



Infi-flux

Market Pulse

Market Pulse is a custom composite sentiment forecasting product of indices that caters to financial markets derived from DayBreak & MidDay.

- Definition of DayBreak: Guess the sentiment of a particular instrument during the first quarter of the next immediate working day of the respective financial market.
- Definition of MidDay: Guess the sentiment of a particular instrument during the second half of the next immediate working day of the respective financial markets.

Daybreak & MidDay are dedicated to one single instrument at a time to predict the sentiment of this instrument like index, etc.

Market pulse takes multiple predicted sentiments of different instruments and aggregates those sentiments using a simple formula that follows the concept of weighted average based on total market capitalization.

The second part of the Market Pulse gives out a correlation heatmap of the instruments tracked under our portfolio for particular financial markets which tells whether the instruments are moving in the same direction or not.

To simplify Market Pulse, allow us to give the steps of how it's constructed.

- DayBreak & MidDay gives out sentiments for instruments. Let's say A to Z.
- If Market Pulse tracks instruments say G, H, K, Z. It will take the sentiment of G, H, K, Z and aggregate these separate sentiments into one single sentiment using a weighted average sum based on total market capitalization indicated as Strength.

Market Pulse is an experiment. It is currently performed only on NSE India and BSE India.

Conditions for accuracy are the same as those of our products DayBreak & MidDay.

The accuracy conditions will give you an estimate of the interval, the sentiment is being guessed for.

Output :-> by DayBreak

[If the Output of DayBreak is Bullish:

And [if, the previous day's close < (**less than**) [price of the Instrument occurred anywhere during the first quarter of the NEXT day for this particular Instrument at least **ONCE**]:

The guess made by DayBreak is correct.

. Else:

The guess made by DayBreak is Incorrect.

•]

Else if the output of DayBreak is Bearish:

And [if, the previous day's close > (**greater than**) [price of the Instrument occurred anywhere during the first quarter of the NEXT day for this particular Instrument at least **ONCE**]:

The guess made by DayBreak is correct.

. Else:

The guess made by DayBreak is Incorrect.

$$\cdot \quad]$$

]

Note: The accuracy of Market Pulse is validated accuracy which can also be called forwarded tested accuracy.

Metric Algorithm for MidDay Accuracy performed on individual components:

Output :-> by MidDay

[If the Output of MidDay is Bullish:

. And [if, the closing price at the end of the **first quarter** of the Next day < (**less than**)
 . [price of the Instrument occurred
 . anywhere during the SECOND HALF of the NEXT
 . day for this particular Instrument at least **ONCE**]:

. The guess made by MidDay is correct.

. Else:

. The guess made by MidDay is Incorrect.

.]

Else if the output of MidDay is Bearish:

. And [if, the closing price at the end of the **first quarter** of the Next day > (**greater than**)
 . [price of the Instrument occurred
 . anywhere during the SECOND HALF of the day
 . for this particular Instrument at least **ONCE**]:

. The guess made by MidDay is correct.

. Else:

. The guess made by MidDay is Incorrect.

.]

]

Note: The accuracy of Market Pulse is validated accuracy which can also be called forwarded tested accuracy.



As visible above, the composition of each section consisting of indices is different. The specialty of the above composition is that these indices track different sectors of Indian financial markets. Market Pulse is a collection of sectorial indices to answer one simple question.

What will be The health of the financial market the next immediate working day during a particular interval?

Market Pulse solves the above problem by leveraging DayBreak & MidDay. DayBreak & MidDay has been live for more than 100+ days clocking out an aggregate accuracy of 70 % + for different conditions of the financial markets.

