Firm Feature Engineering Approach

Our investment firm employs the following feature engineering rules to enhance the analytical value of our financial data. For each point, a new column should be added to the data frame.

1. **Simple Daily Returns:** Calculate the simple daily returns to measure the day-to-day percentage change in the `Close` prices.
2. **Logarithmic Returns:** Calculate the logarithmic returns using `Close` prices.
3. **20-Day Momentum:** Calculate the 20-day momentum by subtracting the `Close` price 20 days prior from the current `Close` price, providing insights into the stock's short-term trend.
4. **20-Day Simple Moving Average:** Calculate the 20-day simple moving average to smooth out short-term fluctuations and highlight longer-term trends in the `Close` prices.
5. **20-Day Rolling Volatility:** Calculate the 20-day rolling volatility based on the standard deviation of simple daily returns to indicate the stock's risk level.
6. **Day of the Week:** Identify the day of the week for each trading day.
7. **Price Surge Identification:** Identify days where the price surged, defined as when the daily return is more than 4 standard deviations above the mean daily return for the period, indicating significant price movements.
8. **Volume Spike Identification:** Identify days where the volume spiked, defined as when the trading volume is more than 6 standard deviations above the mean volume for the period, highlighting unusual trading activity.
9. **Bollinger Bands Calculation:** Calculate the upper and lower Bollinger Bands for the stock, which are set at 2 standard deviations above and below the 20-day simple moving average, to identify overbought and oversold conditions.