

cd3

May 17, 2025

```
[1]: ### Change Point Model ###  
from change_detection import ChangePointDetector  
import numpy as np  
import pandas as pd  
import matplotlib.pyplot as plt
```

```
[2]: import sys  
sys.path.append('.././.././')  
from main import Manager  
m = Manager('.././.././')  
from bin.plots.volume_oi_chart import price_volume_oi_chart  
from bin.utils.tools import pretty_print
```

```
2025-05-15 15:58:55,266 - bin.options.optgd.db_connect - INFO - Options DB  
Initialized  
2025-05-15 15:58:55,266 - bin.options.optgd.db_connect - WARNING - You currently  
have 8 connections open.  
2025-05-15 15:58:55,270 - INFO - PriceDB Initialized successfully at 2025-05-15  
15:58:55.270219  
2025-05-15 15:58:55,270 - bin.price.db_connect - INFO - PriceDB Initialized  
successfully at 2025-05-15 15:58:55.270219  
2025-05-15 15:58:55,270 - INFO - Established 3 database connections  
2025-05-15 15:58:55,270 - bin.price.db_connect - INFO - Established 3 database  
connections  
2025-05-15 15:58:55,266 - bin.options.optgd.db_connect - WARNING - You currently  
have 8 connections open.  
2025-05-15 15:58:55,270 - INFO - PriceDB Initialized successfully at 2025-05-15  
15:58:55.270219  
2025-05-15 15:58:55,270 - bin.price.db_connect - INFO - PriceDB Initialized  
successfully at 2025-05-15 15:58:55.270219  
2025-05-15 15:58:55,270 - INFO - Established 3 database connections  
2025-05-15 15:58:55,270 - bin.price.db_connect - INFO - Established 3 database  
connections  
2025-05-15 15:58:55,356 - bin.alerts.options_alerts - INFO - Notifications  
instance initialized.
```

```
[3]: def get_aligned(stock):  
    price_df = m.Pricedb.ohlcv(stock)
```

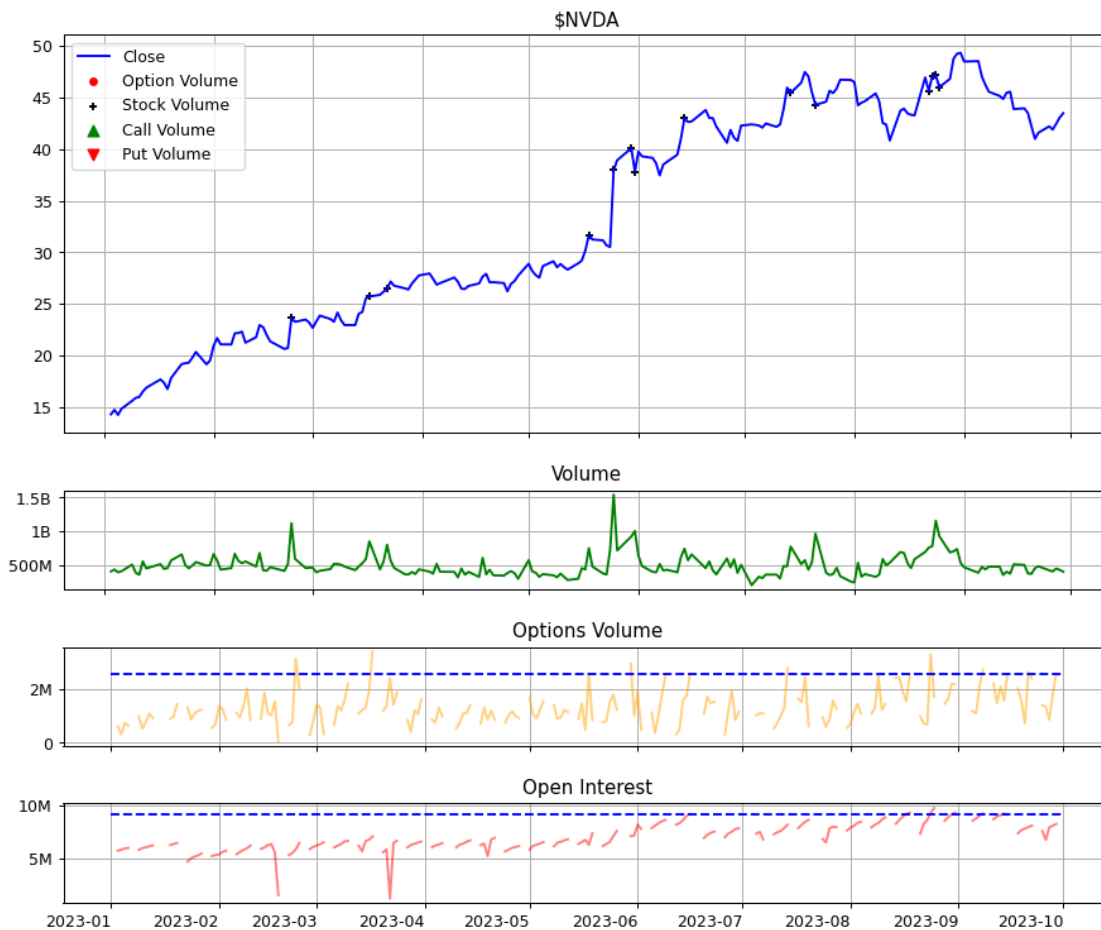
```

price_df = price_df.copy().sort_index()
d = m.Optionsdb.get_daily_option_stats(stock).sort_index()
d = d.resample('1D').sum()
price_df = price_df.loc[d.index[0]:]
d = d.replace(0, np.nan)
return price_df, d

def show_volume_oi(stock, start_date = None, end_date = None):
    pdf, odf = get_aligned(stock)
    pdf.columns = [x.lower() for x in pdf.columns]
    fig, ax = plt.subplots(4, 1, height_ratios=[2, 0.5, 0.5, 0.5], figsize =(
10, 10), dpi = 90)
    price_volume_oi_chart(odf, pdf, fig, ax, stock = stock,
start_date=start_date, end_date=end_date)
    fig.show()
    return pdf, odf

_, _ = show_volume_oi('nvda', '2023-01-01', '2023-10-01')

