

EXPLORING BIOTECH OPTIONS BEFORE CATALYSTS

Findings by Ariv Ahuja



May 2023

TABLE OF CONTENTS

- Setting the Stage
- Overview of System
- Upcoming Biotech Catalysts
- Future Improvements
- Conclusion and Takeaways

SETTING THE STAGE

- Option markets before catalyst events see extremely elevated implied volatilities
- Different success rates for different events
 - Stock price product of perceived success rate
- Small market cap stocks have more to gain from successful approvals
- Small market cap option markets may be less liquid making meaningful analysis difficult
- Nuanced behavior between different catalyst types



OVERVIEW

Phase 1

Extracting
Biotech
Catalysts

Phase 2

Extracting Options
Data

Phase 3

Data Analysis
and Model
Creation

Phase 4

Cloud
Deployment
and Signal
Notifications

SORTING CATALYSTS

ALDX



BBIO



LQDA



Negative Historical Catalysts

Positive Historical Catalysts

Future Catalysts

EXTRACTING CATALYST DATA

- Look through screeners
- Understand context behind event, denote event type
- Event has been known for > lookback days
- For historical, large volume after announcement

	ticker	event_type	result	details
	date			
	2024-06-24 12:00:00+00:00	ALNY	Clinical Data	1
	2024-11-22 22:00:00+00:00	BBIO	FDA	1
	2025-02-18 13:00:00+00:00	SLDB	Clinical Data	1
	2025-02-24 13:00:00+00:00	PEPG	Clinical Data	1
	2025-03-28 12:00:00+00:00	MIST	FDA	-1
	2025-04-03 12:00:00+00:00	ALDX	FDA	-1
	2025-04-17 12:00:00+00:00	QURE	FDA	1
	2025-05-24 12:00:00+00:00	LQDA	FDA	0
	2025-05-26 12:00:00+00:00	MRK	FDA	0
	2025-05-31 12:00:00+00:00	MRNA	FDA	0
	2025-06-23 12:00:00+00:00	NUVB	FDA	0

EXTRACTING OPTION DATA

BBIO CALL \$25 2025-01-17 16:00:00-05:00											BBIO CALL \$25 2025-01-17 16:00:00-05:00		
transactions	stock_vwap	open	high	low	close	volume	vwap	transactions	stock_vwap	open	high	low	close
0.0	25.0964	4.09	4.30	3.65	4.00	204	3.9912	22	25.0964	4.6	4.6	4.0	4.0
2.0	29.0496	6.00	8.65	5.40	5.40	708	6.8918	102	29.0496	8.9	8.9	8.0	8.0
42.0	25.9595	4.60	4.70	2.60	3.40	2596	3.4378	146	25.9595	5.2	5.2	4.0	4.0
164.0	24.7853	3.60	3.60	3.24	3.40	4068	3.3521	652	24.7853	4.6	4.6	3.0	3.0
102.0	25.4865	3.80	4.40	2.75	2.75	1253	3.5914	151	25.4865	4.2	4.2	3.0	3.0
28.0	24.2116	3.05	4.00	2.57	3.74	908	3.3446	154	24.2116	3.6	3.6	2.5	2.5
1355.0	24.2069	3.60	4.92	2.80	3.13	12770	3.4419	1064	24.2069	4.9	4.9	3.0	3.0

- Table contains multi-indexed columns with option object as heading.
- Notable values include volume, transactions, vwap of option contract and vwap of underlying stock over period.

CODE

```
if __name__ == '__main__':
    lookback, increment = 98, 14
    biotech_catalysts_df = pd.read_pickle('biotech_catalysts/biotech_catalysts_data.pkl')
    option_types = ['call', 'put']
    for event in biotech_catalysts_df.itertuples():
        stock_vwap, standard_index = fetch_stock_vwap(event.ticker, event.Index - timedelta(lookback),
                                                       for option_type in option_types:
                                                       contracts = fetch_unique_contracts_over_time(event.ticker, option_type, event.Index - timed
                                                       agg_dfs = []
                                                       for contract in contracts:
                                                       agg_df = fetch_contract_stock_data(contract, event.Index - timedelta(lookback), event.I
                                                       if not agg_df.empty:
                                                       agg_df = agg_df.reindex(standard_index)
                                                       stock_vwap = stock_vwap.reindex(agg_df.index)
                                                       agg_df[Option.from_polygon_contract(contract), 'stock_vwap'] = stock_vwap
                                                       agg_dfs.append(agg_df)
                                                       option_contracts_df = pd.concat(agg_dfs, axis=1)
                                                       option_contracts_df = clean_final_df(option_contracts_df, event.Index, option_type)
                                                       option_contracts_df.to_pickle(f'option_data/{event.ticker.lower()}/{event.Index.strftime("%Y-%m-%d")}.pkl')
```

- Focus on relevant contracts (contracts that expire after event)
- Extract the option data and underlying stock data up until event

ANALYZING OPTION METRICS

Call/Put Ratio and Volume

Calculated by taking total call volume / total put volume. Note that buying puts and calls could be indicative of hedging.