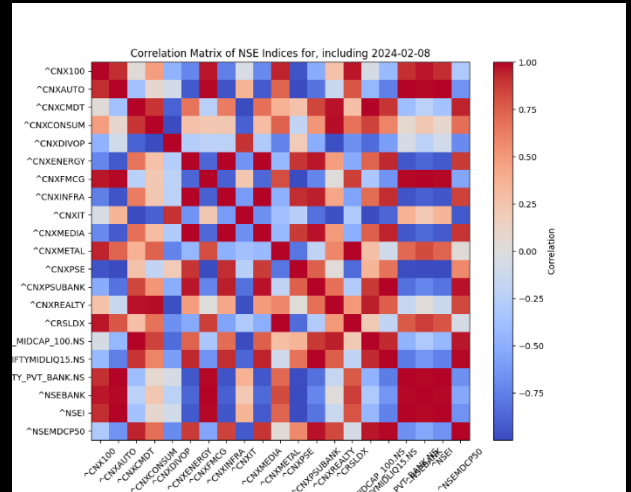
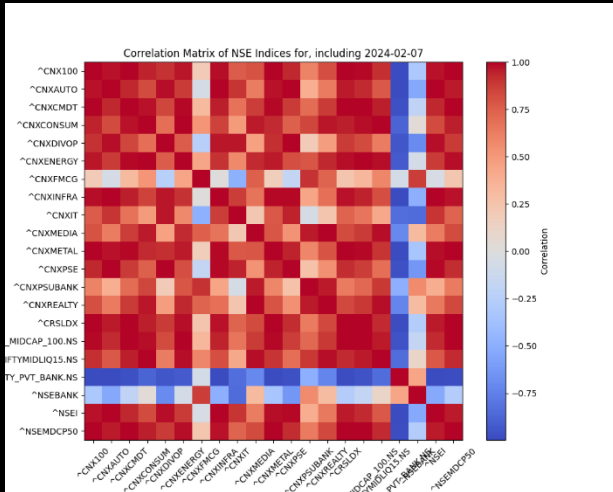
We have created a CSV file that consists of different unique combinations of portfolios like the one mentioned in the images and their respective accuracy. The link for the file is mentioned below ->

Github Link here -> <https://github.com/Infi-boy/Market-Pulse.git>

The sentiment in the above is the Aggregate Weighted market cap sum of sentiments of the instruments present in the dedicated portfolio. In simple words, let's take an example. In the NSE market image. For DayBreak, there are indices mentioned. As the day closes for the NSE market. Our products DayBreak and MidDay perform Data analysis on publicly available data and predict the next day sentiment of the designated index. 7 indices include Auto, commodities, Infra .. etc for the NSE market under DayBreak. Our product DayBreak outputs sentiment for each index on our platform. Market Pulse just takes those sentiments and performs aggregates weighted sum based on the Total Market capitalization of the companies present under those indices to give out one single answer to the above question. Likely sentiment is the Aggregate market cap weighted sum of the sentiments of the indices present in the portfolio mentioned respectively.

The second part of the Market pulse is the Correlation heatmaps of the Indices tracked by DayBreak & MidDay for particular financial markets. A detailed explanation is given below.

Sentiment Analysis of Financial Markets Using Chaos Theory and Simple Correlation



Definition of Correlation: It is a statistical measure that describes the strength and direction of a relationship between two variables. In other words, it quantifies the extent to which changes in one variable are associated with changes in another variable. Point to focus on w.r.t correlations are

- **Strength:** The correlation coefficient ranges from -1 to +1. 1 indicates a positive correlation, meaning that as one variable increases, the other variables increase proportionally and vice versa. The variable moves in the same direction. For the opposite -1 correlation coefficient. If one variable increases, the other decreases proportionally. In other words, variables move in opposite directions.
- **Independence:** Correlation does not imply causation. Even if two variables are strongly correlated, it does not necessarily mean that a change in one variable causes changes in another. There could be other underlying factors or variables influencing the relationship.

Definition of Correlation heatmaps: They are visual representations of the correlation matrix between variables in a dataset. In the above example. Indian indices inside their respective stock exchanges.