```



[]:

notebook controller is DISPOSED.

View Jupyter

notebook controller is DISPOSED.

View Jupyter

notebook controller is DISPOSED.

View Jupyter

```
[4]: from trend_results import TResults
tr = TResults(
    connections = '../.../...',
    lookback_days= 90,
    window_size = 200,
    period = 30

)
```

2025-05-15 15:59:03,724 - bin.options.optgd.db_connect - INFO - Options DB Initialized

2025-05-15 15:59:03,725 - bin.options.optgd.db_connect - WARNING - You currently have 8 connections open.

2025-05-15 15:59:03,742 - INFO - PriceDB Initialized successfully at 2025-05-15 15:59:03.741893

2025-05-15 15:59:03,742 - bin.price.db_connect - INFO - PriceDB Initialized successfully at 2025-05-15 15:59:03.741893

2025-05-15 15:59:03,781 - INFO - Established 3 database connections

2025-05-15 15:59:03,781 - bin.price.db_connect - INFO - Established 3 database connections

2025-05-15 15:59:03,839 - bin.alerts.options_alerts - INFO - Notifications instance initialized.

```
[5]: results = tr.analyze_stocks()
```

Processing ardx: 28%| | 37/134 [00:13<00:29, 3.26it/s, Success=1]2025-05-15 15:59:18,811 - root - ERROR - Data validation error for ardx: This function does not handle missing values
Processing chgg: 57%| | 77/134 [00:25<00:17, 3.29it/s, Success=1]2025-05-15 15:59:30,522 - root - ERROR - Data validation error for

```

chgg: This function does not handle missing values
Processing nke: 99%|      | 132/134 [00:39<00:00, 6.36it/s, Success=1]
2025-05-15 15:59:44,167 - root - ERROR - Data validation error for nke: Data
length must be at least 60 points
Processing nvo: 99%|      | 132/134 [00:39<00:00, 6.36it/s,
Success=1]2025-05-15 15:59:44,222 - root - ERROR - Data validation error for
nvo: Data length must be at least 60 points
Processing nvo: 100%|     | 134/134 [00:39<00:00, 3.42it/s, Success=1]