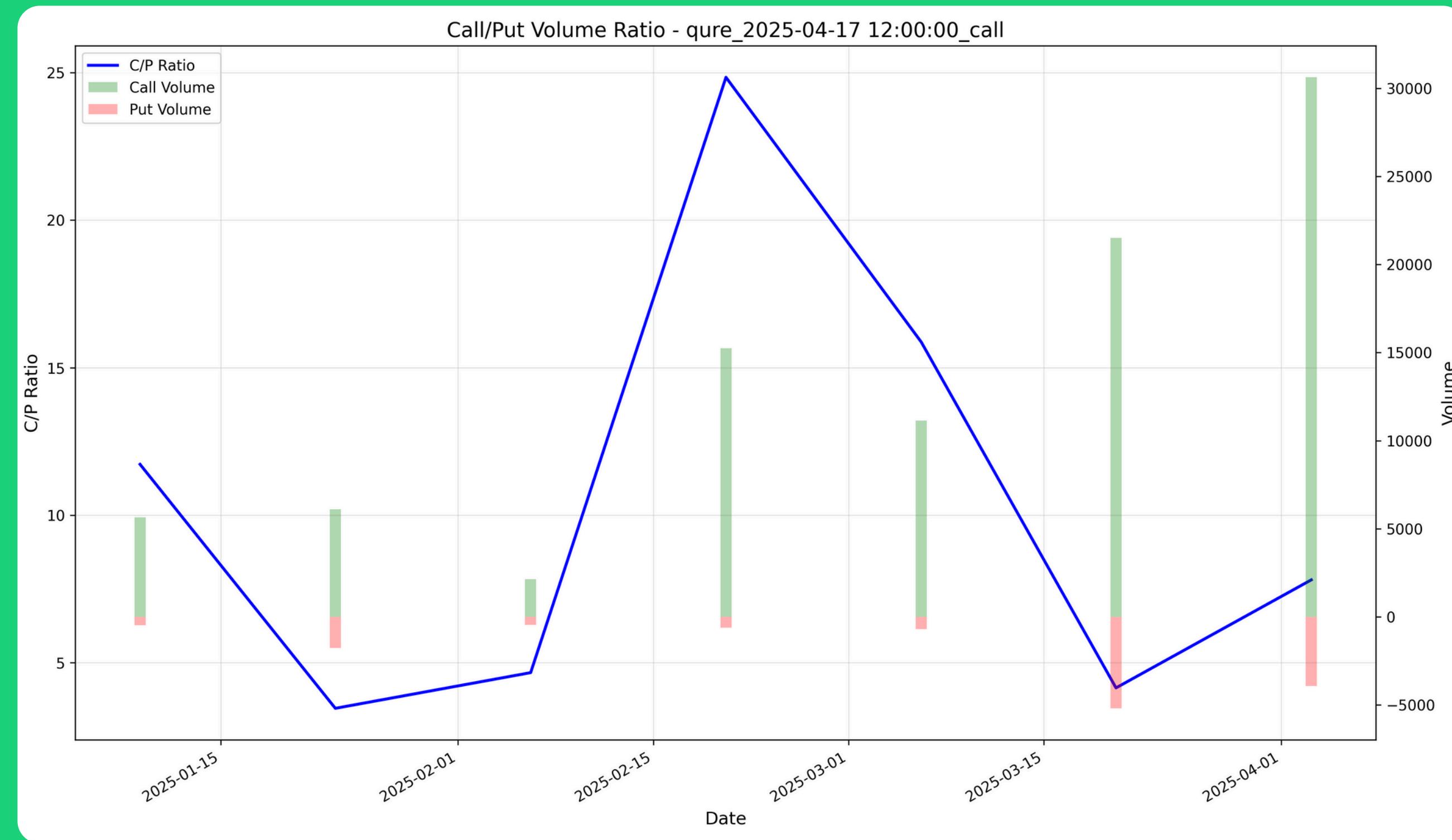
Volume Weighted Implied Volatility

Calculated by taking the average implied volatility along the option chain with more weight to higher volume.

