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Project Report

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1 Strategy 1: Volume Spike Reversal Strategy

1.1 Strategy Summary

This strategy uses the reversal strategy of volume-spike momentum along with risk management with the ATR-based trailing stops and exit logic.

It enters trades on volume spikes judged with momentum and exit trades based on trend weakness as it loses the streak. Then it reverses positions when a volume spike indicates a trend flip.

1.2 Entry Logic

Mathematically it enters when

- Current volume $>$ mean $+ 1.5 \times$ std of past `volume_lookback` bars [Volume Spike]
  - Green candle (close $>$ open) : long
  - Red candle (close $<$ open) : short
- Stop Logic
  - Longs when the trailing_stop $=$ close $-$ ATR $\times$ multiplier
  - Shorts when the trailing_stop $=$ close $+$ ATR $\times$ multiplier

1.3 Exit Logic

For Long Positions

- 3 consecutive bad closes (each close $\leq$ previous close)
- Trailing stop hit (close $<$ trailing stop)
- Reversal: red candle $+$ volume spike $\Rightarrow$ reverse to short

For Short Positions

- 3 consecutive bad closes (each close $\geq$ previous close)
- Trailing stop hit (close $>$ trailing stop)
- Reversal: green candle $+$ volume spike $\Rightarrow$ reverse to long

1.3.1 Trailing Stop Updates:

- Long: max(trailing_stop, close $-$ ATR $\times$ multiplier)
- Short: min(trailing_stop, close $+$ ATR $\times$ multiplier)

1.4 Tunable Parameters

Parameter	Description
atr_length	ATR period (default: 14)
trailing_stop_multiplier	Multiplier for stop distance (default: 2.0)
volume_lookback	Rolling volume window (default: 11)
num_wrong_limit	Max losing streak before exit (default: 3)

1.5 Assessment Metrics

```
Total Trades : 86
Leverage Applied : 1
Winning Trades : 40
Losing Trades : 46
No. of Long Trades : 44
No. of Short Trades : 42
Benchmark Return(%) : 325.632937277405
Benchmark Return(on $1000) : 3256.32937277405
Win Rate : 46.51162790697674
Winning Streak : 6
Losing Streak : 6
Gross Profit : 20305.99168431206
Net Profit : 18942.731383941085
Average Profit : 220.2643184179196
Maximum Drawdown(%) : 29.911684770803838
Average Drawdown(%) : 7.323541333741218
Largest Win : 6168.855879643483
Average Win : 1196.021535426746
Largest Loss : -2627.399652979823
Average Loss : -628.2202181114945
Maximum Holding Time : 37 days 00:00:00
Average Holding Time : 11 days 18:08:22.325581395
Maximum Adverse Excursion : None
Average Adverse Excursion : None
Sharpe Ratio : 3.130301398725924
```

Figure 1: Strategy 1

2 Strategy 2: EMA + MACD Momentum Strategy

2.1 Core Idea

This strategy analyses MACD for momentum signalling, EMA filters for trend confirmations and ATR for risk assessment and exits

2.2 Entry Conditions

Long Entry

While the close price is more than open, if the price goes above EMA, meaning trend is up and MACD line crosses above the signal line, the code signals a long entry.

Short Entry

While the Close price goes below the open, if the price goes below EMA and MACD line crosses below signal line, downtrend is detected and code signals a short entry.

2.3 Exit Conditions

Long Position

While in long position, if the price falls below EMA , MACD shows a similar bearish crossover and we have N consecutive close downs, code exits.

Short Position

If during the short position, price rises above EMA, MACD shows bullish crossover and we have N consecutive close ups, code exits.

2.4 Indicators Used

- EMA (e.g., 100) – trend direction filter
- MACD (6, 19, 4) – fast crossover for entry timing
- ATR (14) – dynamic stop distance

2.5 Risk Management

- **Trailing Stop:** Based on ATR × multiplier (e.g., 2.0)
- **Wrong Move Limit:** Exit after N consecutive closes against position (e.g., 2)

2.6 Assessment Metrics

```
Total Trades : 93
Leverage Applied : 1
Winning Trades : 35
Losing Trades : 58
No. of Long Trades : 55
No. of Short Trades : 38
Benchmark Return(%) : 325.632937277405
Benchmark Return(on $1000) : 3256.32937277405
Win Rate : 37.634408602150536
Winning Streak : 4
Losing Streak : 6
Gross Profit : 5764.520050286566
Net Profit : 5313.186517008937
Average Profit : 57.131037817300395
Maximum Drawdown(%) : 28.985905815374096
Average Drawdown(%) : 8.539006915006937
Largest Win : 1197.9078255092306
Average Win : 319.91824718965063
Largest Loss : -385.19165892427566
Average Loss : -101.44745059704887
Maximum Holding Time : 21 days 00:00:00
Average Holding Time : 4 days 14:42:34.838709677
Maximum Adverse Excursion : None
Average Adverse Excursion : None
Sharpe Ratio : 3.4910985259932117
Sortino Ratio : None
```