```

```

[6]: # Convert to DataFrame
data = []
for i in results:
    for result in i:
        data.append({
            'stock': result.stock,
            'metric': result.name,
            'trend_direction': result.trend_direction,
            'seasonality': result.seasonality,
            'slope': result.slope,
            'change_point': result.change_point
        })
df = pd.DataFrame(data)

# Flag slope discrepancies (where trend direction and slope sign don't match)
df['slope_discrepancy'] = ((df['trend_direction'] == 'up') & (df['slope'] < 0)) |
    ((df['trend_direction'] == 'down') & (df['slope'] > 0))
print("DataFrame with Slope Discrepancies Flagged:")
df[df.slope_discrepancy == True]

```

DataFrame with Slope Discrepancies Flagged:

```

[6]:      stock      metric trend_direction seasonality      slope \
0      gme  close_prices                up      normal -0.000816
5      gme    call_oi                up      normal -0.001136
12     amzn         oi                up      normal -0.006335
14     amzn    call_oi                up      normal -0.007320
15     amzn    put_oi                up      normal -0.005349
...     ...           ...                ...         ...
1154   tem  options_volume                up      normal -0.009200
1159   tem    call_volume                up      normal -0.006608
1160   tem    put_volume                up      normal -0.020490
1163   btu  options_volume                down      normal  0.005441
1169   btu    put_volume                down      normal  0.000901

      change_point  slope_discrepancy
0                1.0                True
5                0.0                True
12               0.0                True

```

| | | |
|------|-----|------|
| 14 | 0.0 | True |
| 15 | 0.0 | True |
| ... | ... | ... |
| 1154 | 1.0 | True |
| 1159 | 1.0 | True |
| 1160 | 1.0 | True |
| 1163 | 0.0 | True |
| 1169 | 1.0 | True |

[461 rows x 7 columns]

```
[7]: df.metric.unique()
```

```
[7]: array(['close_prices', 'stock_volume', 'options_volume', 'oi', 'atm_iv',
        'call_oi', 'put_oi', 'call_volume', 'put_volume'], dtype=object)
```

```
[8]: increasing_oi = df[(df.metric == 'oi') & (df.trend_direction == 'up')].stock.
    ↪tolist()
increasing_call_oi = df[(df.metric == 'call_oi') & (df.trend_direction == 'up')].stock.tolist()
decreasing_oi = df[(df.metric == 'oi') & (df.trend_direction == 'down')].stock.
    ↪tolist()

increasing_options_volume = df[(df.metric == 'options_volume') & (df.
    ↪trend_direction == 'up')].stock.tolist()
increasing_call_volume = df[(df.metric == 'call_volume') & (df.trend_direction == 'up')].stock.tolist()
decreasing_options_volume = df[(df.metric == 'options_volume') & (df.
    ↪trend_direction == 'down')].stock.tolist()

increasing_price_volume = df[(df.metric == 'price_volume') & (df.
    ↪trend_direction == 'up')].stock.tolist()
decreasing_price_volume = df[(df.metric == 'price_volume') & (df.
    ↪trend_direction == 'down')].stock.tolist()

increasing_price = df[(df.metric == 'close_prices') & (df.trend_direction == 'up')].stock.tolist()
decreasing_price = df[(df.metric == 'close_prices') & (df.trend_direction == 'down')].stock.tolist()

def print_10_items_per_line(title, lst):
    print(title)
    print("=====")
    for i in range(0, len(lst), 10):
        print(", ".join(lst[i:i+10]))
```

```
print_10_items_per_line("Decreasing Options Volume:", decreasing_options_volume)
print_10_items_per_line("Decreasing Price Volume:", decreasing_price_volume)
```