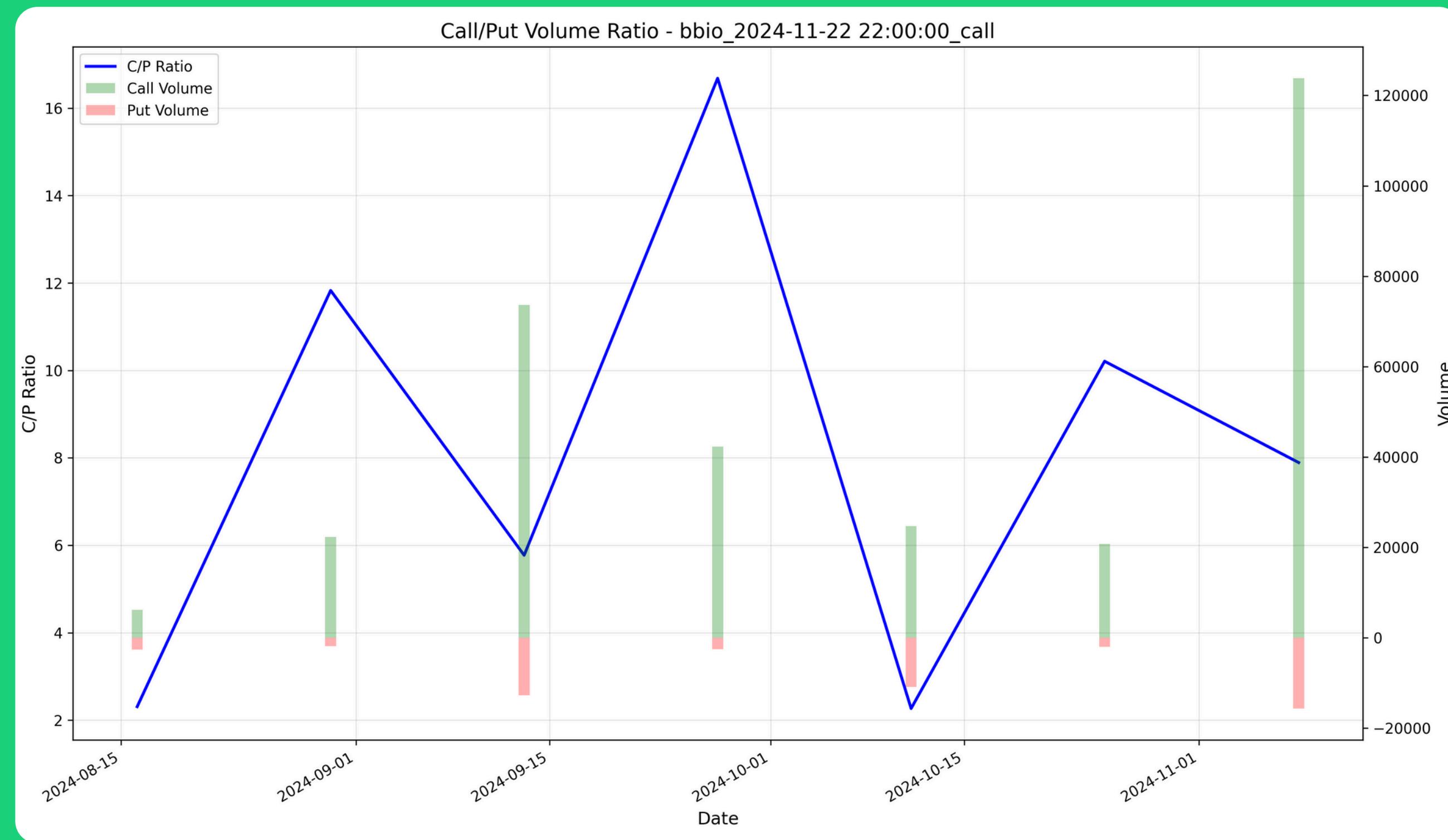
Implied Volatility Skew

Skews can show directional biases in the market.

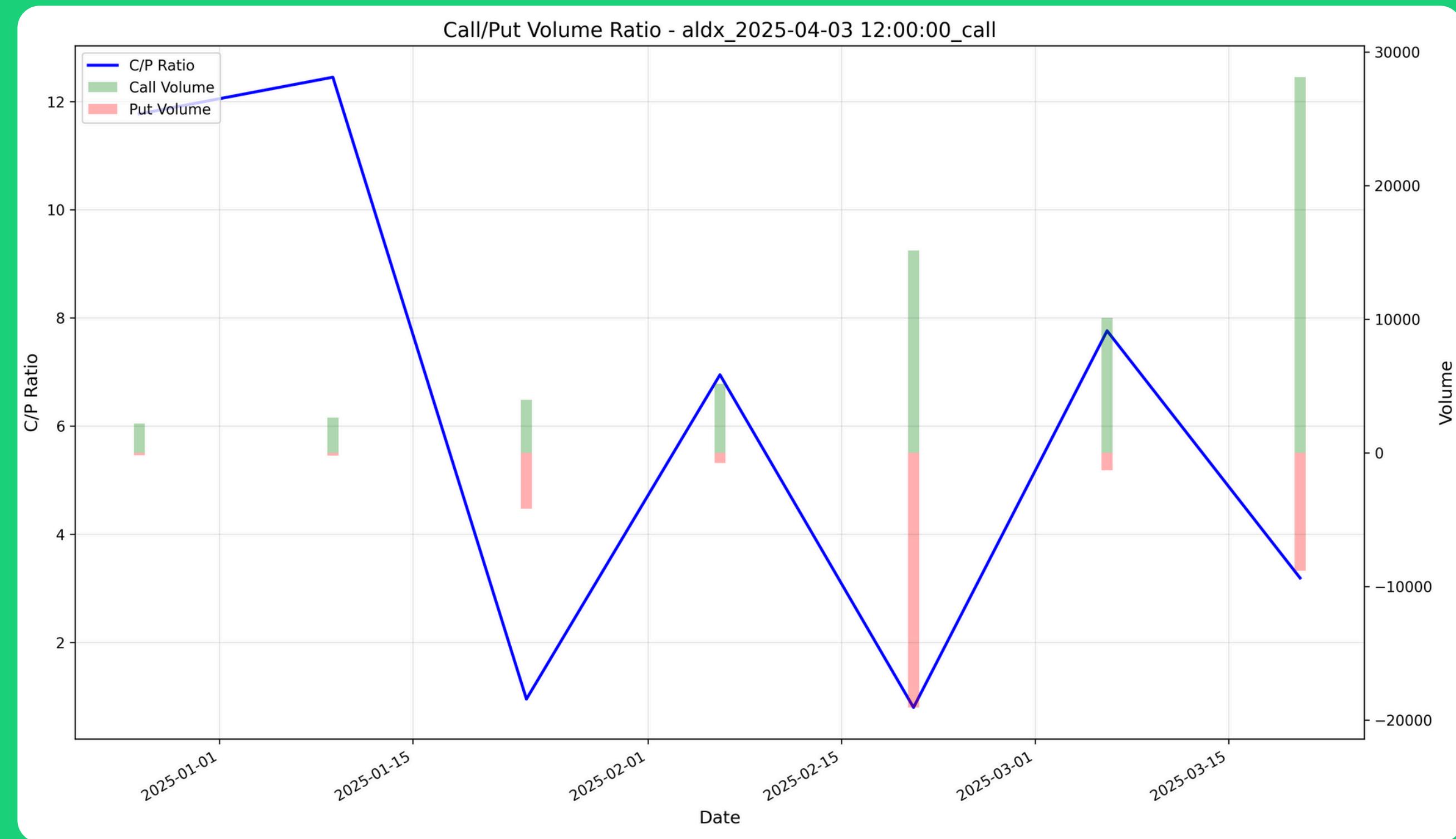
CALL/PUT RATIO AND VOLUME (POSITIVE OUTCOME)



