Scaling and Stabilizing the Brown LES Trend for Annualized Prediction

1. Understanding b_t in Context

In Brown's Double Exponential Smoothing (LES), the trend estimate b_t represents the filtered trend over a defined smoothing window of MyFilterRate samples. This means it already includes some level of noise reduction. However, direct usage of b_t does not provide a standardized measure across different filter rates or time periods.

2. Scaling b_t to an Annualized Value

To ensure comparability across different filter rates, we need to scale the trend to a one-year period. Given that b_t is averaged over MyFilterRate samples, the appropriate scaling factor is:

f_scale = f_s / MyFilterRate

where:
- f_s = total samples per year (e.g., 252 for daily trading, 52 for weekly data).
- MyFilterRate = number of samples in the smoothing window.

Thus, the annualized trend estimate is computed as:

b_annual = b_t * f_scale = b_t * (f_s / MyFilterRate)

3. Volatility Correction (Optional but Recommended)

Even though b_t is smoothed, short-term fluctuations may still persist. To reduce sensitivity to these variations, a volatility-based correction is applied using an exponentially weighted standard deviation:

sigma_t = sqrt(alpha * sum((b_i - b_avg)^2))

where:
- b_avg is the long-term average trend.
- alpha is the smoothing factor.

To further stabilize the annualized trend, the following adjustment is used:

b_adjusted = b_annual / (1 + (sigma_t / (b_avg + epsilon)))

4. Final Formula: Stable Annualized Trend

To further smooth out short-term noise, a rolling average is applied over the past N samples:

b_stable = (1/N) * sum((b_t * (f_s / MyFilterRate)) / (1 + (sigma_t / (b_avg + epsilon))))

5. Conclusion

This method provides a reliable approach for generating a stable and volatility-adjusted annualized trend from Brown's LES. By scaling b_t based on the filter rate and applying volatility correction, we achieve a trend estimate that is independent of the smoothing window while being resilient to short-term fluctuations.