Time Series Decomposition

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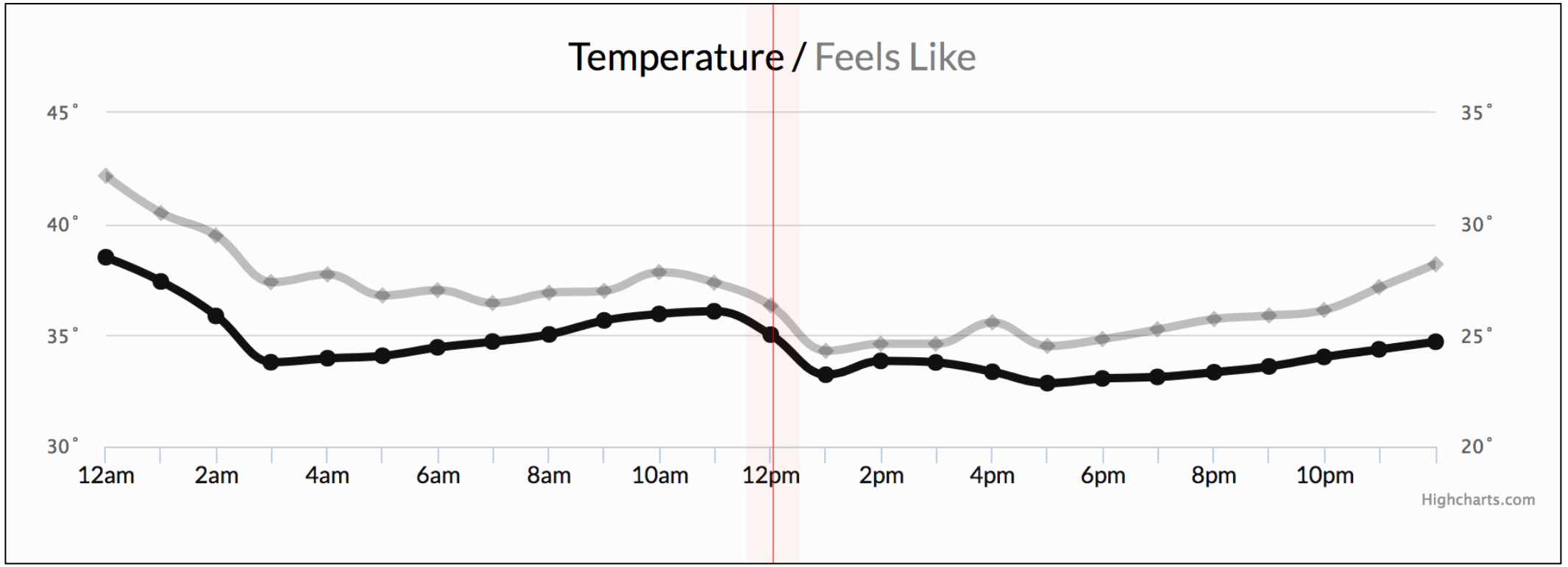
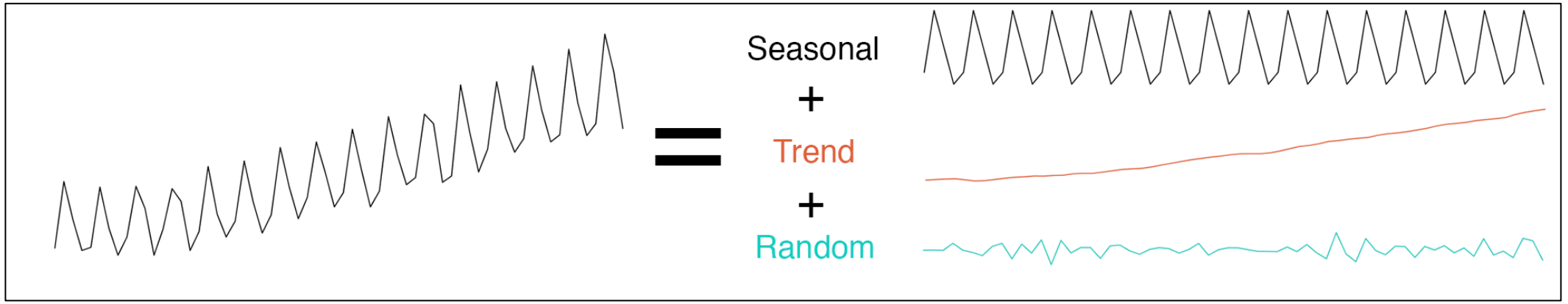
CLASS STARTING SHARP AT 12:35 PM

What is Time Series?



Time series data is a collection of observations obtained through repeated measurements over time. Plot the points on a graph, and one of your axes would always be time.