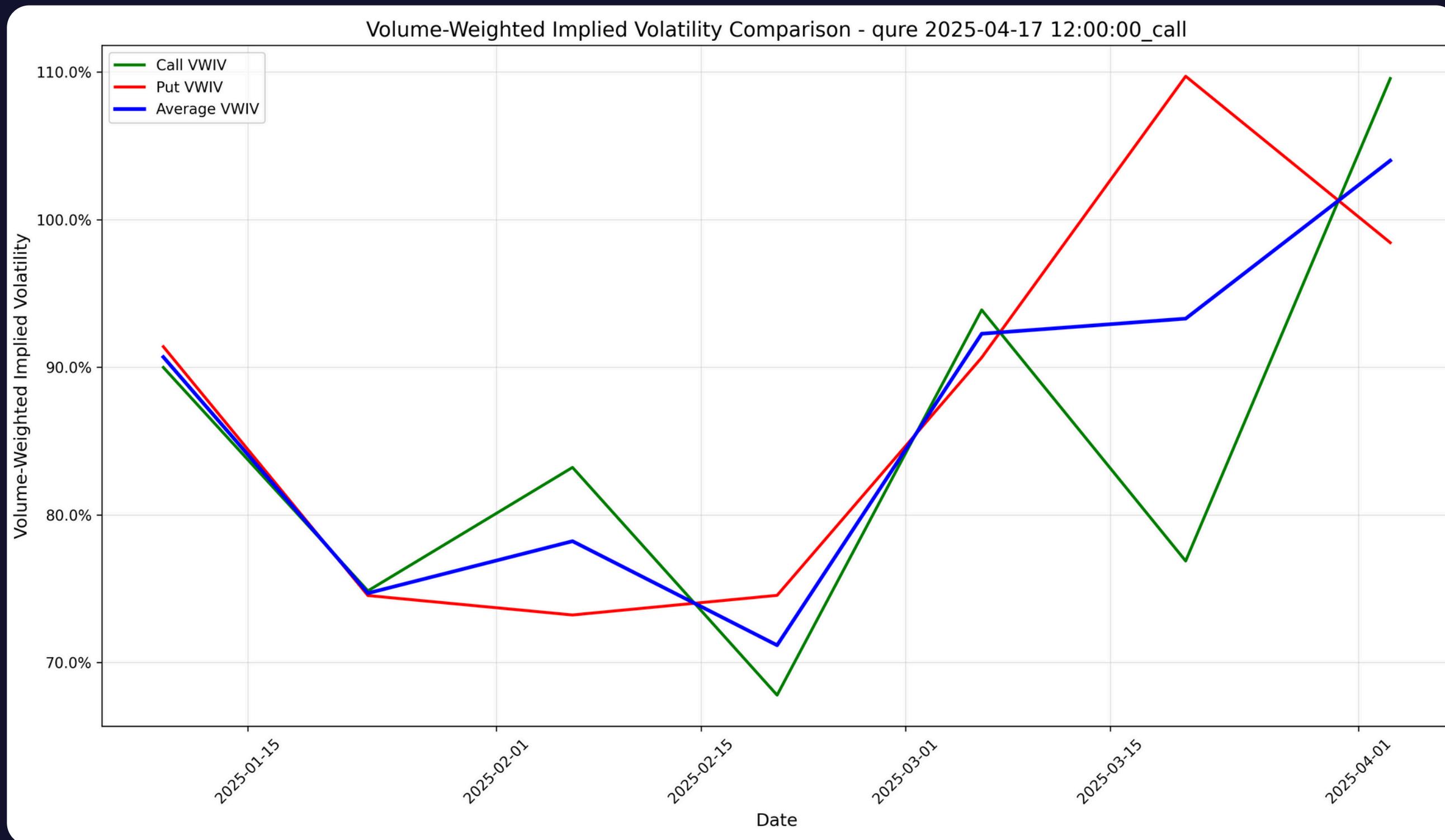
CALL/PUT RATIO AND VOLUME (POSITIVE OUTCOME)



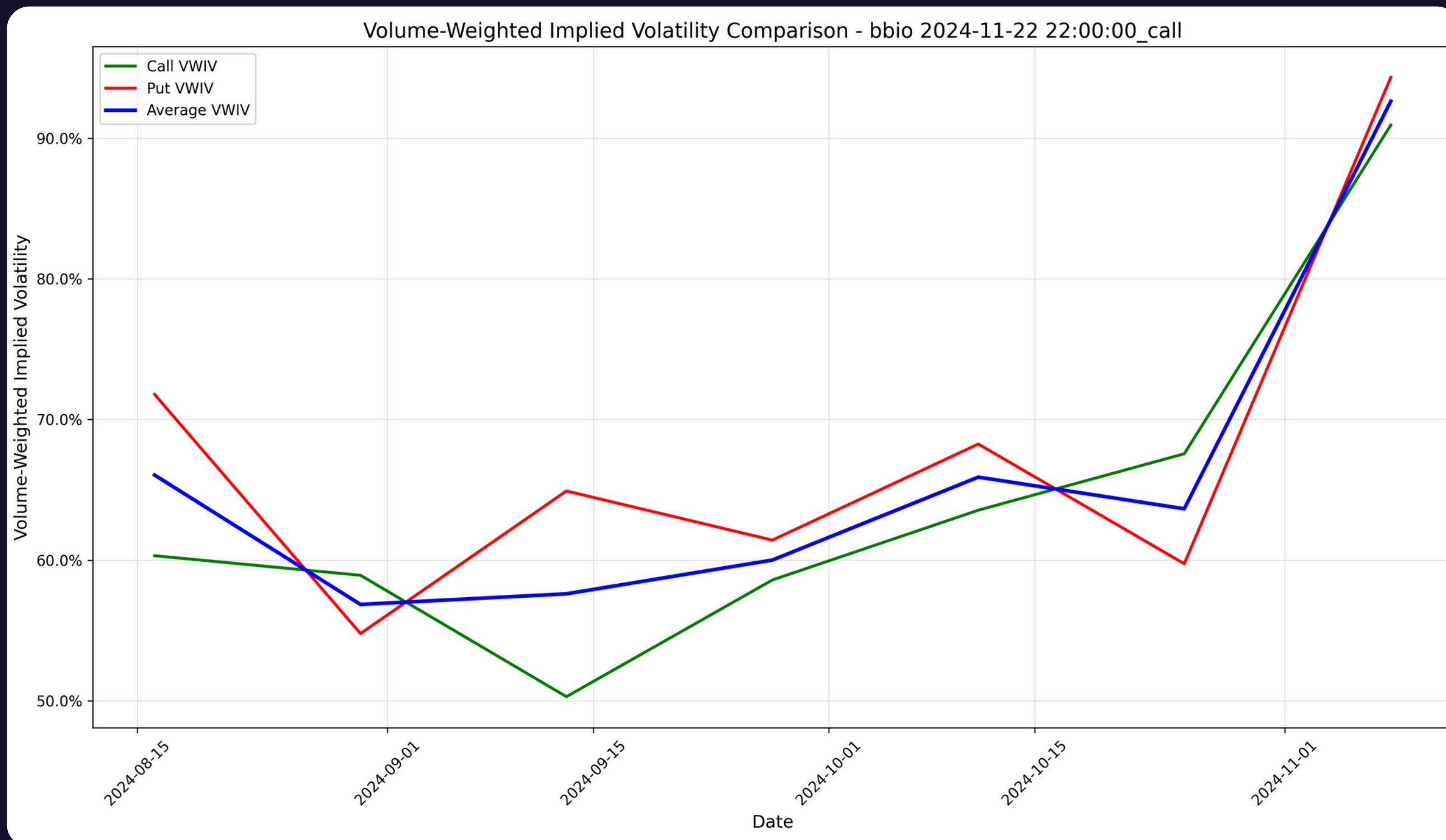
CALL/PUT RATIO AND VOLUME (NEGATIVE OUTCOME)



