Mathematical Description of ThinkScript-Based Area and Volume Metrics

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1 Preliminaries

Let open_k, high_k, low_k, close_k denote the open, high, low, and close prices on bar[1] k. Define:

$$\text{Ocm}_k = \max\bigl(\text{open}_k,\ \text{close}_k\bigr), \tag{1}$$
$$\text{Ocmin}_k = \min\bigl(\text{open}_k,\ \text{close}_k\bigr), \tag{2}$$
$$\Delta_k = \text{Ocm}_k - \text{Ocmin}_k, \tag{3}$$

where Δ_k is the "candle area" on bar k. Let n be a positive integer input parameter.

2 Area-Based Slope Metric

We compute weighted slopes from the current bar (bar 0) to the n preceding bars. For $i = 1, 2, \ldots, n$, the slope from bar 0 to bar $-i$ is

$$m_i \;=\; \frac{\Delta_0 - \Delta_{-i}}{i}. \tag{4}$$

Then the cumulative slope is

$$S \;=\; \sum_{i=1}^{n} m_i \;=\; \sum_{i=1}^{n} \frac{\Delta_0 - \Delta_{-i}}{i}. \tag{5}$$

We normalize this via an exponential transform:

$$s = \exp\bigl(S/n\bigr), \tag{6}$$
$$r = \frac{1}{1 + \exp(-s)}. \tag{7}$$

Thus $r \in (0, 1)$ is the rescaled area-based slope.

[1] A "bar" represents a single trading period; bar 0 is the most recent, bar -1 the previous, etc.

3 Volume-Based Filter

Let V_k denote the trading volume on bar k. Fix a lookback length L (e.g. $L = 30$) and short periods p (e.g. $p = 4$ or 3). Define:

$$\overline{V}_{\text{total}} = \frac{1}{L-p} \sum_{i=p+1}^{L} V_{-i}, \tag{8}$$

$$\overline{V}_p = \frac{1}{p+1} \sum_{i=0}^{p} V_{-i}, \tag{9}$$

$$\overline{V}_q = \frac{1}{q+1} \sum_{i=0}^{q} V_{-i}, \tag{10}$$

where $q < p$ (e.g. $q = 2$). First, check if the recent average volume is below the long-term average:

$$\delta_1 = \begin{cases} 1, & \overline{V}_p \leq \overline{V}_{\text{total}}, \\ 0, & \text{otherwise.} \end{cases} \tag{11}$$

Next, compute a weighted slope of $\overline{V}_q$ over m bars:

$$S_V = \sum_{j=1}^{m} \frac{\overline{V}_q - \overline{V}_{q+j}}{j}, \tag{12}$$

and average it:

$$s_V = \frac{S_V}{m}. \tag{13}$$

We define

$$\delta_2 = \begin{cases} 1, & s_V \leq 1, \\ 0, & \text{otherwise,} \end{cases} \tag{14}$$

and form

$$D = \delta_1 \times s_V. \tag{15}$$

Further,

$$d = \frac{D - D_{-q}}{q+1}, \tag{16}$$

and the volume rescaling is

$$v = \begin{cases} 0, & e^{d/\overline{V}_{\text{total}}} = 1, \\ e^{d/\overline{V}_{\text{total}}}, & \text{otherwise.} \end{cases} \tag{17}$$

4 Additional Composite Metrics

Define:

$$\text{boxheight}_k = \frac{\text{high}_k - \text{low}_k}{\text{high}_k + \text{low}_k} + \tfrac{1}{2}\left|\tfrac{\text{close}_k}{\text{close}_{k-1}} - 1\right|, \tag{18}$$

$$\text{combi}_k = 0.60\,\text{MA}_\ell\big(\text{boxheight}\big) + 0.30\,\text{SD}_\ell\big(\text{boxheight}\big) + 0.10 \max_{0 \leq i < \ell} \text{boxheight}_{k-i}, \tag{19}$$

with moving average length ℓ (e.g. $\ell = 12$). Then three rescalings:

$$r_1 = \frac{1}{1 + 10^{-9} \exp\bigl(28 \cdot \mathrm{round}(r_{-1}, 3)\bigr)}, \tag{20}$$

$$r_2 = \frac{1}{1 + 10^{3} \exp(-9\, v)}, \tag{21}$$

$$r_3 = \frac{1}{1 + 10^{-3} \exp\bigl(84\, \mathrm{combi}\bigr)}. \tag{22}$$

Finally, the combined value is

$$C = \frac{r_1 + r_2 + r_3}{3}. \tag{23}$$