Figure 2: Strategy 2

3 Strategy 3: Volume Spike + RSI Reversal Strategy

3.1 Strategy Summary

This strategy combines a range of different tools: Volume Spike detections for reversal analysis, RSI for momentum indication and ATR for risk management. It is, in a way , a safer advancement to strategy 1 as we use RSI here , therefore giving a better sharpe ratio.

3.2 Entry Logic

Mathematically, the logic is as follows

Volume spike: volume > average + 1.5 × std of last `volume_lookback` bars

Candle indications:

- Green candle represents close > open therefore consider long
- Red candle represents close < open therefore consider short

RSI indicator:

- Consider long if RSI $\geq$ `rsi_entry_threshold_long`
- Consider short if RSI $\leq$ `rsi_entry_threshold_short`

The exit logic is initiatied using ATR as described before

3.3 Exit Logic

Long Position

- Reversal: volume spike + red candle + RSI $\leq$ short threshold $\Rightarrow$ reverse to short
- 3 consecutive closes $\leq$ previous close
- Trailing stop hit
- Trailing stop updated upward only

Short Position

- Reversal: volume spike + green candle + RSI $\geq$ long threshold $\Rightarrow$ reverse to long
- 3 consecutive closes $\geq$ previous close
- Trailing stop hit
- Trailing stop updated downward only

3.4 Tunable Parameters

Parameter	**Description**
atr_length	ATR period for stop distance (default: 14)
trailing_stop_multiplier	ATR multiplier for stop distance (default: 2.0)
volume_lookback	Rolling volume lookback window (default: 11)
num_wrong_limit	Max adverse candles before exit (default: 3)
rsi_entry_threshold_long	RSI threshold for long entry (default: 50)
rsi_entry_threshold_short	RSI threshold for short entry (default: 50)

3.5 Assessment Metrics

```
Total Trades : 54
Leverage Applied : 1
Winning Trades : 26
Losing Trades : 28
No. of Long Trades : 27
No. of Short Trades : 27
Benchmark Return(%) : 325.632937277405
Benchmark Return(on $1000) : 3256.32937277405
Win Rate : 48.148148148148145
Winning Streak : 6
Losing Streak : 5
Gross Profit : 14433.50584934075
Net Profit : 13655.389914469557
Average Profit : 252.8775910086955
Maximum Drawdown(%) : 32.23447611822988
Average Drawdown(%) : 9.001221746033806
Largest Win : 4773.17201097172
Average Win : 1244.6333611598063
Largest Loss : -2032.958903550343
Average Loss : -668.0384812744788
Maximum Holding Time : 45 days 00:00:00
Average Holding Time : 15 days 03:33:20
Maximum Adverse Excursion : None
Average Adverse Excursion : None
Sharpe Ratio : 4.430993607360364
Sortino Ratio : None
```

Figure 3: Strategy 3

Strategy Comparison Table (Ordered by Sharpe Ratio)

Metric	Strategy 1 (Sharpe 3.13)	Strategy 2 (Sharpe 3.49)	Strategy 3 (Sharpe 4.43)
Total Trades	86	93	54
Leverage Applied	1	1	1
Winning Trades	40	35	26
Losing Trades	46	58	28
Long Trades	44	55	27
Short Trades	42	38	27
Benchmark Return (%)	325.63	325.63	325.63
Benchmark Return ($1000)	3256.33	3256.33	3256.33
Win Rate (%)	46.51	37.63	48.15
Winning Streak	6	4	6
Losing Streak	6	6	5
Gross Profit	20305.99	5764.52	14433.51
Net Profit	18942.73	5313.19	13655.39
Average Profit	220.26	57.13	252.88
Max Drawdown (%)	29.91	28.99	32.23
Avg Drawdown (%)	7.32	8.54	9.00
Largest Win	6168.86	1197.91	4773.17
Average Win	1196.02	319.92	1244.63
Largest Loss	-2627.40	-385.19	-2032.96
Average Loss	-628.22	-101.45	-668.03
Max Holding Time	37 days	21 days	45 days
Avg Holding Time	11d 18h	4d 14h	15d 3h
Sharpe Ratio	3.13	3.49	4.43
Sortino Ratio	None	None	None