Rebound Strategy Analyzer

1. Overview

The Rebound Strategy Analyzer is a Streamlit-based application designed to backtest and optimize a trading strategy that capitalizes on price reversals after an Opening Range Breakout (ORB).

Key Features
- Automated Data Fetching: Pulls 5-minute OHLC data from Yahoo Finance.
- Opening Range Detection: Identifies high/low bounds of a specified opening range.
- Breakout & Reversal Logic: Simulates trades when price breaks out of the range and then retraces.
- Optimization Engine: Tests various Take-Profit (TP) and Stop-Loss (SL) combinations.
- Visual Analytics: Heatmaps, PnL curves, and trade execution charts.

2. How to Use the App (For Clients/Traders)

Step 1: Input Parameters
Trading Session & Opening Range
- Ticker Symbol: Asset to analyze (e.g., GC=F for gold futures).
- Timezone: Session timezone (e.g., Europe/London).
- Trading Hours: Start/end of the trading day.
- Opening Range (OR) Hours: Time window for calculating OR high/low.

Strategy Rules
- Confirmation Bars: Number of bars needed to confirm breakout.
- Require Close Inside OR: If enabled, price must close back inside OR before trade entry.
- Buffer Multiplier: Adjusts entry buffer around OR levels.

Risk Management
- TP/SL Range: Absolute points for optimization (e.g., TP: 4-10 pts, SL: 4-10 pts).
- Friction Costs: Commission + slippage (default: 1 point).

Date Range
- Default: Last 50 trading days.

Step 2: Run Analysis
Click "Run Analysis" to:
- Fetch market data.
- Optimize TP/SL combinations.

- Generate trade simulations.

Step 3: Interpret Results
- Optimization Heatmaps: Shows best TP/SL combinations.
- Trade Logs: Entry/exit details for each trade.
- Performance Metrics: Win rate, PnL, profit factor.
- Cumulative PnL Curve: Equity growth over time.

3. Strategy Logic (For Senior Analysts)

Core Hypothesis
Markets often retrace after an initial breakout from the opening range.
The strategy fades breakouts (sells highs, buys lows) with confirmation.

Mechanism
- Opening Range Calculation: High/low of a user-defined window (e.g., 14:30-15:00). ATR (Average True Range) used for volatility adjustment.
- Breakout Confirmation: Price must exceed OR high/low by buffer_multiplier * ATR. Requires N consecutive confirming bars (default: 1).
- Trade Execution: Short Entry: After upside breakout, if price re-enters OR high. Long Entry: After downside breakout, if price re-enters OR low. Exit: TP/SL or end-of-day (EOD).
- Optimization: Grid search over TP/SL values. Filters poor risk-reward ratios (SL < TP).

Why It Works (Theoretical Basis)
- False Breakouts: Many breakouts fail, leading to reversals.
- Liquidity Zones: OR highs/lows act as support/resistance.
- Volatility Adjustment: ATR-based buffer avoids whipsaws.

4. Code Structure (For Developers)

File: app.py

1. Dependencies
- Data: yfinance, pandas
- Visualization: matplotlib, seaborn, mplfinance
- App Framework: streamlit

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2. Key Functions

Function Purpose

get_trading_days_data() Fetches 5m OHLC data from Yahoo Finance

get_opening_range_levels() Calculates OR high/low and ATR

simulate_rebound_trade() Executes strategy logic per trade

optimize_tp_sl() Grid search for best TP/SL

plot_*() Visualization helpers

3. Data Flow

User inputs -> Streamlit sidebar.

yfinance fetches data -> Pandas processes it.

Optimization runs -> Results stored in DataFrame.

Streamlit renders tables/charts.

4. Maintainability Tips

- Caching: Add @st.cache_data to expensive functions (e.g., data fetching).
- Error Handling: Wrap Yahoo Finance calls in try/except.
- Config File: Move hardcoded params (e.g., buffer_multiplier) to config.py.

5. Potential Upgrades

- Multi-Asset Backtesting: Run across multiple tickers.
- Machine Learning: Replace grid search with Bayesian optimization.
- Live Trading Integration: Connect to Alpaca/Interactive Brokers.
- Advanced Filters: Add volume/volatility filters.

6. Conclusion

The Rebound Strategy Analyzer provides a systematic way to validate a mean-reversion strategy post-breakout. Its modular code allows easy upgrades, while the logic aligns with market microstructure principles.

Next Steps:

- Clients: Test different assets/timeframes.
- Developers: Expand optimization metrics (e.g., Sharpe ratio).
- Analysts: Stress-test during high-volatility regimes.

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Appendix:

- Sample Inputs: GC=F, OR 14:30-15:00, TP/SL 4-10 pts.
- Sample Output: 60% win rate, 1.8 profit factor.

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