

# ALGORITHMIC TRADING HIGH-FREQUENCY FINANCE

## Final Project

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### Abstract

In this study, we employed a combination of the Relative Strength Index (RSI) indicator and MACD from Exponential Weighted Moving Average (EWMA), to develop a trading strategy for Zillow Group (ZG) stocks over a six-year period from January 1, 2018, to January 1, 2024. The strategy resulted in a total return of 433%, significantly outperforming the buy-and-hold (BH) return of 34%. Notably, our strategy achieved a peak gain of 871%, and effectively identified major downturns in ZG's stock price, thereby mitigating the risks associated with the continuous declines faced by long-term holdings. These findings underscore the potential of technical indicators to enhance investment strategies in volatile markets. Subsequently, to confirm the stability of the model, I utilized Ordinary Least Squares (OLS) for bootstrapping the stock price data. This approach consistently yielded positive returns for each dataset, with an average return of 22%. Such results within the context of highly volatile stocks indicate the effectiveness of the strategy.

**Key Words:** MACD,EWMA,RSI,Trading Strategy

## 1 Data Analysis

For the selected stock Walt Zillow Group Inc. (NYSE: ZG), I first process the data and calculate the daily return of the stock. Then, I will evaluate the performance of a technical strategy on this stock.

## 2 Trading Strategy Building

My trading strategy for Zillow Group (ZG) stock over six years combines the Relative Strength Index (RSI) and Exponential Weighted Moving Average (EWMA)

Table 1: Ticker’s Information

Company Name	Zillow Group Inc.
Ticker	ZG
Time Period	2018-01-01 ~ 2024-01-01
Price Data	Adj Close Price

to inform buy and sell decisions. It aims to capitalize on momentum and trends while mitigating risks during significant price declines. The strategy has outperformed a standard buy-and-hold approach, demonstrating its potential effectiveness in volatile market conditions.

## 2.1 MACD

Exponential Weighted Moving Average (EWMA) is similar to Simple Moving Average (SMA), measuring trend direction over a period of time. However, whereas SMA simply calculates an average of price data, EWMA applies more weight to data that is more current. Because of its unique calculation, EWMA will follow prices more closely than a corresponding SMA. I will introduce the formula for calculating EWMA:

$$\begin{aligned} \text{EWMA}(t) &= \text{Price}(t) \times k + \text{EWMA}(t-1) \times (1-k) \\ t &= \text{today} \\ N &= \text{number of days in EWMA} \\ k &= \text{weights for today's price} \end{aligned}$$

Then, the MACD formula is given by:

$$\text{MACD}(t) = \text{EWMA}_{12}(t) - \text{EWMA}_{26}(t) \quad (1)$$

where:

- $\text{EWMA}_{26}(t)$  represents the long-term trend and is the exponential moving average calculated over the past 26 days.
- $\text{EWMA}_{12}(t)$  signifies the short-term trend and is the exponential moving average over the past 12 days.

Then, I use MACD values to calculate the EWMA of MACD, which has 10-days window, as MACD signal. A daily MACD value above MACD signal suggests that the short-term average is higher than the long-term average, signaling upward momentum. Conversely, a MACD value below MACD signal indicates that the short-term average is lower than the long-term average, signifying downward momentum.

## 2.2 RSI Indicator

The Relative Strength Index (RSI) is a momentum oscillator that measures the speed and change of price movements. Developed by J. Welles Wilder Jr. in 1978, RSI is commonly used in technical analysis to help identify overbought or oversold conditions in the trading of an asset.

Traders and analysts use the RSI to identify bullish or bearish price momentum through the observation of short-term moving averages and trend lines within the RSI itself, such as the 7-day RSI commonly used for short-term trading signals. Thus, I decided to add RSI as one of the indicators in my strategy.

