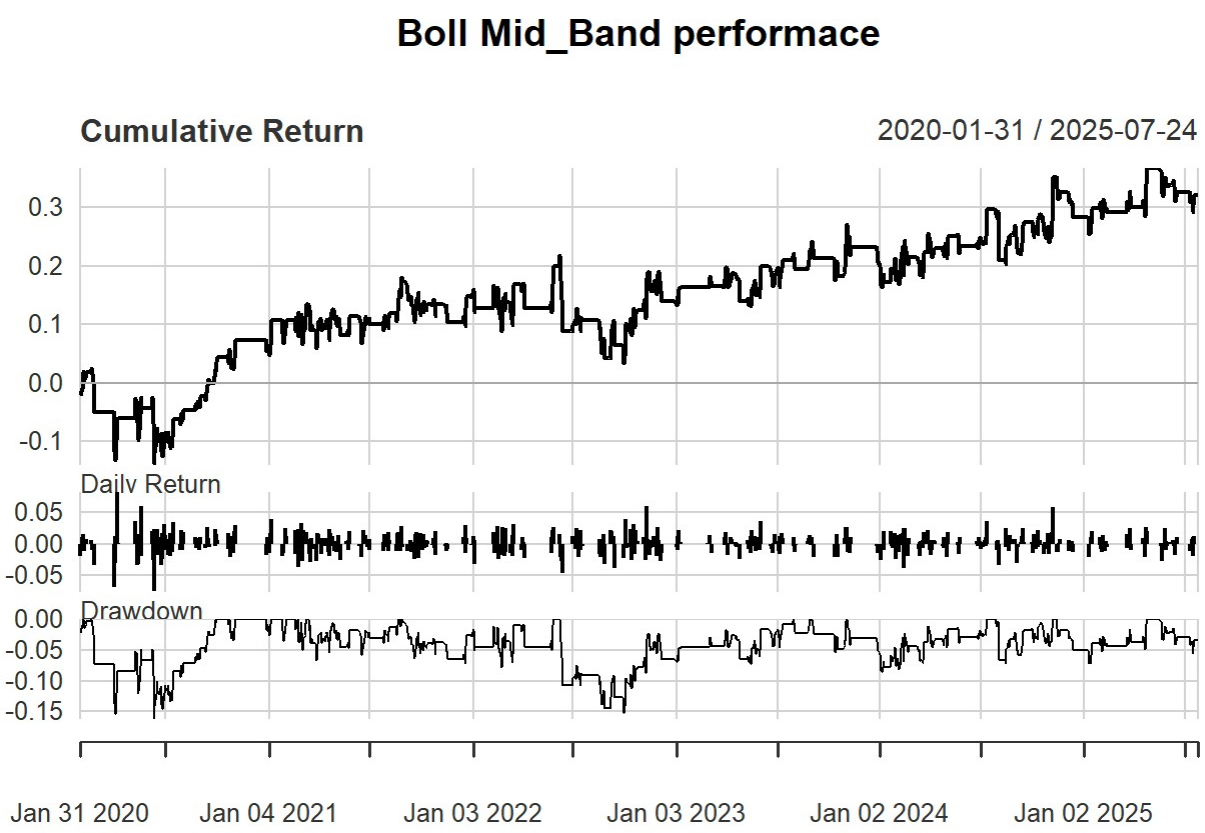

```
# 3.2 在图上打点：绿点 = 触及中轨买入；蓝点 = 突破中轨买入
addTA(signals$TouchMid * Lo(RUT), on = 1, col = "darkgreen", pch = 24, type = "p")
```




```
addTA(signals$BreakMid * Cl(RUT), on = 1, col = "steelblue", pch = 25, type = "p")
```




```r
library(PerformanceAnalytics)

# 4.1 计算日收益
rets <- dailyReturn(Cl(RUT))

# 4.2 在买入日开仓，持有到下一个买点（或固定持有期），此处举例：持有 5 日
nHold <- 5
positions <- lag(buy_signal)  # 在信号当天收盘后下单
strat_rets <- na.omit(positions * rets)  # 信号当日不含收益

# 4.3 持有多日
library(zoo)
roll_pos <- rollapply(positions, width = nHold, FUN = max, align = "left", fill = 0)
strategy_returns <- na.omit(roll_pos * rets)

# 4.4 回测业绩
charts.PerformanceSummary(strategy_returns, main = "Boll Mid_Band performace")
```




```
table.Drawdowns(strategy_returns)
```

```
##         From     Trough         To   Depth Length To Trough Recovery
## 1 2020-02-21 2020-06-11 2020-10-01 -0.1602    156        78       78
## 2 2022-06-08 2022-09-30 2023-07-31 -0.1522    287        80      207
## 3 2023-11-06 2024-01-05 2024-07-11 -0.0853    170        42      128
## 4 2021-08-30 2022-02-23 2022-05-27 -0.0775    189       123       66
## 5 2024-11-14 2025-01-10 2025-04-24 -0.0718    109        38       71
```