Calculation:

After determining the proxy variables of resistance and support and the definition of relative strength, we establish the RSRS index according to this. One is to directly use the slope itself as the index value.

1. Take the highest price sequence and the lowest price sequence before N days.
two
2. OLS linear regression was carried out for the model of two columns of data according to formula:
$high_i = \alpha + \beta * low_i + \epsilon$, where $\epsilon \sim N(0, \sigma)$.

3. The fitted beta value is used as the RSRS slope index value for the day.

The other approach is to standardize the slope and take its standard score as the index value. The method is similar to the first approach, but data used for OLS is standardized:
1. Take the slope time series of the previous M days.
2. Calculate OLS linear regression with previous formula using standard scores. And the beta is used as the RSRS slope.
3. Take the time series of beta in the previous M days and calculate the z-score standard score.

Here we calculate RSRS slope with both two approaches. In our model $N = 18$ and $M = 600$.

RSRS Strategy Construction: using 000001.SZ

We construct the time selection strategy after preliminarily defining the RSRS parameter. In this part we will exam the timing effect of RSRS.

The trading framework is using the threshold. We select distinct threshold for longing and shorting. When the index exceeds certain threshold S_{long}, the strategy will long the full position of the observed stock; when index passes through another threshold S_{short}, the strategy will close its position.

We use 000001.SZ as the example, and the time range is from 2000 to 2020 (21 years). The data is collected via "tushare" python package. First we display the intuitive image on the stock's performance:
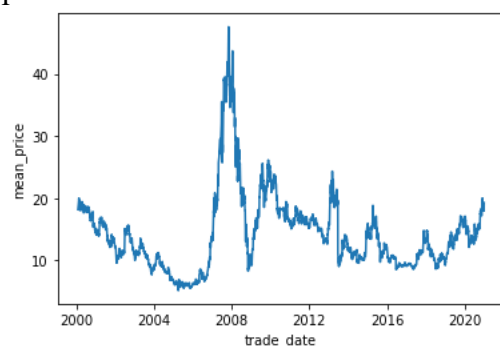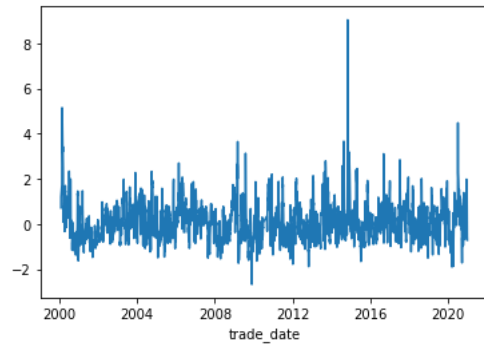
The descriptive statistics results of RSRS is shown:

RSRS Statistics Index	Value
Mean	0.9264
Standard Deviation	0.1610
Skewness	0.3325
Kurtosis	3.8174

And the histplot is displayed below:
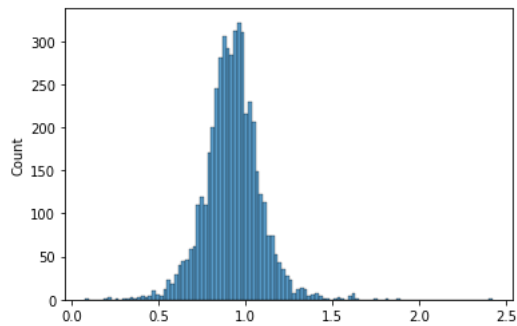
The time-series plot on RSRS is:

Considering aforementioned statistical results, a plausible threshold is $S_{long} = 1$ and $S_{short} = 0.8$. Then the trading strategy of RSRS slope index is:

Strategy 1 (Fixed):
1. Calculate the RSRS slope using the first approach.
2. If $RSRS > S_{long} = 1$, buy and hold.
3. If $RSRS < S_{short} = 0.8$, the position is closed by selling.

For robustness checking, we construct Strategy 2 strictly using the mean and standard deviation:

Strategy 2 (One Sigma):
1. Calculate the RSRS slope using the second approach.
2. If $RSRS > S_{long} = \mu + \sigma$, buy and hold.
3. If $RSRS < S_{short} = \mu - \sigma$, the position is closed by selling.

Strategy Performance on individual stocks: using 000001.SZ

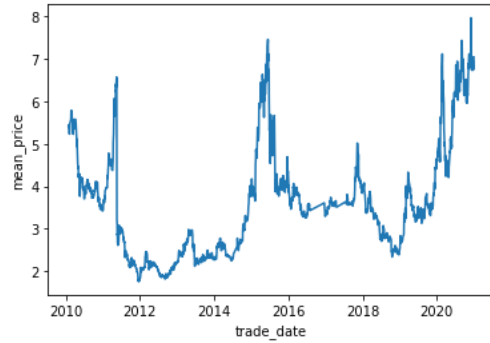|	Strategy 1: Fixed	Strategy 2: One Sigma
Initial Value at 2000.01.01.	1,000,000	1,000,000
Long Frequency	92	55
Short Frequency	91	55
Ending Value at 2020.12.31.	23,733,107.00	23,065,175.00
Annualized Return Rate	16.27%	16.12%
Tracking Error	6.0695	5.3109
Information Ratio	0.0540	0.0610
Maximize Drawback Rate	-16.07%	-16.09%

The value comparison between 2 strategies and buy-and-hold strategy.
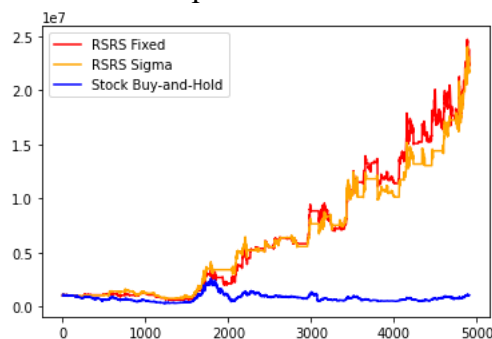
Here we ignore the transaction cost, and use the real transaction rule for our Monte Carlo: investors are only allowed to transact with the number at multiplier of 100. Since the assumed initial value of portfolio is higher, the transaction frictions are negligible. And the sigma approach performs slightly better than the fixed approach.

Robustness Checking: using 000100.SZ, from 2010 to 2020

The stock price:

	Strategy 1: Fixed	Strategy 2: One Sigma
Initial Value at 2010.01.01.	1,000,000	1,000,000
Long Frequency	49	27
Short Frequency	49	27
Ending Value at 2020.12.31.	2,308,860.00	2,850,588.00
Annualized Return Rate	7.90%	9.99%
Tracking Error	0.4135	0.6901
Information Ratio	0.1335	0.1102
Maximize Drawback	-42.40%	-42.40%

The value comparison between 2 strategies and buy-and-hold strategy.
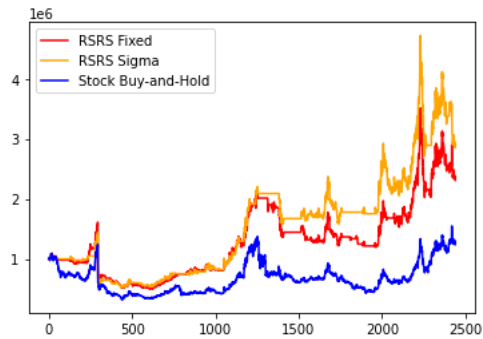
This stock has a higher volatility and the price is fluctuating. Under turbulent scenario, the sigma threshold performs better than fixed threshold, with higher tracking error and higher information ratio. This is also fit to our expectation.