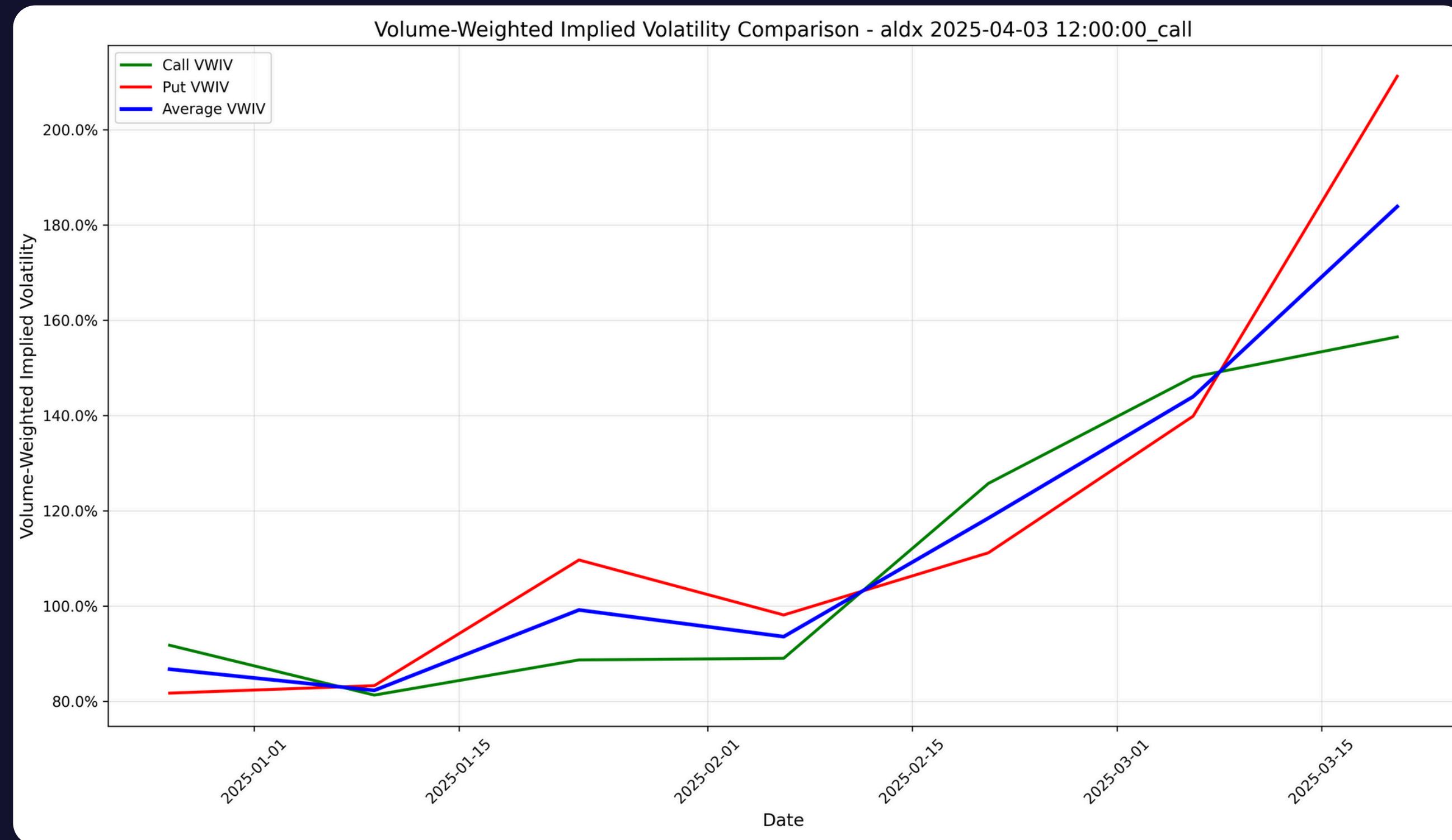
VOLUME WEIGHTED IV (POSITIVE OUTCOME)



