

$$LOB_t = \{(p_i, v_i, d_i) \mid i = 1, 2, \dots, N\}$$

$$\text{Mid (Midpoint Price)} = \frac{A + B}{2}$$

$$\text{Spread (Spread)} = A - B$$

$$\text{VolImb (Volume Imbalance)} = \frac{V_B - V_A}{V_B + V_A}$$

$$\text{PWVolImb (Price-Weighted Volume Imbalance)} = \frac{\sum_i p_i v_i d_i}{\sum_i v_i}$$

$$\text{MomentumN (Momentum with respect to } N \text{ periods)} = P_t - P_{t-N}$$

$$\text{VolatilityN (Volatility computed with respect to } N \text{ periods)} = \sqrt{\frac{1}{N} \sum_{i=1}^N (r_i - \bar{r})^2}$$

$$\text{DepthN (Depth in top } N \text{ levels)} = \sum_{i=1}^N v_i^{\text{bid}} + \sum_{i=1}^N v_i^{\text{ask}}$$

FFT_BaseFeature_K (*Fast Fourier Transform of BaseFeature over K periods*)

SpecDens_BaseFeature_K (*Spectral Density of BaseFeature computed over K periods*)

SpecCentroid_BaseFeature_K (*Spectral Centroid of BaseFeature*)

SpecSpread_BaseFeature_K (*Spectral Spread of BaseFeature*)

SpecEntropy_BaseFeature_K (*Spectral Entropy of BaseFeature*)

$$\text{FFT_BaseFeature_K} = \sum_{k=0}^{K-1} x_k e^{-i2\pi k/K}$$

$$\text{SpecDens_BaseFeature_K} = \frac{1}{K} \sum_{k=0}^{K-1} |X_k|^2$$

$$\text{SpecCentroid_BaseFeature_K} = \frac{\sum_{k=0}^{K-1} k |X_k|^2}{\sum_{k=0}^{K-1} |X_k|^2}$$

$$\text{SpecSpread_BaseFeature_K} = \sqrt{\sum_{k=0}^{K-1} \left(\frac{k}{K} - \text{SpecCentroid_BaseFeature_K} \right)^2 |X_k|^2}$$

$$\text{SpecEntropy_BaseFeature_K} = - \sum_{k=0}^{K-1} P_k \log P_k, \quad P_k = \frac{|X_k|^2}{\sum_{m=0}^{K-1} |X_m|^2}$$