We have displayed two different correlation heatmaps of two different consecutive days for NSE India. A warm-cool scale is also provided to indicate a +1 Red to -1 Blue correlation coefficient in between indices mentioned in the respective plots. Dates used are -> 2024-02-07 & 2024-02-08

The correlation matrix used for the above plots is constructed on the Adjusted Close price of each index for 3 days including the displayed datetime. Example. Let's say 2024-02-07. The data used to calculate correlation for 2024-02-07 is by taking three Adj close data for the day which includes 2024-02-07 and Adjusted close of the previous two consecutive days of 2024-02-07, which in this case is 2024-02-06 and 2024-02-05. In simple words to calculate the correlation of Feb 7th. We took data of Adj Close of 5th 6th and 7th of Feb 2024.

One of the simple reasons to do this exercise is pattern recognition. It's evident from the plots pasted above that in the plot for 7th Feb 2024 most of the indices seem to go in one direction. And in the next day, on 2024-02-08 it's chaos. No visible pattern. Remember we are talking about the direction of indices concerning each other. These plots DO NOT say that the market is bearish or Bullish.

The colors red and blue represent the direction. For example, on 7th Feb 2024. Most of them have a positive correlation meaning if one index is increasing, the other indices with high correlation are increasing also if one index is decreasing the other indices with positive correlation are also decreasing. This is to emphasize that with positive correlation indices move in the same direction! Regardless of whether the market is bearish or bullish.

Now some notation:

Peace: When the market moves in one particular direction like the first plot for 7th Feb 2024

Chaos: When the market shows no pattern for direction movement. Like the second plot 8th Feb 2024.

To recognize some patterns, we retrieved data from Yfinance and got the plots for the correlation for the last three Adj Close from 2016-12-15 to 2024-4-19. You may find the plots on GitHub and the code to generate those plots is provided in the notebook. You may find the links to the resources below.
[Link - >](#)

https://colab.research.google.com/drive/100dYYIRPj1DCJKqmSRTa_Tz8gwZE60uJ?usp=sharing

We have gathered over 1791 different plots that is 1791 correlation heatmaps that is 1791 correlation matrix. One can ask many questions to recognize patterns and gain simple insights by analyzing these correlation matrices.

Question no 1: What is the ratio of peace plots vs chaos plots?

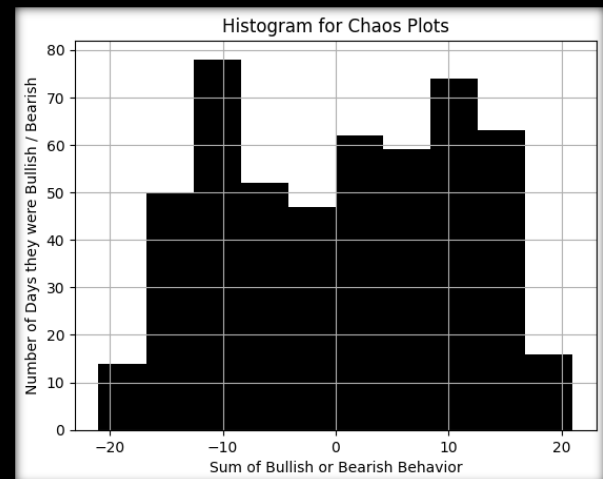
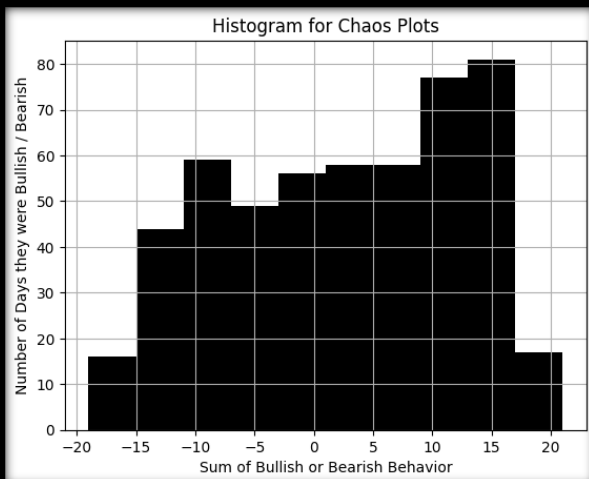
Answer ->

The answer is derived in our colab notebook. We used simple logic to get the answer. The one difference that you may notice between the peace and chaos plot is that the peace plot has a lot of strong Correlations. Which is around or close to +1 as one can see on 7th Feb. It turns out, that one can separate the peace plot from the chaos one just by taking the aggregate of the lower half of the correlation matrix ignoring the diagonal, and adding a condition of average correlation greater than > 0.4. As it turns out, the plot that shows positive directions has a high average correlation.