Decreasing Options Volume:

```
=====
gme, amzn, aapl, pfe, pep, ntr, dkng, mdb, wmt, cvx
fccl, vale, mo, intc, mu, hd, rrc, lc, vuzi, bkkt
lmt, wfc, crwd, mrk, baba, tsla, sol, mos, qs, tgt
meta, abbv, ccj, f, pypl, amd, amc, xom, clsk, asan
hsbc, kr, wba, ba, cmre, ge, intu, snap, nvda, ctva
aa, cscs, ko, ctra, snow, li, run, lulu, oxy, c
abnb, x, mara, clx, jpm, k, sony, hood, cag, ual
pgr, aig, avgo, sofi, mpw, amat, open, panw, tdoc, djt
dell, dltr, adbe, orcl, u, tost, pct, oklo, btu
```

Decreasing Price Volume:

```
=====
```

```
[9]: print_10_items_per_line("Increasing OI:", list(set(increasing_oi +
    ↪increasing_price)))
print_10_items_per_line("Increasing Call OI:", list(set(increasing_call_oi +
    ↪increasing_price)))
```

Increasing OI:

```
=====
ge, mmm, cvs, x, cava, aapl, amat, hd, pct, xom
clx, nvda, enph, mdb, mos, intu, snow, uber, lmt, btu
tsla, cvx, oklo, ba, jpm, goog, pltr, dkng, meta, gme
snap, djt, dbx, ko, ttd, sono, wmt, pfe, tgt, gsl
dash, afm, hood, msft, spot, sol, pypl, ntr, hims, wfc
rtx, u, oxy, dell, v, eog, aa, mrk, hsbc, mo
crwd, pep, aal, qcom, sbux, arm, dltr, ups, rkt, ual
nflx, f, dis, afl, pgr, ebay, roku, ccj, kr, clsk
k, c, run, fang, amzn, rblx
```

Increasing Call OI:

```
=====
ge, mmm, cvs, x, cava, aapl, amat, pct, xom, clx
enph, mdb, mos, intu, snow, uber, lmt, btu, tsla, cvx
oklo, abbv, ba, jpm, goog, pltr, tost, meta, gme, snap
djt, dbx, ko, sono, wmt, orcl, tgt, dash, afm, hood
msft, spot, sol, pypl, ntr, amd, hims, wfc, rtx, u
oxy, dell, v, aa, mrk, hsbc, mo, crwd, pep, aal
qcom, sbux, arm, dltr, ups, rkt, nflx, f, sofi, dis
afl, panw, pgr, ebay, ccj, kr, clsk, k, tsn, c
run, fang, amzn, rblx
```

```
[12]: b = set(increasing_options_volume) & set(increasing_price)
      b = set(increasing_options_volume) & set(increasing_price) &
      ↪set(increasing_call_volume) & set(increasing_call_oi)
      print(b)
```

