Technical Assignment: Options Pricing Signals for Binary Catalysts

Objective: Build a pipeline that analyzes historical and upcoming binary biotech events using options pricing signals to infer market expectations, investor sentiment, and predictive patterns. Analyze options data and signals for historical catalyst events to identify useful metrics and implement them for near-term biotech binary events.

Instructions

1. **Select Events for Testing**: Use historic events for signal research and backtesting signal behavior. Use future-looking events to test signals and infer market sentiment and potential price movement.
2. Suggested future-looking events for testing
    a. Nuvation Bio PDUFA date (FDA approval/denial decision) on June 23, 2025 for the indication of NSCLC
    b. Capricor Therapeutics PDUFA date on August 31, 2025 for the indication of Duchenne Muscular Dystrophy
    c. Atyr Pharmaceutical Phase 3 clinical data in Q3 2025 (July 1 – September 30, 2025) for the drug efzofitimod in the indication of sarcoidosis
3. Suggested historical events with large volatility
    a. SLDB Duchenne Muscular Dystrophy Phase 1/2 clinical data release in February 2025
    b. PEPG Myotonic Dystrophy 1 Phase 1/2 clinical data release in February 2025
    c. PEPG data release in January 2024
    d. AKRO data release in January 2025
    e. NOVOB obesity readout in December 2025
    f. RNA data announcement in June 2024
    g. RGNX data announcements in November 2024 and March 2025
    h. ALNY data announcement in June 2024 and FDA announcement in March 2025
    i. BBIO data announcement in September 2024 and FDA decision in November 2024
    j. QURE data announcements and regulatory updates in July and December 2024, and regulatory update in April 2025
4. **Extract Options Data**: Use the Polygon.io API or another options data provider of your choice. Pull historical and current options pricing, open interest, volume, and other key indicators.
    a. Extract metrics at 2-week intervals going back 3 months before the event date
    b. For historical events, analyze metrics leading up to the event and corresponding stock movement. Analyze predictivity using appropriate metrics.
    c. For upcoming events, summarize the current market setup and expectations based on extracted signals

Focus on the Following Option Pricing Signals (choose at least 3–5)

Signal Type	Metric / Indicator	What It Shows
Implied Volatility (IV)	Absolute IV (e.g., 30-day or 90-day IV)	Expected magnitude of future stock movement
IV Percentile / Rank	% vs past 52-week IVs	Relative IV elevation
Implied Move	ATM straddle premium / spot price	Market-implied price swing by expiration
IV Skew / Smirk	OTM Put IV minus OTM Call IV	Directional sentiment bias
Risk Reversals	Long OTM call plus short OTM put	Directional positioning in neutral vol terms

Signal Type	Metric / Indicator	What It Shows
Unusual Options Volume	Volume ≥ 2–3x normal	Informed or speculative positioning
Open Interest (OI)	OI buildup at specific strikes	Market consensus on landing zones
Call/Put Volume Ratio	Ratio >1.5 or <0.7	Skew in bullish or bearish sentiment
Calendar Spreads	Long-dated IV < short-dated IV	Term structure insight
Large Trades / Sweeps	Block trades or repeated sweeps	Smart money conviction

Deliverables

- A brief write-up interpreting:
    - Which signals were predictive in historical events, along with metrics of their predictive value
    - Your sentiment assessment for each future event
    - Include tables summarizing signal trends leading up to the event, and Time-series plots of key metrics (e.g., IV, volume, OI, skew)
- A Python script or Jupyter notebook
- A recorded 5-minute video screen-share demo
- A README file

Guidance on Signal Analysis

- Compare metrics across multiple events to identify consistent predictive patterns
- Track the magnitude and timing of signal changes relative to the event
- Where possible, compare signal evolution with actual stock price movement
- Use signal thresholds (e.g., IV > 100%, call/put ratio > 1.5) to flag notable moments.

Bonus Points

- Cloud deployment of the pipeline
- Useful visualizations