Strategy

EMA

Compute Exponential Moving Average (EMA) on the price of 3 Instruments: $EMA_{0,1,2}$

To Calculate an EMA
$\text{EMA} = (P * \alpha) + (\text{Previous EMA} * (1 - \alpha))$ P = Current Price $\alpha = \text{Smoothing Factor} = \frac{2}{1+N}$ N = Number of Time Periods

VWAP

Compute VWAP for the same 3 instruments: $VWAP_{0,1,2}$

$$\text{VWAP} = \frac{\sum \text{Number of Shares Bought} \times \text{Share Price}}{\text{Total Shares Bought}}$$

Liveness

Compute a ‘Liveness’ signal volume of last trade / max volume observed, exponentially decaying over time:

$$Liveness_{0,1,2} = \frac{lastTradeVolume}{maxTradeVolume} e^{-L * \text{time since last trade}}$$

Execution

Compute execution value:

$$E_f = \frac{currentPrice}{EMA}$$
$$V_f = \frac{currentPrice}{VWAP}$$
$$Execute_i = c_{i\ ema} \times E_f + c_{i\ vwap} \times V_f + c_{i\ active} \times Liveness_i$$

If Execute >= E then send order

Direction

Direction: Price < VWAP → Buy else Sell