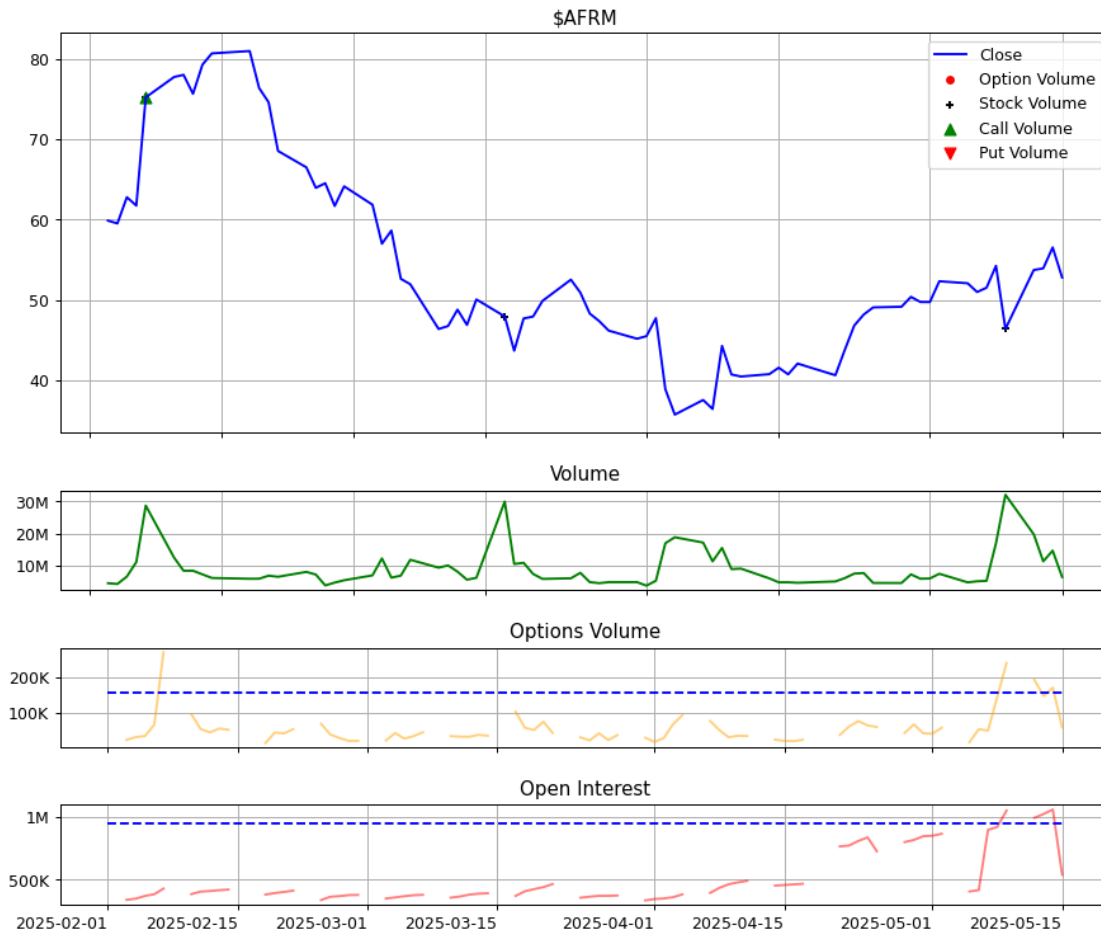
{'msft', 'cava', 'rblx', 'uber', 'spot'}

```
[11]: _, odf = show_volume_oi('afrm',start_date = "2025-02-01")

      pretty_print(odf[['total_vol', 'call_vol_chng', 'put_vol_chng', 'total_oi',
      ↪'call_oi','call_oi_chng', 'put_oi','put_oi_chng']].tail())
```

| | total_vol | call_vol_chng | put_vol_chng | total_oi | call_oi \ |
|------------|------------|---------------|--------------|--------------|------------|
| date | | | | | |
| 2025-05-11 | nan | nan | nan | nan | nan |
| 2025-05-12 | 191,860.00 | -122,774.00 | -56,848.00 | 995,136.00 | 621,684.00 |
| 2025-05-13 | 146,305.00 | -69,083.00 | -38,724.00 | 1,025,618.00 | 637,614.00 |
| 2025-05-14 | 169,762.00 | 1,052.00 | -904.00 | 1,061,268.00 | 662,324.00 |
| 2025-05-15 | 58,246.00 | -25,073.00 | -2,461.00 | 540,861.00 | 336,192.00 |

| | call_oi_chng | put_oi | put_oi_chng |
|------------|--------------|------------|-------------|
| date | | | |
| 2025-05-11 | nan | nan | nan |
| 2025-05-12 | -9,880.00 | 373,452.00 | -48,146.00 |
| 2025-05-13 | 15,930.00 | 388,004.00 | 14,552.00 |
| 2025-05-14 | 24,710.00 | 398,944.00 | 10,940.00 |
| 2025-05-15 | 5,030.00 | 204,669.00 | 5,197.00 |



```
[13]: change_df = df[df.change_point == 1]
      call_volume_change = list(change_df[change_df.metric.isin(['call_volume'])].
      ↪stock.unique())
      put_volume_change = list(change_df[change_df.metric.isin(['put_volume'])].stock.
      ↪unique())
      print_10_items_per_line('Call Change Points',call_volume_change)
```