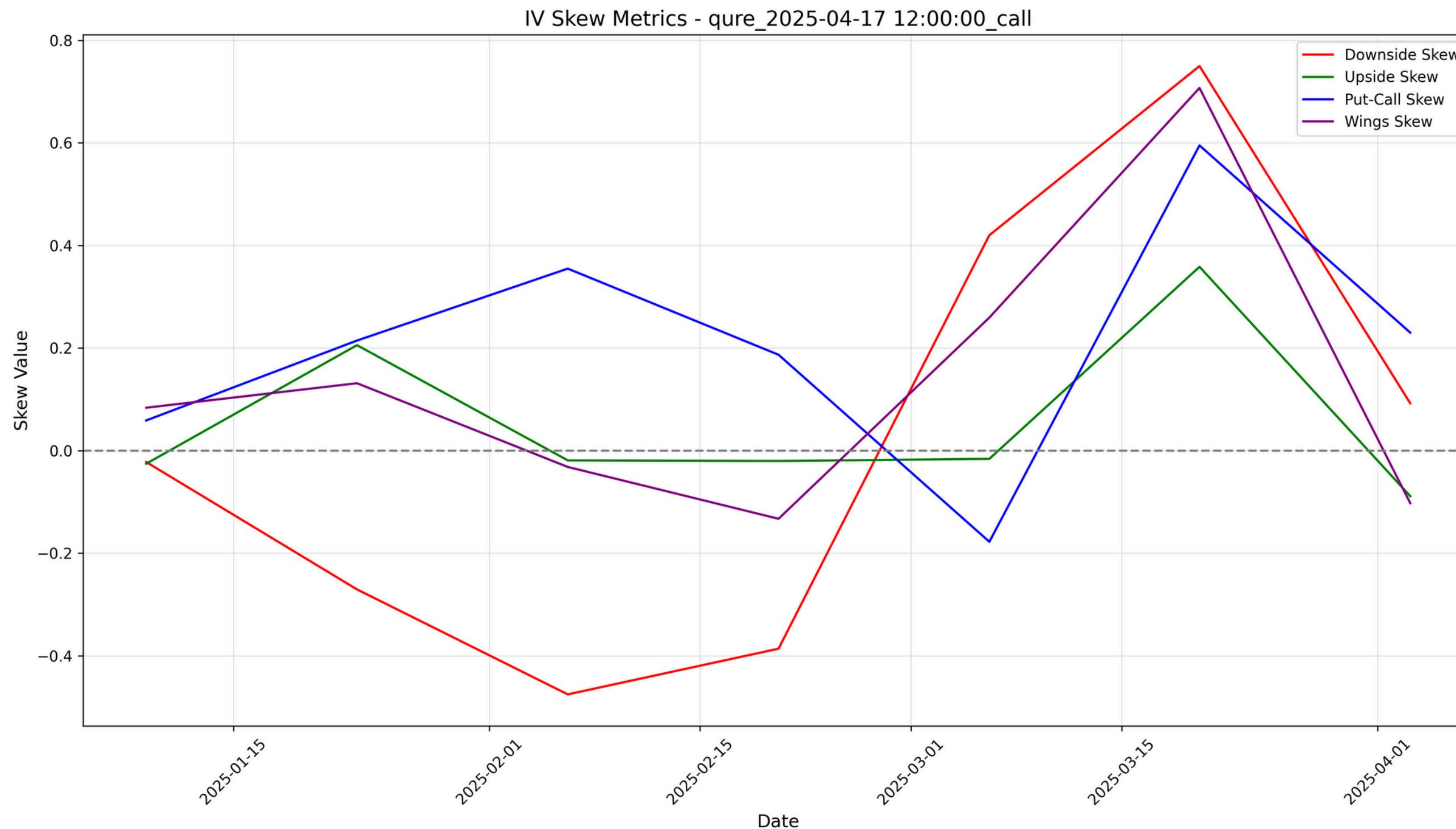
VOLUME WEIGHTED IV (POSITIVE OUTCOME)



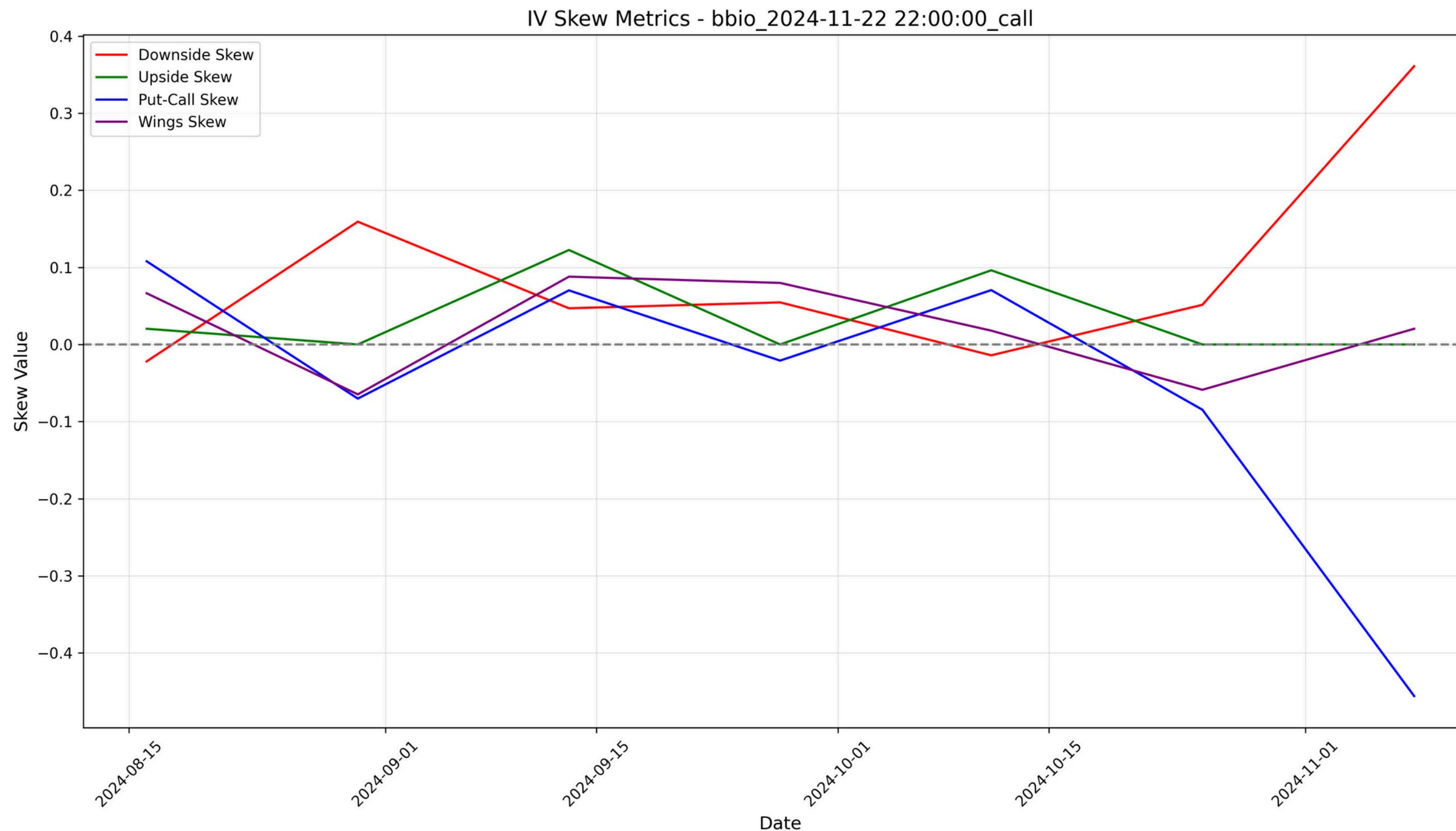
VOLUME WEIGHTED IV (NEGATIVE OUTCOME)