There are several variations for calculating the RSI. I will introduce the method I use below:

1. Calculate the price change on each day

$$\Delta P_t = P_t - P_{t-1}$$

2. Calculate the upward change  $U_t$  and downward change  $D_t$  on each day

$$U_t = \begin{cases} \Delta P_t & \text{if } \Delta P_t > 0 \\ 0 & \text{if } \Delta P_t \leq 0 \end{cases}$$

$$D_t = \begin{cases} 0 & \text{if } \Delta P_t \geq 0 \\ |\Delta P_t| & \text{if } \Delta P_t < 0 \end{cases}$$

3. Calculate average  $U_t$  and  $D_t$  by N-period Exponential Moving Average  
Usually, the time period N is 14 days.

$$\text{Average}(U_t) = a \times U_t + (1 - a) \times \text{Average}(U_{t-1})$$

$$\text{Average}(D_t) = a \times D_t + (1 - a) \times \text{Average}(D_{t-1})$$

$$a = \frac{2}{N + 1}$$

4. Calculate Relative Strength (RS)

$$RS_t = \frac{\text{Average}(U_t)}{\text{Average}(D_t)}$$

5. Calculate the Relative Strength Index (RSI)

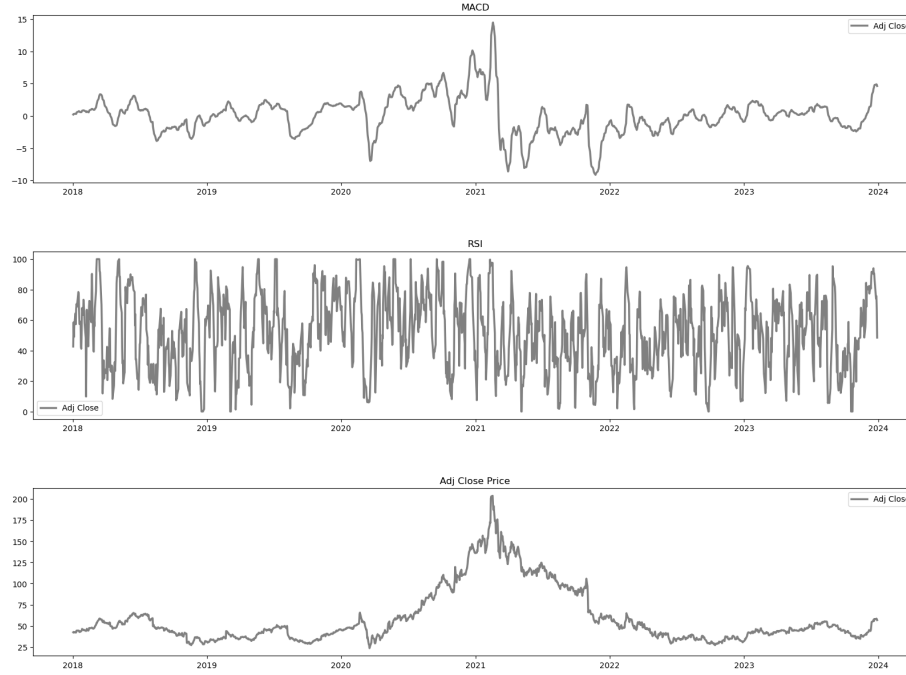
$$RSI_{Nt} = \frac{100 \times RS_t}{1 + RS_t}$$

Additionally, numerous methods are available for executing step 3, such as the use of a simple moving average. For step 4, an alternate method exists for determining the mean values of the up and down indicators: this involves calculating the average quantities of upward and downward shifts in the closing price during the selected time frame, as noted by Schmidt (2021).

## 2.3 Strategy Methodology

This document outlines a trading strategy that integrates the Moving Average Convergence Divergence (MACD) and Relative Strength Index (RSI) to identify buy and sell signals.

### 2.3.1 Indicators' Performance:



### 2.3.2 Generating Buy and Sell Signals

- **Buy Signal:**  
Generated when  $MACD > MACD\_signal$  AND  $RSI > 70$ .
- **Sell Signal:**  
Generated when  $MACD < MACD\_signal$  AND  $RSI < 20$ .

Once a buy signal appears, buy on the next trading day and continue holding. Once a sell signal appears, sell on the next trading day and enter a cooling-off period, meaning that for the next five trading days, do not buy regardless of whether there is a buy signal or not. After the cooling-off period ends, return to the normal period, meaning buy when a buy signal appears. The strategy starts and ends with a zero position; if still holding on the day before expiration, sell on the expiration day.

### 3 Backtesting performance on historical sample

My strategy uses continuous compounding to calculate the strategy returns.

