

Explanation for Chosen Parameters

Indicator 1: Stochastic Oscillator

The Stochastic Oscillator is used to identify overbought and oversold market conditions. The %K line is defined as:

$$\%K = \frac{\text{Close} - \text{Lowest Low}}{\text{Highest High} - \text{Lowest Low}} \times 100$$

where:

- **Lowest Low** is the lowest price over the last n periods.
- **Highest High** is the highest price over the last n periods.

A 17-period lookback window is used instead of the standard 14 periods. This extended window captures broader price movements and reduces short-term noise, thereby improving signal stability with minimal additional lag.

Standard threshold levels are applied:

- A **buy signal** is generated when %K crosses above 20 from below.
- A **sell signal** is generated when %K crosses below 80 from above.

Indicator 2: Accumulation–Distribution (A/D) Line

The Accumulation–Distribution Line is used to assess the flow of volume into and out of an asset.

The **Money Flow Multiplier (MFM)** is defined as:

$$\text{MFM} = \frac{(\text{Close} - \text{Low}) - (\text{High} - \text{Close})}{\text{High} - \text{Low}}$$

The **Money Flow Volume (MFV)** is then calculated as:

$$\text{MFV} = \text{MFM} \times \text{Volume}$$

The Accumulation–Distribution Line is updated recursively as:

$$\text{A/D}_t = \text{A/D}_{t-1} + \text{MFV}_t$$

The A/D line is used as a **trend confirmation filter**. Buying is favored when the slope of the A/D line is positive (indicating accumulation), while selling is favored when the slope is negative (indicating distribution).

Indicator 3: Volatility Index (BTC-VIX)

Market volatility is estimated using log returns, which are time-additive and provide a more stable measure of price changes compared to simple returns.

The log return at time t is defined as:

$$r_t = \ln \left(\frac{\text{Close}_t}{\text{Close}_{t-1}} \right)$$

The rolling volatility over the last 22 periods is computed as the standard deviation of log returns:

$$\sigma_t = \text{StdDev}(r_t \text{ over last 22 periods})$$

To annualize volatility, it is scaled by the square root of the number of trading days in a year:

$$\text{BTC_VIX}_t = \sigma_t \times \sqrt{365} \times 100$$

A volatility filter is applied such that trades are executed only when:

$$\text{BTC_VIX} > 30$$

Rationale for Trading Above $\text{BTC-VIX} > 30$

High-volatility environments are typically associated with stronger momentum, wider price ranges, and faster price discovery. The strategy is designed to operate exclusively under such conditions, where price movements are sufficiently large to justify active trading and reduce the impact of false signals.

The threshold value of 30 represents a regime of elevated volatility in Bitcoin markets, ensuring that trades are taken only when volatility is high enough to compensate for noise and transaction costs.