Time Series Decomposition



Additive decomposition

$$y_t = \hat{T}_t + \hat{S}_t + \hat{R}_t$$

Multiplicative decomposition

$$y_t = \hat{T}_t \times \hat{S}_t \times \hat{R}_t$$

Trend component | Seasonal component | Residual component

Multiplicative decomposition

$$\log(y_t) = \log(T * S * R)$$

$$\log(y_t) = \log(T) + \log(S) + \log(R)$$

Time Series

1. **Time**: Time is the most crucial component of a time series. It represents the moments when data was collected. In our example, each day's spending data is recorded, so time would be the dates in the upcoming month.
2. **Observations**: Observations are the actual data points collected at each specific time. In our case, the amount of money you spend each day is an observation. For instance, on the 1st of the month, you spend $20, on the 2nd, you spend $25, and so on.
3. **Trend**: The trend is the overall long-term pattern or direction that the data tends to follow over time. In our example, if you notice that your spending generally increases as the month goes on, that would be an upward trend.
4. **Seasonality**: Seasonality refers to the repeating patterns that occur at regular intervals. In real life, there might be certain days of the week or specific months when you tend to spend more money. For instance, if you always spend more on weekends, that's a weekly seasonality pattern.
5. **Noise**: Noise refers to the random fluctuations or irregularities in the data that cannot be attributed to any specific pattern. In real life, unexpected expenses or unforeseen circumstances can introduce noise into your spending data, causing daily variations that can't be predicted.

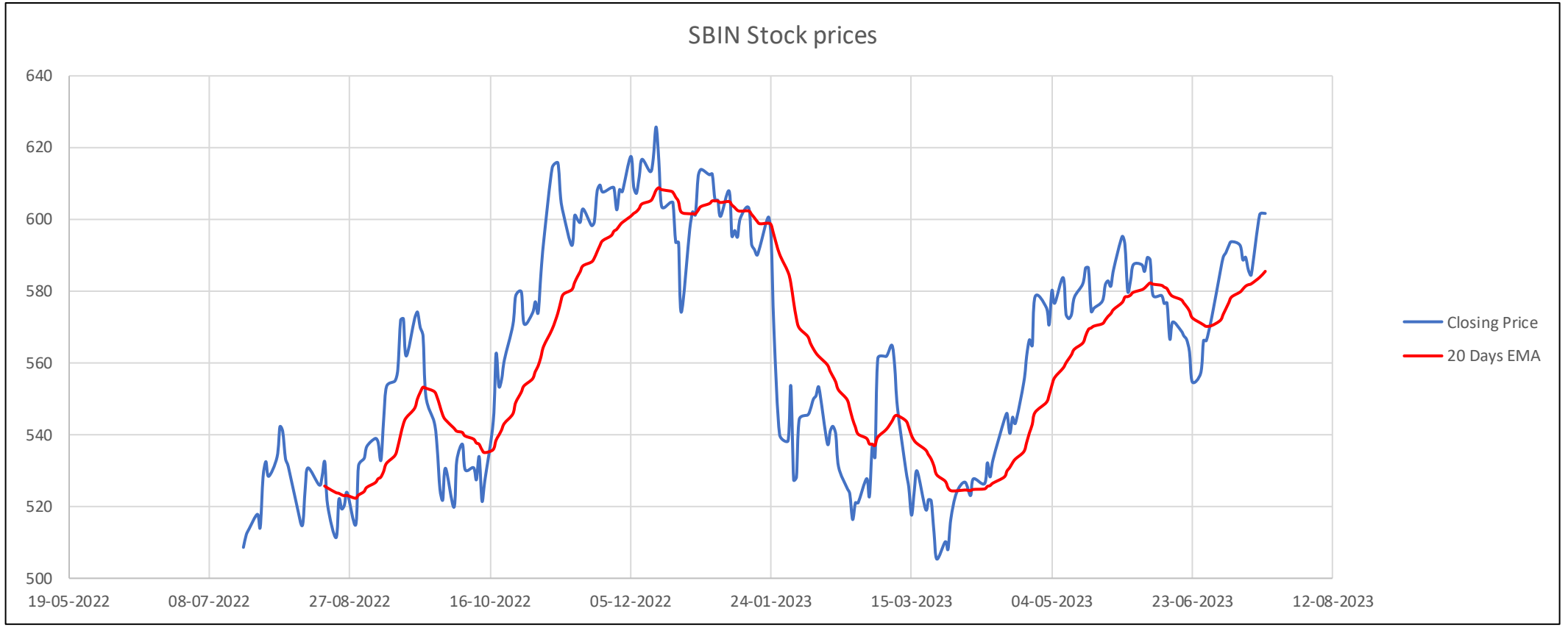
Exponential Moving Average to calculate trend in data

$$\boldsymbol{EMA\_t = \alpha * X\_t + (1 - \alpha) * EMA\_t - 1}$$

Where:

- EMA_t is the exponential moving average at time t.
- X_t is the value at time t (the current data point).
- EMA_t-1 is the EMA at the previous time period (t-1).
- α is the smoothing factor, which determines the weight of the current data point in the calculation. It is calculated as: α = 2 / (N + 1), where N is the number of periods you want to use for the EMA. For example, if you want to calculate the 10-period EMA, N would be 10.

Trend analysis of SBIN Stock for 1 year



Thank you

PING ME ON SKYPE FOR ANY QUERIES – UTKARSH GAIKWAD