The peace vs chaos plot ratio comes out to be $1277 / 515 \sim 2.4796$. There are more peace plots than the ones with chaos. Predicting when the next peace plot is relatively easier than guessing when the next chaos plot is going to happen.

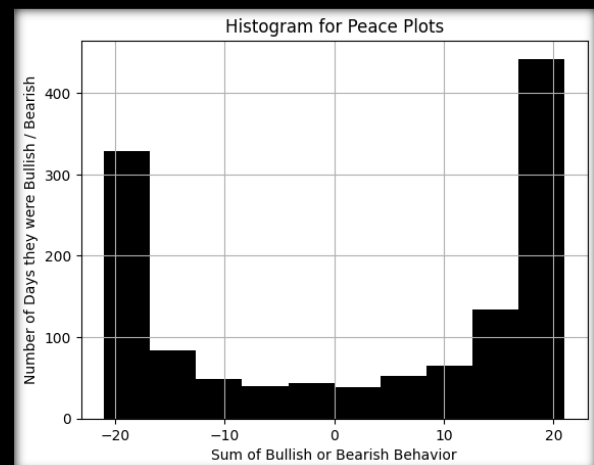
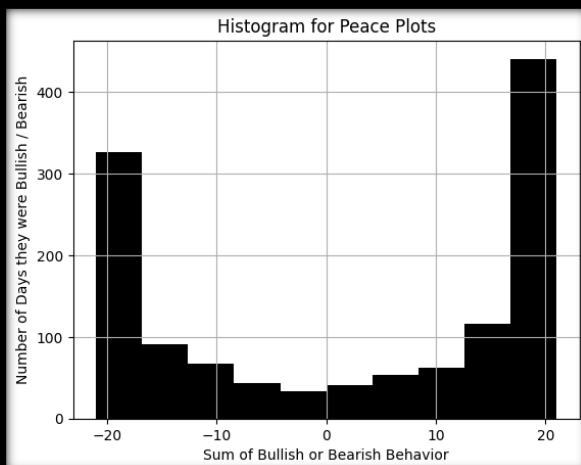
Question no 2: What is the sentiment during the peace plot or chaos plot? And what pattern does it show?

Answer-> We have provided one possible solution to this question in our colab notebook. To summarise what we did in our notebook. As we have separated the peace vs chaos plot. We calculated the movement of the prices by calculating the difference. Suppose the plot is for the current date let's say 7th Feb. Two different differences were calculated. One was the difference of Adj Close between the 7th Feb to 6th Feb. and the second difference was between the 6th and the 5th Feb. 2024. This exercise of calculating the 2 different differences was carried out for each date keeping peace plots and chaos plots separate. And we registered bullish "up" behavior as 1 and bearish "down" behavior as -1. We then plotted the histogram for both the chaos plots and the peace plots. They are as follows.



The above histograms are for chaos where the average correlation is considered to be < 0.4 . The X-axis is the sum of the bullish or bearish behavior for that particular day. On the Y axis is the frequency of the dates where the respective number of the bullish or bearish behavior was repeated. This is an initial crude way of analysis in the search for patterns, Here in the case of chaos plots. The bullish/bearish behavior came out to be a uniform plot. When there is chaos, no pattern is visible that could generate insights.

But for the peaceful plots, the story is a bit different.



What does the histogram that is plotted for peace say to us? What are the insights that this particular pattern gives to us?

When the market is moving in one direction. There is a high chance that it's either going to be a Bull market or a bear market. Which is Obvious.

Question 3:

Since the number of peace plots is more than the number of chaos plots. If you notice, the peace plot maintains its state for several days before a chaotic state is achieved. It seems like a phase. Is there a

change in Sentiment between this peaceful phase or does the market go in the same sentiment in that phase? And for which weekday does the sentiment change or does not change?

Answer -> code available in colab notebook

The ratio for the no change in sentiment for the next peaceful plot vs sentiment change in the next peaceful plot is 305 / 203 ignoring the weekend gap.

The information on the frequency of sentiment change to no change in the sentiment for the next day assuming the next day is peaceful is as follows

No Sentiment Change = ncd = {0: 136, 1: 112, 2: 124, 3: 113, 4: 137}

Sentiment Change = cd = {0: 105, 1: 92, 2: 68, 3: 72, 4: 63} where 0, 1, 2, 3, 4 represent Monday, Tuesday, Wednesday, Thursday and Friday respectively. One can notice that sentiment changes during consecutive days are relatively less likely on Wednesday, Thursday, and Friday.

Practical Implementation of Market Pulse: -> Systematic Risk Analysis

A detailed guide has been created to explain basic risk management. Please visit <https://www.infiflux.com/pages/guide.php>

Another advantage of analyzing markets on a higher level is as follows.

- Sector Wise performance
- Portfolio Risk Management and optimization
- Market Cycles and Trends
- Macroeconomic analysis
- Developing trading strategies
- Etc

A final question that may arise is, why does a stock market like NSE India exhibit certain chaotic behavior intervals on a higher level where indices no longer move in the same direction?

Fundamentals of chaos theory include nonlinearity, sensitive dependence on initial conditions, period doubling, bifurcations, and deterministic chaos are some of the fundamentals of chaos theory. But to practically apply chaos theory to financial markets is extremely difficult. Because we do not know exactly what the initial conditions of the financial markets are. The only useful concept for predicting the fundamentals of chaos theory is deterministic chaos. As we proved above. When the market is in chaos where there is no same direction exhibited by indices. The pattern for bullish or bearish comes out to be uniform. But when the market moves in the same direction, the chance of predicting the overall market sentiment increases. We also saw that the markets tend to maintain peaceful states longer than chaotic states. Most of the peace plots occurred in batches before a chaotic state occurred. We also saw that there was a sentiment change during the peaceful plots as well. Please be mindful. Suppose there are three consecutive peace plots. There is NO guarantee that the market is going to move in the same sentiment in all three consecutive peace plots. It can be any combination of a bull or a bear market. For example for three consecutive plots, it can be bull, bear, bull or bear, bull, bear, or many other configurations. The three consecutive peace plots guarantee that the indices are moving in the same direction. They do not tell you anything about the sentiment of the markets whether it is going to be bear or bull. This correlation approach simply helps you to gauge the direction of the market whether in the same direction or there is chaos.

One may find some fundamentals of chaos in the following YouTube video. Please have a look.

<https://youtu.be/ovJcsL7vyrk?si=tyHBy8Tn8cm2RzL>

Using this approach may help you gauge the direction of the instruments in the markets and if the instruments are all indices that track various sectors of the targeted financial markets. You can find the answer to the question if the whole market is moving in the same direction or not. And may help you predict the direction of the whole market by answering the question of will the market continue to move in the same direction or not.

It will not help you to gauge the sentiment of the market. This approach cannot answer the question of whether the market that moving in the same direction is either bullish or bearish. You are gonna need something extra. Those extra skills lie in the domain of fundamental analysis and technical analysis depending on your investment goals. We have created a detailed resource and guide on this topic on our platform, please have a look. This is also where our product can help you gauge the sentiment of the market. Combining the above approach of correlation and our product that predicts tomorrow's sentiment where the portfolio that tracks and predicts 200 + indices with aggregate accuracy of 70% + for 25 + global stock exchanges may help you reduce uncertainty in terms of predicting market sentiment on a higher level in hope of bringing you close to your investment goals.

Note: The above analysis is performed on NSE India indices. The analysis for other stock exchanges may differ. Or show other chaotic behavior. One can perform the same analysis by following the code provided in the colab notebook. This was just the basic analysis one can perform to gain a higher level of understanding of the behavior of financial markets. This can be further combined with fundamental analysis, and technical analysis to further improve the accuracy of predicting the sentiment of Financial markets.

Our flagship products DayBreak & MidDay may also help you gain an understanding of tomorrow's market sentiments of different financial markets. Our product is built upon many concepts such as Quantitative analysis, and artificial Intelligence that track and predict market sentiments of 25 + financial Global stock exchanges through 200 + indices clocking out aggregate accuracy of 70%-75% on live data. We believe that our products may be one of the best tools out there for understanding and managing Systematic risk for short-term strategies.

We request you to please have a look.

<https://www.iniflux.com>

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Glossary :

Algorithm: for accuracy used.

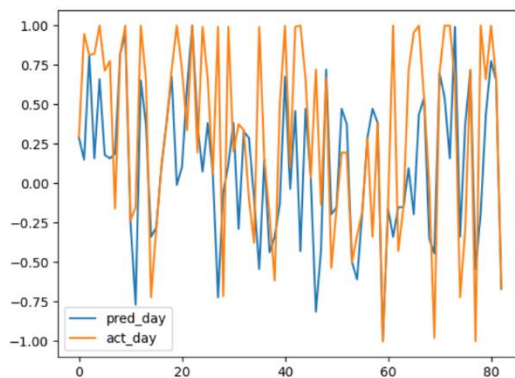
```
In [498]: 1 check['results_day'] = (
2         (check['pred_day'] > 0) & (check['act_day'] > 0)
3         ) | (
4         (check['pred_day'] < 0) & (check['act_day'] < 0)
5         )
6 check['results_mid'] = (
7         (check['pred_mid'] > 0) & (check['act_mid'] > 0)
8         ) | (
9         (check['pred_mid'] < 0) & (check['act_mid'] < 0)
10        )
```

Pred_(day/mid) is the aggregate market cap weighted sum prediction sentiment AMCWS and the act_(day/mid) is the actual AMCWS and the result is stored in results_(day/mid) where day and mid represent DayBreak and MidDay. Checking for the same signs.

Results: for 80+ days data forwarded tested. Predicted Vs actual where sentiment 1 to -1 where 1 is bullish and -1 is bearish

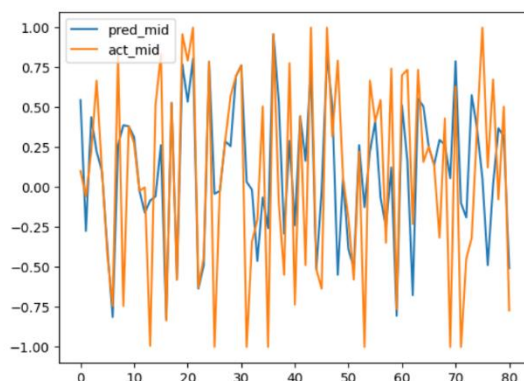
```
In [605]: 1 nse_daybreak = check
2 nse_daybreak[['pred_day', 'act_day']].plot(), len(check[check['results_day'] == 1])/len(check),k
3 # pred_day -> forecast foward tested, act_day -> acutal sentiment / Live data
4
```

```
Out[605]: (<Axes: >,
0.8192771084337349,
['CNXAUTO',
'CNXCHDT',
'CNXINFRA',
'CNXIT',
'CNXMEDIA',
'CNXREALTY',
'NSEBANK'])
```



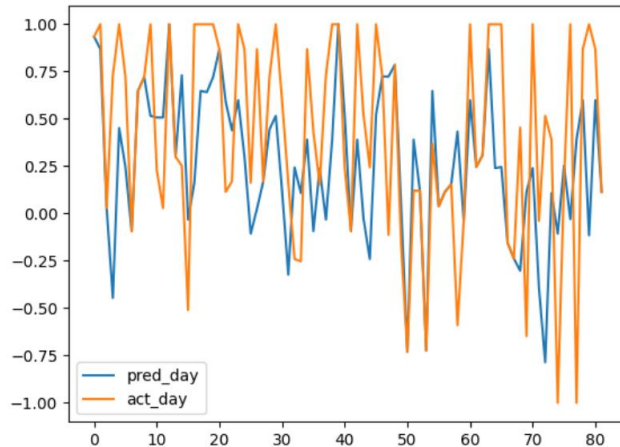
```
In [609]: 1 nse_midday = check
2 nse_midday[['pred_mid', 'act_mid']].plot(), len(check[check['results_mid'] == 1])/len(check),k
3 # pred_mid -> forecast foward tested, act_mid -> acutal sentiment / Live data
4
```

```
Out[609]: (<Axes: >,
0.8395061728395061,
['CNXAUTO',
'CNXCONSUM',
'CNXENERGY',
'CNXFHCG',
'CNXINFRA',
'CNXIT',
'CNXMEDIA',
'CNXREALTY'])
```



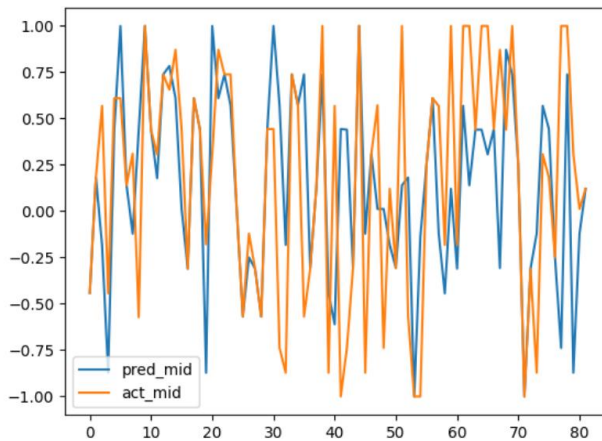
```
In [612]: 1 bse_daybreak = check
2 bse_daybreak[['pred_day','act_day']].plot(), len(check[check['results_day'] == 1])/len(check),k
3 # pred_day -> forecast foward tested, act_day -> acutal sentiment / Live data
4
```

```
Out[612]: (<Axes: >,
0.7804878048780488,
['BSE.AUTO',
'BSE.BANK',
'BSE.CG',
'BSE.PR.OWER',
'BSE.REALTY',
'INDSTR',
'TELCOM'])
```



```
In [616]: 1 bse_midday = check
2 bse_midday[['pred_mid','act_mid']].plot(), len(check[check['results_mid'] == 1])/len(check),k
3 # pred_day -> forecast foward tested, act_day -> acutal sentiment / Live data
4
```

```
Out[616]: (<Axes: >,
0.8048780487804879,
['BSE.CG', 'BSE.PR.OWER', 'BSE.REALTY', 'INDSTR', 'BSE.METAL'])
```



The accuracy that you are seeing will not match the accuracy displayed on the image as the first 20 days were skipped due to a major update in the system. This also demonstrates that even in highly uncertain conditions and major changes in the underlying system, the accuracy deviates from stated with the confidence interval of +- 3 to 5 %.

Code: for finding the interval of DayBreak and MidDay:

```
#####  
import yfinance as yf  
import pandas as pd  
ticker_symbol = '^NSEI' ## Replace the ticker symbol according to your requirements.  
data = yf.download(ticker_symbol,interval = '1m')  
data.reset_index(drop = False, inplace = True)  
li = data.Datetime.dt.strftime("%Y-%m-%d").unique()  
ti = []  
for i in li:  
    fd = data[data.Datetime.dt.strftime("%Y-%m-%d").str.contains(i)]  
    ti.append([  
        i,  
        str(fd[:int(len(fd)/4)].iloc[-1].Datetime).split(' ')[1],  
        str(fd[int(len(fd)/2):].iloc[0].Datetime).split(' ')[1]  
    ])  
ti = pd.DataFrame(ti, columns = ['Date', 'End_of_first_quarter', 'Start_of_second_Half'])  
ti[:~1]
```

```
#####
```

Thank You

Hope this helps

By Infi-flux