

Mean Reversion Trading Strategy

This is a simple trading strategy that uses Bollinger bands and simple moving average (SMA) to enter and exit the market. This strategy is specifically made for the ICICIBANK stock, where we see prices' reverting behaviour quite often.

Bollinger bands consist of a moving average (or the middle band, usually 20-period) and bands above and below it at a certain number of standard deviations:

- Upper Band = Moving Average + (Standard Deviation × Factor)
- Lower Band = Moving Average – (Standard Deviation × Factor)

Simple moving average (SMA, not the Moving Average in Bollinger band) is the moving average of closing price here.

The strategy has the following entry and exit conditions:

We enter a long position when most recent closing price is less than or equal to lower band of the Bollinger band.

We enter a short position when most recent closing price is more than or equal to the upper band.

```
price = self.data.Close[-1]
lookback = 10
recent_low = min(self.data.Low[-lookback:])
recent_high = max(self.data.High[-lookback:])
if not self.position:
    if price <=self.lower[-1]:

        sl= recent_low * 0.99
        tp = price + (price - sl) * 2
        self.buy(sl=sl, tp=tp)

    elif price >=self.upper[-1]:

        sl = recent_high * 1.01
        tp = price - (sl - price) * 2

        self.sell(sl=sl, tp=tp)
```

We exit a long position when the closing price crosses above the mid-point of upper band and the SMA.

We exit the short position when closing price crosses below the mid-point of lower band and the SMA.

In exit positions we do not use the middle band for position exits.

```
elif self.position:
    if self.position.is_long and price > (self.upper[-1]+self.sma[-1])/2:
        self.position.close()
    elif self.position.is_short and price < (self.lower[-1]+self.sma[-1])/2:
        self.position.close()
```

The risk management is as follows:

For long position:

We set 1:2 risk-reward ratio by setting stop loss 1 % below the support level (observed for last 10 candles)

```
recent_low = min(self.data.Low[-lookback:])
```

```
sl= recent_low * 0.99
```

For short position:

We set the same risk-reward ratio by setting stop loss 1 % above the resistance level (observed for last 10 candles)

```
recent_high = max(self.data.High[-lookback:])
```

```
sl = recent_high * 1.01
```

Reason behind the choice of indicators:

Bollinger Bands is the measure of volatility, it shows how much the price is moving up and down compared to its average.

Simple Moving Average (SMA) is the measure of trend. It helps to identify the overall direction of the price.

Combining both gives us a clearer and smarter picture.

Reversal points can be identified with more guarantee, if both factors go along with each other.

If the price hits the lower band but the SMA is flat or rising, it's a possible buy signal, expecting the price to go back up.

False signals can be avoided, if one of the factors go against each other.

Example: If price touches the upper band but SMA is sloping up, it might be a continuation, not a reversal. So, it's not a good time to short.

The results of the strategy are as follows:

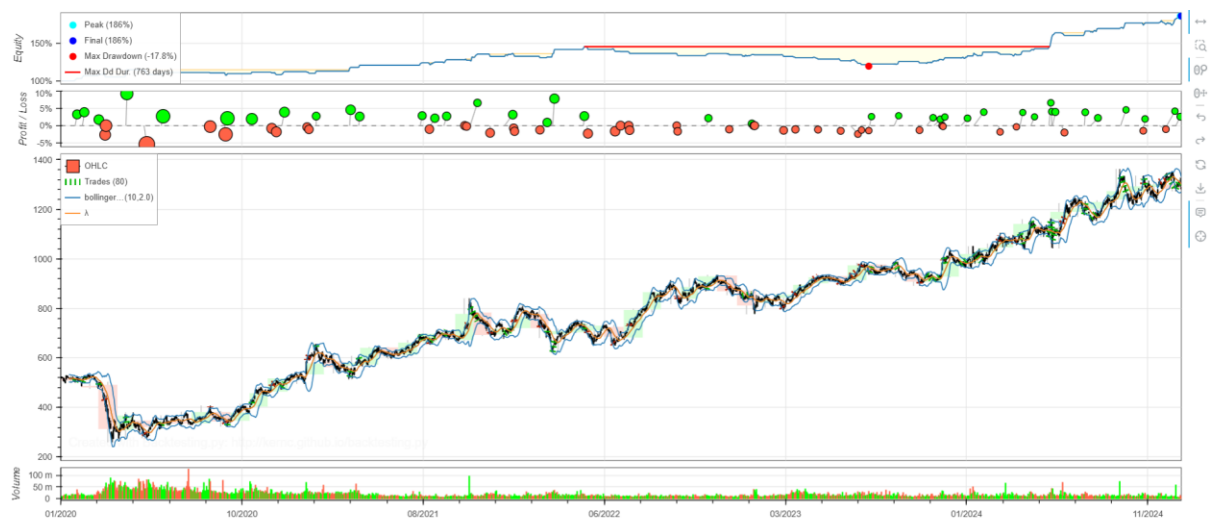
Return [%]	86.02078
Buy & Hold Return [%]	146.62496
Return (Ann.) [%]	13.4672
Volatility (Ann.) [%]	11.19439
Sharpe Ratio	1.20303
Sortino Ratio	2.39948
Max. Drawdown [%]	-17.79152
Avg. Drawdown [%]	-3.3128
Number of Trades	80
Win Rate [%]	48.75
Best Trade [%]	9.30851
Worst Trade [%]	-5.44943
Avg. Trade [%]	0.98037
Profit Factor	2.67026
Exposure Time [%]	21.97092

The data that is fetched is of ICICI bank stocks over the period of Jan 2020 to Dec 2024, 5 years of data.

Optimization of parameters like SMA period, standard deviation and Bollinger band mean period along with maximizing the returns, yielded better results.

```
results = bt.optimize(  
    bb_period=range(10, 30, 5),  
    bb_stddev=[1.5, 2.0, 2.5, 3.0],  
    sma_period=range(5, 25, 5),  
    maximize='Return [%]' )
```

It is also observed that the exposure time is 21%, which contributes to reduced risk by limiting the strategy's time in the market and thereby lowering the potential impact of adverse price movements.



Resources used:

https://www.youtube.com/playlist?list=PLX2SHiKfualH_xMbGM-3zWC47s9gUjGR

<https://www.incrediblecharts.com/indicators/technical-indicators.php>

https://www.youtube.com/playlist?list=PLnSVMZC68_e48IA4aRYL1yHYZ9nEq9AiH

<https://www.investopedia.com/terms/b/bollingerbands.asp>

<https://kernc.github.io/backtesting.py/doc/backtesting/>

<https://colab.research.google.com/>