Call Change Points

=====

```
gme, uber, pltr, wmt, intc, mu, rrc, baba, tsla, msft
rkt, amd, coin, ba, nvda, cvs, run, hood, avgo, smci
hims, rddt, dltr, pct, oklo, tem, btu
```

```
[16]: _, b = show_volume_oi('hims', start_date = "2025-02-01")
      b.tail()
```

```
[16]:      total_vol      total_prem      total_oi      call_vol      put_vol      call_oi  \
      date
```


| | | | | | | |
|------------|----------|--------------|-----------|----------|----------|----------|
| 2025-05-11 | NaN | NaN | NaN | NaN | NaN | NaN |
| 2025-05-12 | 393059.0 | 3.057829e+07 | 1419268.0 | 241078.0 | 151981.0 | 728380.0 |
| 2025-05-13 | 558814.0 | 3.851387e+07 | 1495586.0 | 306596.0 | 252218.0 | 760538.0 |
| 2025-05-14 | 238862.0 | 3.850276e+07 | 1594736.0 | 122254.0 | 116608.0 | 785580.0 |
| 2025-05-15 | 229682.0 | 1.752551e+07 | 832764.0 | 117248.0 | 112434.0 | 395207.0 |

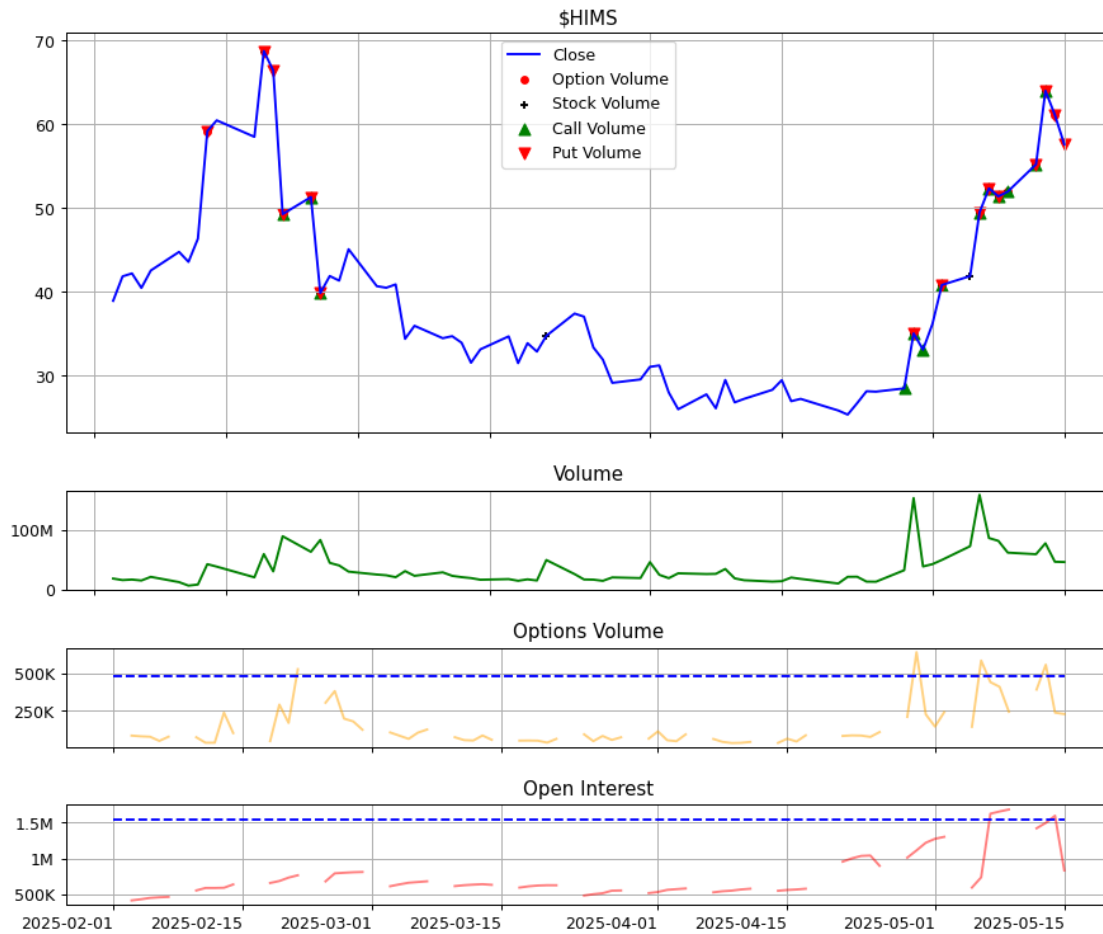
| | | | | | | |
|------------|----------|----------|----------|----------|-----|----------------|
| | put_oi | call_iv | put_iv | atm_iv | ... | call_oi_chng \ |
| date | | | | | ... | |
| 2025-05-11 | NaN | NaN | NaN | NaN | ... | NaN |
| 2025-05-12 | 690888.0 | 2.038795 | 2.184185 | 2.158153 | ... | -79918.0 |
| 2025-05-13 | 735048.0 | 2.291952 | 2.314761 | 2.444424 | ... | 32158.0 |
| 2025-05-14 | 809156.0 | 2.511663 | 2.088062 | 2.568824 | ... | 25042.0 |
| 2025-05-15 | 437557.0 | 1.047511 | 1.156742 | 1.130022 | ... | 2417.0 |