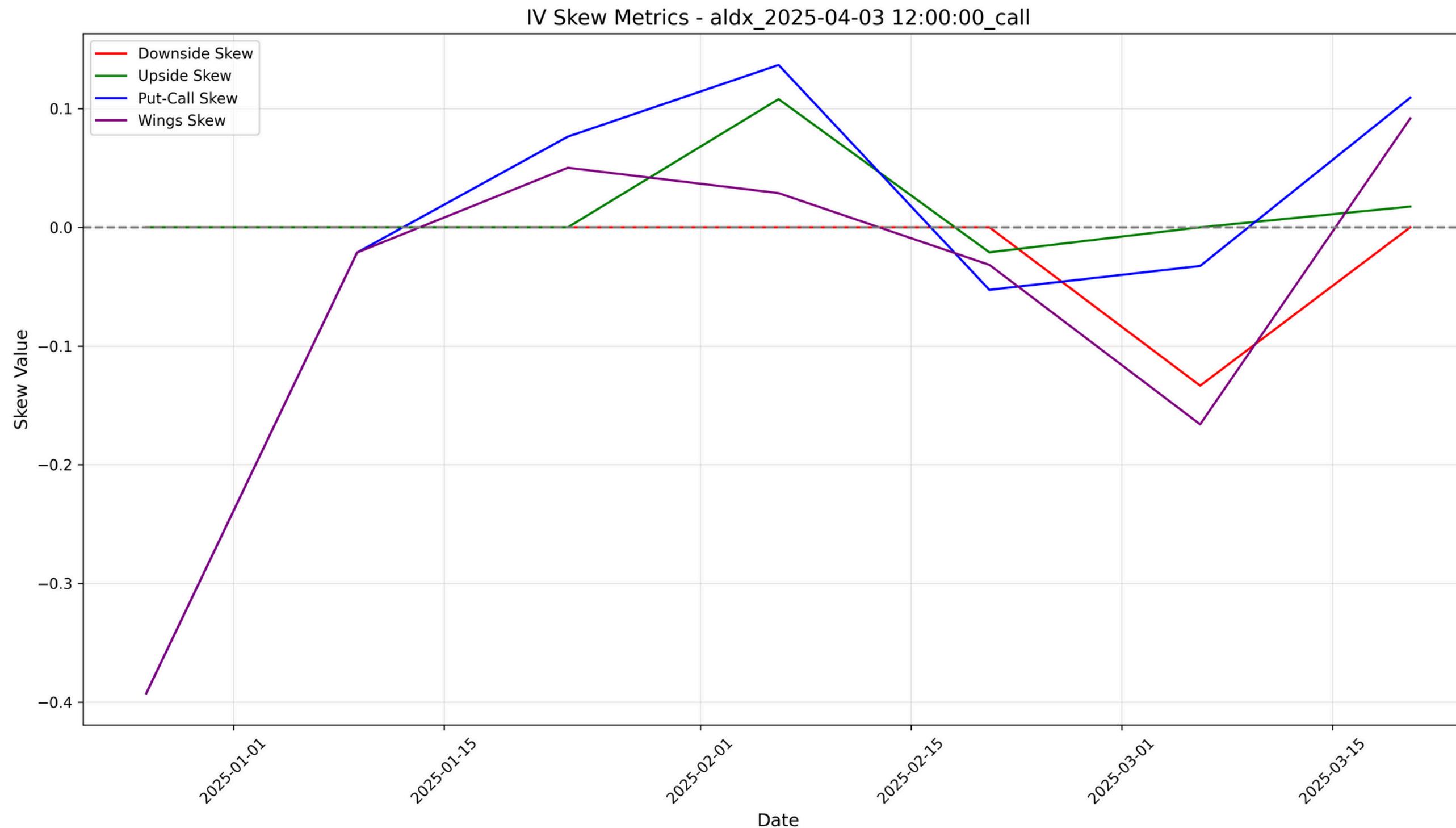
IV SKEW (POSITIVE OUTCOME)



IV SKEW (POSITIVE OUTCOME)



IV SKEW (NEGATIVE OUTCOME)



STATISTICAL ANALYSIS

- Limited sample of stocks
- Consistently elevated c/p ratio was observed in both positive and negative outcomes
- On average more call volume for positive outcomes
- Utilize VWIV to detect large stock moves
- Put VWIV > Call VWIV seems like potential signal
- Skews seem not consistent in sample

CLOUD DEPLOYMENT

- Adapted tables to be stored in google storage buckets
- Polygon API moved to secret manager
- Moved script to cloud functions
- Need to create email send alerts based on thresholds

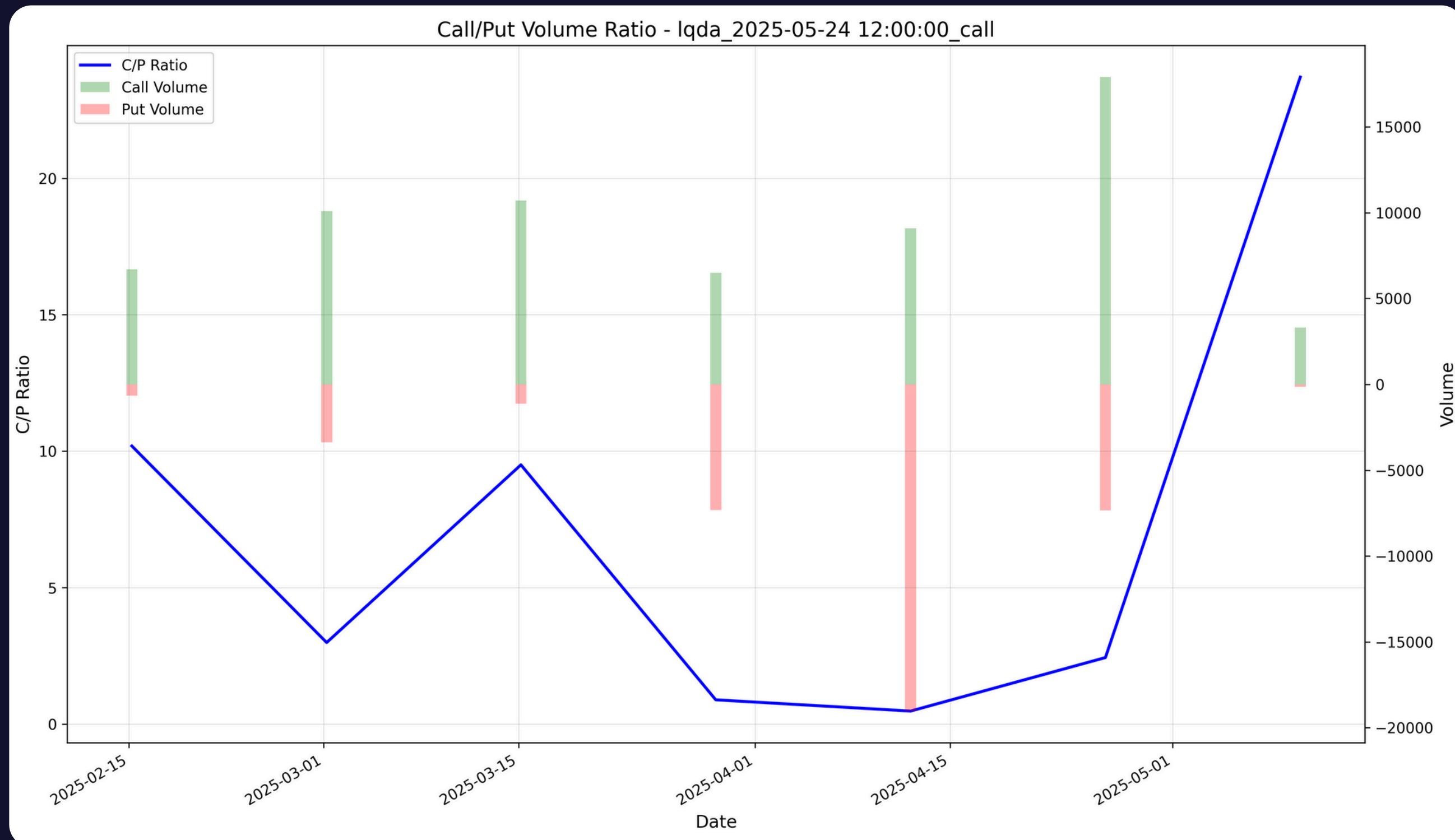


Google Cloud

FUTURE EVENTS: LQDA

- YUTREPIA FDA approval expected after May 23, 2025; tentative approval already granted
- \$100M additional financing secured; \$176.5M cash position as of December 2024
- ASCENT study nearing completion; L606 formulation in development
- Legal victories with SCOTUS rejecting UTHR appeal; one patent lawsuit remains
- Risk: C/P volume patterns similar to ALDX prior to its negative outcome

C/P RATIO AND VOLUME (NEGATIVE OUTCOME?)



FUTURE IMPROVEMTNNS

Extracting Catalysts

Use API provider or devlop way to scrape upcoming catalysts events. For historical cross refrencing with volume at event time.

More complex and conclusive analysis

With more data points more complex forms of analysis could be used line a regression model based on option metrics.

Ability to Select Models

For notifications through GCP adding the ability to combine models to get signals only when both send alerts or subscribe to multiple models.

CONCLUSION AND TAKEAWAYS

- Option analysis shows promising results however further more thorough testing would be necessary
- Look for increases in implied volatility leading up to find high impact events
- Use skews and put call ratio and volume thresholds to understand market directional bias



GOT ANY QUESTIONS?

Email:

- ahuja.ari@northeastern.edu

Phone:

- 781-952-0540

CREDITS

This presentation template is free for everyone to use, thanks to the following:

Slides Carnival

for this presentation template

Pexels, Pixabay, Sketchify

for the photos, graphics, and elements