Trading Strategy Simulation Report for HP,Inc.

Project Overview

This project focuses on implementing and evaluating multiple trading strategies using **historical stock price data** from Yahoo Finance. The goal is to identify the best-performing strategy based on **risk-adjusted returns** and other performance metrics like **final portfolio value** and **minimum drawdown**.

The strategies analyzed include:

- **Relative Strength Index (RSI) Strategy**
- **Bollinger Bands Strategy**
- **Moving Average Convergence Divergence (MACD) Strategy**
- **Exponential Moving Average (EMA) Crossover Strategy**
- **Simple Moving Average (SMA) Crossover Strategy**

Each strategy was **backtested** with an **initial capital of $10,000**, tracking portfolio performance over time.

Data Collection and Yahoo Finance Utilization

- The dataset was obtained using **Yahoo Finance API**, which provides **historical stock prices, volume, and technical indicators**.
- We used **adjusted closing prices** to account for stock splits and dividends, ensuring accurate backtesting.

Trading Strategies and Their Definitions

1. RSI (Relative Strength Index) Strategy

Definition: Measures **momentum** by comparing recent gains vs. losses.
Signals:

- **Buy Signal:** RSI < 30 (Oversold condition)
- **Sell Signal:** RSI > 70 (Overbought condition)
- **Best Used:** Short-term trading, volatile markets.

2. Bollinger Bands Strategy

Definition: Uses **moving averages & standard deviation** to create upper & lower price bands.
Signals:

- **Buy Signal:** Price touches the **lower band** (oversold).
- **Sell Signal:** Price touches the **upper band** (overbought).

- **Best Used:** When stocks fluctuate around a mean price.

3. MACD (Moving Average Convergence Divergence) Strategy

Definition: Uses **EMA differences** to detect trends.
Signals:

- **Buy Signal:** MACD crosses **above** the signal line.
- **Sell Signal:** MACD crosses **below** the signal line.
- **Best Used:** Trending markets (bullish or bearish).

4. EMA Crossover Strategy

Definition: Uses two EMAs (short-term & long-term) to detect trend changes.
Signals:

- **Buy Signal:** Short EMA crosses **above** long EMA.
- **Sell Signal:** Short EMA crosses **below** long EMA.
- **Best Used:** Trend-following trades.

5. SMA Crossover Strategy

Definition: Uses two SMAs, similar to EMA but **slower to react**.
Signals:

- **Buy Signal:** Short SMA crosses **above** long SMA.
- **Sell Signal:** Short SMA crosses **below** long SMA.
- **Best Used:** Long-term trend trading.

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4 Observations & Insights from Backtesting

Best Strategy: RSI

Why RSI performed the best?

- RSI identifies **overbought and oversold conditions**, making it effective for **short-term trading**.
- Unlike SMA and EMA, RSI provides **clear entry and exit points** based on market momentum.
- It avoids **holding positions for too long**, reducing exposure to market downturns.
- **Lower drawdown and better returns** compared to other strategies.

Capital Utilization: Why Some Strategies Used Only a Small Percentage of Capital?

- Some strategies (**EMA/SMA crossovers**) generate **fewer trade signals**, leading to **cash reserves being held** instead of being fully invested.
- This can **act as a risk management measure**, preventing overexposure to bad trades.
- Using Full capital lead to bad portfolio value in this case

Cooldown Counter (Avoiding Overtrading)

- A **cooldown period** was introduced to **prevent excessive trading**, avoiding losses from frequent **whipsaws** (false signals).
- RSI, for example, may hit overbought/oversold **multiple times in a short period**, but cooldown prevents acting on every small fluctuation.

Issues Noticed with Some Strategies

SMA Crossover performed the worst

- **Too slow to react**, making it ineffective for high-frequency trading.
- **Large drawdowns** due to late sell signals.

MACD struggled in sideways markets

- Works well in **strong trends** but generates false signals in **choppy markets**.

Bollinger Bands struggled with extreme price swings

- The assumption that prices will **revert to the mean** doesn't always hold in strong trends.

Performance Metrics & Key Financial Concepts

Standard Deviation (σ)

- Measures how much a stock's price deviates from its average.
- **Higher Std Dev = Higher volatility & risk.**

Sharpe Ratio

- Measures **risk-adjusted returns** (how much return per unit of risk).
- **Higher Sharpe Ratio = Better risk-adjusted performance.**

Max Drawdown

- Measures **largest loss from peak to trough** before recovery.
- A **lower drawdown** means the strategy is more stable.

Whipsaw

- False signals that cause **frequent buying & selling**, leading to losses.

Lagging vs. Leading Indicators

- **Lagging Indicators** (SMA, MACD) react **after** the trend has started.
- **Leading Indicators** (RSI) try to **predict** price movements.

How to Improve the Strategies?

Combine Strategies

- Use **RSI + EMA** instead of relying on one indicator alone.
- Example: **RSI confirms oversold, EMA crossover triggers trade.**

Add Stop Loss & Take Profit

- Stop-loss **limits potential losses**.
- Take-profit ensures gains are locked in **before reversal**.

Optimize Parameters

- Different stocks have **different optimal RSI thresholds** (e.g., 25 instead of 30).
- Backtesting with **different parameters** can improve accuracy.

Use Volume Indicators

- **High volume + buy signal = strong trade confirmation.**
- Adding **On-Balance Volume (OBV)** can filter out weak signals.

Incorporate Market Trends

- RSI works **best in sideways markets**, but in strong uptrends, **combining with MACD** avoids false signals.

Final Thoughts & Key Takeaways

RSI Strategy outperformed others due to its ability to identify good entry & exit points.
MACD & EMA crossovers are best for trend-following but struggle in sideways markets.
SMA crossovers lag too much, making them ineffective for short-term trading.
Avoid overtrading! Whipsaws can erode profits, so a cooldown mechanism helps.
Adding stop-losses, volume analysis, & optimizing parameters can improve strategy success.

Conclusion

No single strategy **always works**. **Combining multiple indicators & risk management techniques** leads to better results!