| | | | | | |
|------------|-------------|--------------|-------------|-------------|---------------|
| | put_oi_chng | call_iv_chng | put_iv_chng | atm_iv_chng | otm_iv_chng \ |
| date | | | | | |
| 2025-05-11 | NaN | NaN | NaN | NaN | NaN |
| 2025-05-12 | -181880.0 | 0.301551 | 0.267640 | 0.362817 | 0.009391 |
| 2025-05-13 | 44160.0 | 0.335072 | 0.097677 | 0.428541 | 0.896612 |
| 2025-05-14 | 74108.0 | 0.233517 | -0.259815 | 0.120365 | 0.583033 |
| 2025-05-15 | 32979.0 | -0.130138 | 0.064248 | -0.093096 | -0.396153 |

| | | | |
|------------|-------------------|------------------|--------------------|
| | call_vol_pct_chng | put_vol_pct_chng | call_oi_pct_chng \ |
| date | | | |
| 2025-05-11 | NaN | NaN | NaN |
| 2025-05-12 | -0.046842 | 0.046842 | 0.064767 |
| 2025-05-13 | -0.132957 | 0.132957 | -0.009373 |
| 2025-05-14 | -0.062635 | 0.062635 | -0.031827 |
| 2025-05-15 | 0.013308 | -0.013308 | -0.018036 |

| | |
|------------|-----------------|
| | put_oi_pct_chng |
| date | |
| 2025-05-11 | NaN |
| 2025-05-12 | -0.064767 |
| 2025-05-13 | 0.009373 |
| 2025-05-14 | 0.031827 |
| 2025-05-15 | 0.018036 |

[5 rows x 30 columns]



```
[17]: df
```

```
[17]:
```

| | stock | metric | trend_direction | seasonality | slope \ |
|------|-------|----------------|-----------------|-------------|-----------|
| 0 | gme | close_prices | up | normal | -0.000816 |
| 1 | gme | stock_volume | up | normal | 0.020711 |
| 2 | gme | options_volume | down | normal | -0.000415 |
| 3 | gme | oi | down | normal | -0.001282 |
| 4 | gme | atm_iv | up | normal | 0.000992 |
| ... | ... | ... | ... | ... | ... |
| 1165 | btu | atm_iv | up | normal | 0.078907 |
| 1166 | btu | call_oi | up | normal | 0.012122 |
| 1167 | btu | put_oi | up | normal | 0.011901 |
| 1168 | btu | call_volume | up | normal | 0.011024 |
| 1169 | btu | put_volume | down | normal | 0.000901 |

| | change_point | slope_discrepancy |
|---|--------------|-------------------|
| 0 | 1.0 | True |
| 1 | 0.0 | False |

| | | |
|------|-----|-------|
| 2 | 1.0 | False |
| 3 | 0.0 | False |
| 4 | 1.0 | False |
| ... | ... | ... |
| 1165 | 1.0 | False |
| 1166 | 1.0 | False |
| 1167 | 1.0 | False |
| 1168 | 1.0 | False |
| 1169 | 1.0 | True |

[1170 rows x 7 columns]

[]: