

# OPTIMIZATION REPORT: Intraday with Open Range Breakout and VWAP Trend Strategies

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## 1 Introduction

This document describes the Opening Range Breakout (ORB) and Volume Weighted Average Price (VWAP) trending strategies and their optimization implementation.

## 2 Strategies Definition

### 2.1 VWAP Trending Strategy

#### 2.1.1 Entry Conditions, Stop Loss, and Profit Target

The strategy waits for the first  $P$ -minute candle to close after the market opens at 9:00 AM. If the asset price exceeds the VWAP by at least  $D$  immediately after this period, a long position is initiated. The strategy sets a stop loss at the price level where a 1-minute candle closes below the VWAP by at least  $D$ , with a target profit of  $T$ . The position is held throughout the trading day until the stop loss or take-profit signal is met, or until 2:29 PM.

Similarly, if the asset price after the first period is below the VWAP by at least  $D$ , the strategy enters a short position at that price.

#### 2.1.2 Position Sizing

Each trading day, the strategy enters at most one position.

#### 2.1.3 Free Parameters

This strategy has three free parameters: the period  $P$ , difference price  $D$ , and target profit  $T$ .

### 2.2 ORB Strategy

#### 2.2.1 Entry Conditions, Stop Loss, and Profit Target

The strategy waits for the first  $P$ -minute candle to close after the market opens at 9:00 AM. If the closing price of that candle exceeds the opening price by at least  $D$ , a long position is initiated at the opening price of the next candle. The strategy sets a stop loss at a market price that is below the low of the first  $P$ -minute candle by at least  $D$ , with a target profit of  $T$ . The position is held throughout the trading day until the stop loss or take-profit signal is met, or until 2:29 PM.

Similarly, if the closing price of the first  $P$ -minute candle is below the opening price by at least  $D$ , the strategy enters a short position at the opening price of the next candle.

#### 2.2.2 Position Sizing

Each trading day, the strategy enters at most one position.

#### 2.2.3 Free Parameters

This strategy has three free parameters: the period  $P$ , difference price  $D$ , and target profit  $T$ .

## 3 Optimization

### 3.1 In-Sample Data

The in-sample data consists of the matched price and volume of VN30F1M from June 2021 to December 2022.

### 3.2 Algorithm for Optimization

Both strategies share the same free parameters, so the same algorithm is used to optimize them. The optimization algorithm, shown in Algorithm 1, demonstrates how the optimal free parameters are determined for both strategies.

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**Algorithm 1** Strategy Optimization

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1: Input: data (In-Sample Data)
2: Output: Optimized parameters
3: Initialize optimize_parameters  $\leftarrow \{period : 0, condition\_diff : 0, take\_profit : 0\}$ 
4: Initialize max_sharpe_ratio  $\leftarrow 0$ 
5: backtesting  $\leftarrow Backtesting(data)$ 
6:                                      $\triangleright$  Step 1: Optimize period with fixed condition_diff and take_profit
7: for  $i = 5$  to 145 step 5 do
8:   sharpe  $\leftarrow backtesting.run(i, 2, 1).sharpe\_ratio()$ 
9:   if sharpe > max_sharpe_ratio then
10:    max_sharpe_ratio  $\leftarrow sharpe$ 
11:    optimize_parameters[period]  $\leftarrow i$ 
12:    optimize_parameters[condition_diff]  $\leftarrow 1$ 
13:   end if
14: end for
15:                                      $\triangleright$  Step 2: Fine-tune period and optimize condition_diff
16: for  $i = optimize\_parameters[period] - 5$  to  $optimize\_parameters[period] + 4$  do
17:   for  $j = 1$  to 9 do
18:    sharpe  $\leftarrow backtesting.run(i, 2, j).sharpe\_ratio()$ 
19:    if sharpe > max_sharpe_ratio then
20:      max_sharpe_ratio  $\leftarrow sharpe$ 
21:      optimize_parameters[period]  $\leftarrow i$ 
22:      optimize_parameters[condition_diff]  $\leftarrow j$ 
23:    end if
24:   end for
25: end for
26:                                      $\triangleright$  Step 3: Optimize take_profit with fixed period and condition_diff
27: for  $i = 1$  to 3 do
28:   sharpe  $\leftarrow backtesting.run(optimize\_parameters[period], i, optimize\_parameters[condition\_diff]).sharpe\_ratio()$ 
29:   if sharpe > max_sharpe_ratio then
30:     max_sharpe_ratio  $\leftarrow sharpe$ 
31:     optimize_parameters[take_profit]  $\leftarrow i$ 
32:   end if
33: end for
34:                                      $\triangleright$  Step 4: Save optimized parameters
35: Save optimize_parameters to file
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