#### 3.1 Backtesting performance

Samle	Round-trip trades	Total Return, %	Sharpe Ratio, %	B & H return, %	B & H Sharpe Ratio	Winning trades, %	Max drawdown, %
Historical	19	433.53	1.15	34.09	0.49	42.11	-105.76

Figure 1 : Historical Performance

The strategy executed 19 round-trip trades. It generated a total return of 433.53%, which is significantly high. The Sharpe Ratio for this strategy is 1.15, indicating a favorable risk-adjusted return.

In comparison, the B&H returned 34.09%, with a negative Sharpe Ratio of 0.49, suggesting an less profitable risk-adjusted return.

The strategy also had a winning trades percentage of 42.11%, which indicates that less than half of the trades were profitable. However, the high total return suggests that the winning trades were significantly profitable.

Lastly, the strategy experienced a maximum drawdown of -105.76%, which implies a substantial risk as the value of the investment portfolio could have decreased by this percentage from its peak before recovering. This high drawdown indicates a potential for significant losses and suggests a high-risk strategy.

#### 3.2 P&L

For P&L plot,the provided image, titled Figure 2 and Figure 3, showcases two distinct plots representing the P&L distributions for my trading strategy and B&H investment approach, respectively.

I use one-sample t-test against zero to check whether mean return from rounds-strategy differs significantly from zero at the 99% confidence level. The null hypothesis is the mean total return equals zero. The alternative hypothesis is the mean total return of the stock is not equal to zero. The critical t-value for 99% confidence interval is 5.65. The result shows the p value is much less than 0.01 and t-statistic is higher than the critical t-value, therefore, we reject the null hypothesis. The mean return differs significantly from zero at the 99% confidence level. Therefore, the t-statistic and p-value from the hypothesis test can also help me to confirm profitability of my strategy.

Also,comparatively, the trading strategy exhibits a much wider range of outcomes with the potential for significantly higher returns than the B&H approach.

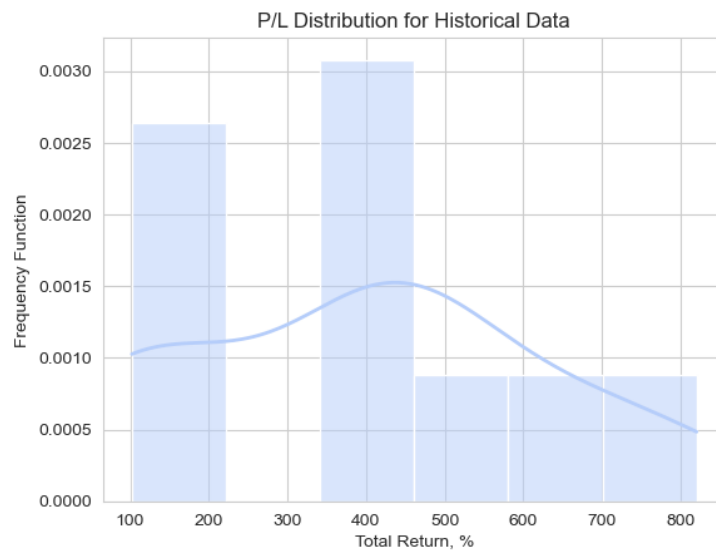


Figure 2 :

Strategy Historical Return P&L Plot

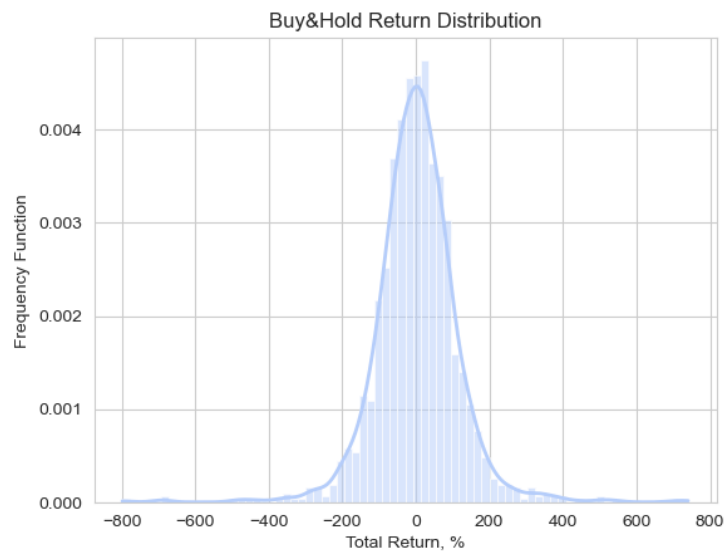


Figure 3 :

B&H Historical Return P&L Plot

### 3.3 Detailed Performance

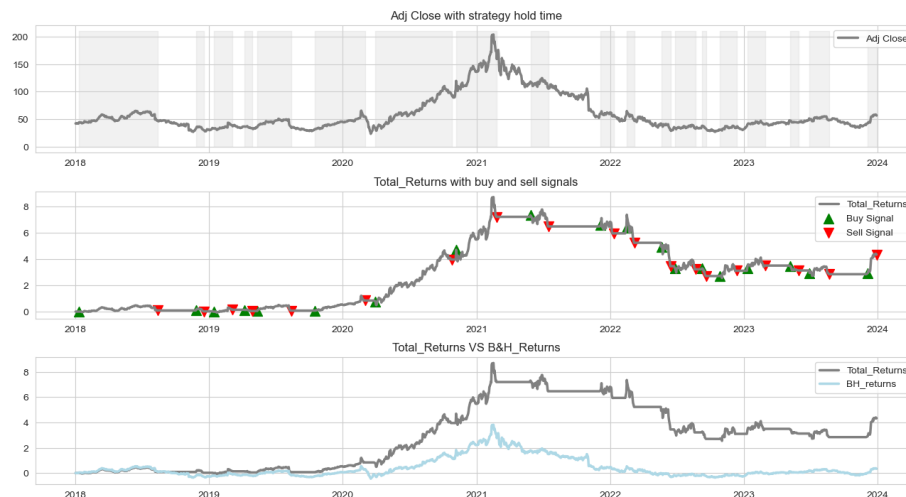


Figure 4 : Historical Performance

The provided image consists of three separate charts that detail the performance of a trading strategy compared to a B&H approach.

**Total Returns with Buy and Sell Signals:** The middle graph shows the total returns of the strategy, marked with buy (green triangle) and sell (red triangle) signals. Analyzing this chart, you would look for the timing of these signals relative to the overall market trend:

- In an upward trend: My strategy's total returns surpassed expectations when the long-term prices are rising, with the buy signals being highly responsive and capable of accurately identifying the beginning of an long-term upward trend. Also, the sell signal could distinguish the short-term downward trend during long-term upward trend, tends to avoid the short-term drawdown.
- In a downward trend: My strategy's strength would be shown by its ability to distinguish the long-term downward trend by less buy signals. It's hard to find the long-term downward trends when there were few short-term upward trend.

In conclusion, my trading strategy, when analyzed over these charts, would demonstrate the ability to capture significant portions of long upward trends (reflected in timely buy signals and sustained growth in total returns) and effectively avoid or mitigate losses during downward trends (evident from early sell signals and lesser buy signal). The performance should ultimately be assessed by the strategy's ability to outperform the B&H strategy over the entire period, especially during distinct market phases.

## 4 Bootstrapped methodology and Backtesting Performance

### 4.1 Bootstrapped methodology

The bootstrap technique, as described by Brock et al. in 1992, is utilized to create alternative price samples. These newly generated price samples serve as a basis for further testing of the trading strategy. During the bootstrap process, we construct an entirely distinct environment where prices exhibit different behaviors. This method enhances the precision of our backtesting results and aids in verifying the strategy's profitability. It illustrates the potential outcomes for the strategy under varied circumstances. The specifics of this method will be outlined subsequently.

I used  $n$  independent and identically distributed draws to obtain new sample residuals, where  $n$  is equal to one less than the length of the price sample. Using these new sample residuals, I compute the returns, and from these returns, I derive the new price sample. Upon calculating this new price sample, I apply my trading strategy to it. The performance of the strategy on this new sample may vary significantly from that on the original sample.

To ensure sufficient accuracy, I generate 200 bootstrapped price samples. Subsequently, I examine the backtesting results for these bootstrapped samples in the section below.

### 4.2 Bootstrapped Backtesting Performance

#### 4.2.1 Bootstrapped Performance

Samle	Round-trip trades	Total Return, %	Sharpe Ratio, %	B & H return, %	B & H Sharpe Ratio	Winning trades, %	Max drawdown, %
Historical	19	433.53	1.15	34.09	0.49	42.11	-105.76
Bootstrapped Average	26.3	160.75375	0.1015	473.99515	0.18	41.44395	-130.90665

Figure 5 : Bootstrapped Performance

The Figure 5 provides a comparative analysis between the historical performance of a trading strategy and its performance when applied to bootstrapped samples.

When the strategy was applied to bootstrapped data, the average outcomes showed more round-trip trades (26.3) and a total return of 160.75%. The Sharpe Ratio decreased to 0.1015, suggesting a decline in risk-adjusted performance. The winning trades percentage for the bootstrapped strategy was slightly lower at 41.44%, and the maximum drawdown increased to -130.91%, indicating higher volatility and risk.



The reduced performance in the bootstrapped samples compared to historical results can primarily be attributed to the high volatility of the original stock price. Bootstrapping involves randomly resampling from the original data, which can magnify the effects of volatility and lead to diverse scenarios with varying degrees of profitability. Also, stock's price has the trend, which become not significant in the bootstrapped samples, leading to harder trend-capture.

However, it's crucial to note that despite the decreased performance in the bootstrapped samples, the total return remains positive at 160.75%. This indicates that, even under varied simulated market conditions that likely include increased volatility and risk, the trading strategy still manages to generate profits. This positive return, despite a lower Sharpe Ratio and increased drawdown compared to the historical scenario, suggests that the strategy possesses inherent profitability that can withstand different market simulations.

#### 4.2.2 Bootstrapped P&L

I use one-sample t-test against zero to check whether bootstrapped mean return differs significantly from zero at the 99% confidence level. The null hypothesis is the mean total return equals zero. The alternative hypothesis is the mean total return of the stock is not equal to zero. The critical t-value for 99% confidence interval is 7.35. The result shows the p value is much less than 0.01 and t-statistic is higher than the critical t-value, therefore, we reject the null hypothesis. The mean return differs significantly from zero at the 99% confidence level. Therefore, the t-statistic and p-value from the hypothesis test can also help me to confirm profitability of my strategy in bootstrapped data set.

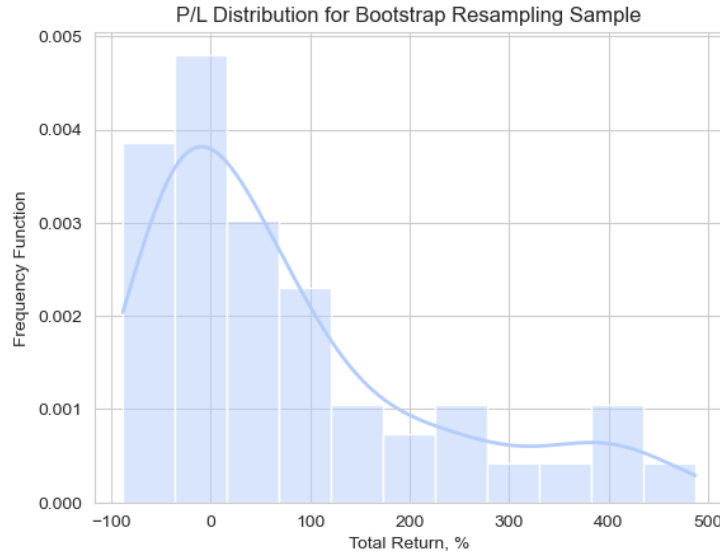


Figure 6 :

Strategy Bootstrapped Return P&L Plot

## 5 Conclusion and Improvement

### 5.1 Conclusion

In conclusion, I evaluate the effectiveness of trading strategy on the Zillow Group Inc. Initially, I conducted a backtest of the strategy using historical price data. The outcomes were promising: the strategy yielded a positive total return, which is 433.53%. Both the total return and Sharpe ratio of the strategy significantly surpassed those of the buy and hold approach. Although the winning rate is not high, the winning trades were significantly profitable.

Based on the backtesting for historical data, my strategy would demonstrate the ability to capture significant portions of long upward trends (reflected in timely buy signals and sustained growth in total returns) and effectively avoid or mitigate losses during downward trends (evident from early sell signals and lesser buy signal). The performance should ultimately be assessed by the strategy's ability to outperform the B&H strategy over the entire period, especially during distinct market phases.

Additionally, the use of bootstrap resampling has reaffirmed the strategy's profitability. By employing a one-sample t-test against zero, I verified that the average total returns are significantly different from zero at the 99% confidence level. The average total returns and Sharpe ratio from the bootstrapped samples were lower than those from the historical data analysis. But the sharpe ratio of bootstrapped data is still higher than B&H approach.

### 5.2 Improvement

1. **Incorporating Additional Indicators:** While MACD and RSI are popular, they might not capture all market nuances. Incorporating additional technical indicators, such as the Stochastic Oscillator, Bollinger Bands, or ATR (Average True Range), could provide a more holistic view of market conditions and help refine entry and exit points.
2. **Implementing Stop-Loss and Take-Profit:** To protect against large losses and secure profits, implementing stop-loss and take-profit levels could be beneficial. These levels could be set based on a percentage of the entry price, volatility measures, or support and resistance levels. Usually, traders will use 2 ATR to determine the stop-loss point.

## Appendix

Table 2: All Bootstrapped sample

Sample	Round-trip trades	Total Return, %	Sharpe Ratio, %	B & H return, %
B1	30	55.95	-0.88	1407.98
B2	29	26.99	0.78	466.30
B3	26	94.70	0.97	478.00
B4	26	28.54	0.59	28.94
B5	26	-63.76	-1.04	-90.51
B6	27	0.08	-0.24	54.72
B7	31	-56.67	-1.77	-52.97
B8	25	62.79	0.18	61.20
B9	20	193.89	0.35	-21.15
B10	23	213.80	0.42	64.00
B11	25	362.37	0.26	765.78
B12	24	-16.22	-0.45	45.23
B13	22	75.46	2.17	-37.83
B14	28	88.55	1.13	1294.48
B15	26	312.71	1.05	899.15
B16	24	-18.90	1.12	-67.35
B17	27	-61.69	-0.78	19.03
B18	22	553.69	1.42	190.38
B19	30	204.89	0.94	1059.43
B20	29	-83.55	-1.33	-89.63
B21	27	-31.52	-0.94	-47.56
B22	26	875.63	1.15	1793.68
B23	22	65.26	0.60	109.77
B24	24	203.13	1.98	224.09
B25	23	343.05	0.49	587.67
B26	25	260.22	1.31	1426.65
B27	29	-21.10	0.44	166.21
B28	26	-57.47	-0.49	-79.79
B29	26	11.13	0.66	-24.62
B30	33	11.54	0.58	222.61
B31	24	310.90	1.59	2143.64
B32	27	116.14	0.70	168.29
B33	25	284.92	1.11	424.62
B34	24	348.35	1.00	154.39
B35	28	49.99	1.02	560.91
B36	27	116.80	0.43	181.46
B37	25	663.63	1.44	522.91

Continued on next page

**Table 2 – Bootstrap Sample Data**

B38	26	262.05	0.88	536.04
B39	25	120.32	1.73	451.17
B40	28	10.57	0.62	-72.21
B41	27	37.62	-0.45	-45.27
B42	27	-71.32	-0.46	-23.71
B43	20	153.28	0.67	156.08
B44	25	320.70	1.02	1171.81
B45	26	-36.50	0.12	-81.48
B46	24	-14.11	0.22	-20.74
B47	29	-33.42	-0.74	117.82
B48	27	71.69	-0.41	641.86
B49	22	769.15	1.31	653.47
B50	27	7.66	1.09	656.91
B51	26	-9.56	0.33	-56.70
B52	27	6.25	0.15	-36.57
B53	26	44.06	0.81	50.61
B54	23	188.88	1.71	260.96
B55	26	73.20	1.10	283.97
B56	28	-20.08	0.48	493.59
B57	26	1059.79	1.40	626.80
B58	29	-18.02	-0.88	-40.89
B59	25	330.68	1.45	423.74
B60	27	162.92	0.42	135.31
B61	25	1133.60	1.74	735.42
B62	23	54.84	0.65	-35.77
B63	25	64.64	0.89	-54.78
B64	32	-39.60	-1.66	147.19
B65	25	158.22	1.22	5.11
B66	26	-72.81	-1.92	-74.91
B67	25	69.02	0.30	-33.14
B68	24	-60.47	-3.49	-94.48
B69	30	-73.58	-2.52	-75.37
B70	24	328.72	1.30	283.00
B71	22	561.96	0.67	446.48
B72	25	39.54	-0.25	134.82
B73	26	153.96	0.91	1569.38
B74	25	-82.48	-2.40	-94.76
B75	27	-25.19	0.14	-61.23
B76	25	12.79	1.05	-0.76
B77	20	17.64	-0.96	-74.40
B78	29	-23.38	-1.91	27.68
B79	25	-3.33	-0.65	25.02

Continued on next page

**Table 2 – Bootstrap Sample Data**

B80	27	114.84	0.48	236.55
B81	29	43.65	0.89	41.47
B82	27	-28.98	-1.09	3.01
B83	27	13.18	0.14	4.90
B84	28	26.48	-0.03	654.97
B85	27	-92.23	-2.51	-99.03
B86	28	57.24	1.08	442.69
B87	19	735.43	0.93	676.87
B88	26	47.62	0.98	18.95
B89	28	1.20	-0.35	43.98
B90	21	199.29	1.54	-66.10
B91	29	47.60	1.20	554.25
B92	23	13.54	1.39	-54.24
B93	27	-50.46	-0.14	-53.16
B94	25	0.89	1.40	-30.11
B95	23	289.28	1.58	1213.64
B96	29	-53.03	-0.44	87.37
B97	26	444.52	1.28	238.45
B98	29	75.67	0.34	16.00
B99	23	925.42	1.24	1077.85
B100	22	375.90	1.66	841.75
B101	23	77.58	2.55	625.86
B102	22	325.24	1.20	104.50
B103	27	306.73	0.40	2790.03
B104	23	150.23	0.77	-26.45
B105	27	233.26	0.13	192.25
B106	28	293.83	0.57	493.44
B107	20	40.60	0.62	-86.16
B108	23	131.52	2.06	-47.14
B109	32	-15.40	-2.05	-40.94
B110	29	-13.55	-1.51	102.67
B111	25	247.31	2.01	231.24
B112	29	-64.64	-1.65	-58.91
B113	24	43.36	0.10	93.47
B114	26	18.08	-0.61	544.04
B115	33	-78.66	-2.17	-58.21
B116	28	-67.00	-1.67	223.58
B117	26	239.91	0.65	14.13
B118	29	286.92	1.05	901.43
B119	30	226.45	1.69	1942.31
B120	29	-80.55	-1.71	-74.86
B121	25	64.25	1.23	95.89

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**Table 2 – Bootstrap Sample Data**

B122	32	-91.51	-1.96	-96.66
B123	28	-10.39	0.67	371.60
B124	19	263.27	1.22	-1.09
B125	26	190.48	1.35	139.02
B126	26	51.28	0.49	49.56
B127	29	-39.18	-1.02	-65.05
B128	29	10.68	-0.32	2234.49
B129	26	54.58	1.10	1.99
B130	22	698.45	1.10	791.17
B131	23	-65.71	-1.34	-96.07
B132	24	15.76	1.29	43.90
B133	23	474.56	0.61	113.07
B134	27	397.50	0.19	465.19
B135	26	155.32	0.67	-78.82
B136	29	-74.45	-1.97	-63.88
B137	29	-41.94	-2.98	-76.73
B138	28	-26.61	-0.78	82.81
B139	26	110.09	0.37	704.52
B140	35	-88.66	-1.38	-52.66
B141	21	307.81	1.10	305.85
B142	29	-15.03	-0.87	0.39
B143	21	334.82	0.54	101.58
B144	28	139.63	1.01	1429.35
B145	28	-36.92	-5.63	47.81
B146	25	103.97	1.93	248.33
B147	26	271.55	0.86	933.87
B148	28	225.72	0.25	1636.93
B149	27	119.70	-0.63	1484.72
B150	27	159.59	1.41	192.13
B151	17	191.99	1.06	-46.68
B152	23	153.05	1.11	-32.15
B153	30	134.43	0.59	1044.83
B154	26	291.71	0.28	459.90
B155	23	1891.11	1.56	781.94
B156	30	-27.79	-3.08	136.24
B157	26	121.57	1.06	625.92
B158	24	56.55	1.90	136.38
B159	26	26.99	-2.89	253.90
B160	22	3282.54	0.73	2095.03
B161	29	220.75	0.81	753.34
B162	24	4.80	0.67	-40.16
B163	24	255.96	0.96	215.64

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**Table 2 – Bootstrap Sample Data**

B164	21	204.86	1.39	139.46
B165	28	-59.43	-2.58	-69.91
B166	28	1.35	1.05	151.55
B167	25	423.20	2.13	343.73
B168	29	-16.44	-0.99	34.06
B169	23	-43.33	0.79	-69.78
B170	26	19.77	1.51	-60.30
B171	30	-17.56	1.28	185.50
B172	30	178.37	1.01	1451.37
B173	27	92.20	1.98	522.89
B174	25	120.39	0.68	460.15
B175	29	-33.85	0.43	-0.95
B176	29	-40.25	-3.66	78.75
B177	22	382.21	1.25	388.13
B178	24	152.60	1.66	87.16
B179	28	127.42	1.07	1309.82
B180	28	-54.77	-1.83	-80.56
B181	23	-20.00	0.14	-43.17
B182	23	222.55	0.63	164.97
B183	28	58.89	0.01	523.68
B184	27	77.83	2.21	334.26
B185	25	275.97	1.00	1222.99
B186	32	-47.46	-0.98	12.07
B187	23	307.56	1.55	2340.27
B188	24	76.62	1.18	294.41
B189	28	95.15	1.00	278.65
B190	26	665.19	0.69	1487.04
B191	23	1117.03	1.05	2262.22
B192	31	111.95	0.27	1168.18
B193	27	-3.25	-0.20	-38.24
B194	27	-14.48	-0.68	16.03
B195	25	172.90	0.07	622.23
B196	22	601.37	0.94	1809.72
B197	24	62.27	0.17	-84.69
B198	30	-9.35	-1.46	293.17
B199	31	-38.47	-0.39	368.05
B200	26	31.22	1.02	136.45

Table 3: Historical Trading Round

Round	Buy_Date	Buy_Price	Sell_Date	Sell_Price	Total Return, %	Sharpe Ratio, %
1	2018-01-12	44.369999	2018-08-15	46.529999	8.79	1.34
2	2018-11-27	33.130001	2018-12-18	30.410000	2.11	1.89
3	2019-01-14	33.150002	2019-03-07	37.119999	13.85	0.48
4	2019-04-09	36.500000	2019-04-29	33.689999	4.61	1.98
5	2019-05-13	35.459999	2019-08-14	34.660000	7.59	2.58
6	2019-10-18	31.750000	2020-03-03	53.509998	84.05	1.87
7	2020-03-30	34.709999	2020-10-26	92.529999	395.91	2.22
8	2020-11-06	119.580002	2021-02-25	159.330002	720.35	4.63
9	2021-05-28	118.290001	2021-07-16	105.610001	647.29	21.32
10	2021-12-06	60.270000	2022-01-11	57.730000	594.86	21.32
11	2022-02-14	57.349998	2022-03-08	46.869999	523.33	10.42
12	2022-05-20	40.230000	2022-06-15	31.510000	345.22	8.71
13	2022-06-27	34.360001	2022-08-22	32.730000	321.64	14.00
14	2022-09-09	38.200001	2022-09-20	32.389999	270.48	14.47
15	2022-10-27	30.700001	2022-12-12	34.450001	310.37	11.07
16	2023-01-10	39.730000	2023-02-28	41.349998	349.80	18.90
17	2023-05-08	47.380001	2023-05-31	44.790001	312.58	34.79
18	2023-06-29	49.009998	2023-08-22	48.619999	284.32	15.14
19	2023-12-04	42.330002	2023-12-29	56.720001	433.53	6.48