# Alpha Slides : Text Dump

I want to start creating Alphas for the Alphaverse Premier League.

I have the following Textual Learning Materials. :

INTRODUCTION TO ALPHAVERSE

The Alphaverse platform is a powerful tool that enables analysts to develop and test Alphas using large and complex data sets. There's a process of creating Alphas on the AlphaVerse platform, including selecting appropriate factors and adjusting the parameters to optimize performance.The next step includes process of analyzing Alphas using the platform's advanced analytics tools. This process will help evaluate the performance of Alphas over different time periods, and compare them with set benchmarks and other Alphas.Ultimately, we move on to the process of improving Alphas using machine learning techniques to optimize parameters and identify new factors. This process uses the platform's machine learning capabilities to analyze large data sets and identify patterns and correlations that can be used to improve Alpha performance.Overall, this presentation will provide a comprehensive overview of how to create, analyze, and improve Alphas using the AlphaVerse platform. By understanding these concepts, analysts can gain valuable insights into the performance of their investment decisions and make informed decisions in the field of quantitative finance.x

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Introduction to AlphaVerse

Exploring Fundamental Components

Know this before submitting your first Alpha

Know Your Simulation Parameters

Crafting, Backtesting, and Evaluating Alpha Performance

Process that follows Alpha Submissions

Elevating Strategies with Insights and Evaluation Process

FAQ

●Fast Simulator ○Lightning-fast data processing○Quick and Fast Data Analysis●Large Variety of Fields○ Fundamental fields○Analyst Fields○Numerous Other Fields●Inbuilt Functions for Analysis○Large number of Optimized Fields○Test-console to test output of the fields What our platform provides ?  xDISCLAIMER: This document is strictly confidential, private and personal to its recipients and should not be copied, shared or reproduced in whole or in part, nor passed to any third party.

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●Various Ongoing Competitions  ○Users Can Register in each of the competitions and simulate various alphas.xDISCLAIMER: This document is strictly confidential, private and personal to its recipients and should not be copied, shared or reproduced in whole or in part, nor passed to any third party.

Alpha Research & Data Analysis

ALPHA•In simple terms - Alpha means excess market returns•It's an expression to predict relative/cross-sectional stock returns•Market/Sector/Industry neutralization•Group of stocks whose returns are correlated•Neutralization helps in reducing market/sector specific directional risk . •Key Alpha Stats•IR/Sharpe•Turnover•Margin•Correlation •Return on GMV (gross market value)•Long/short leg Alpha•Alpha making involves optimizing above stats despite various risk constraints

ALPHA CONSTRUCTION•Data Analysis•Check for data consistency•Missing/coverage of data•Data range/mean/median•Frequency of data change•Visual Analysis of data•Scatter plots/histogram and more•Distribution of data•Alpha Operations•Use various time series/cross-sectional operations to capture data changes•Rate at which the data keeps fluctuating•Data Normalization•Auto/serial correlation of data•Regression/machine learning to predict future stock returns•Statistical operations in order to capture higher data order momentsx

Alpha Making – Key Issues•Overfitting•Degree of freedom – variables/parameters used•Robustness test•Turnover consistence – Alpha turnover and lookback parameters should be consistent with data frequency•Sub-universe performance consistency •Parameter sensitivity•Consistent performance across years•Long/Short Alpha•OS/IS Ratio•Single stock exposurex

Datasets

Data CategoriesPrice Volume•Price volume refers to the relationship between the price of a security and the corresponding trading volume.•It helps analyze the market dynamics and investor sentiment associated with a particular security or market.Fundamental•Fundamental analysis involves evaluating the intrinsic value of a security by examining its underlying factors.•It considers financial statements, industry trends, management quality, competitive landscape, and macroeconomic factors to assess the investment potential of a security.Earnings Estimates•Earnings estimates are forecasts made by analysts or financial institutions of the expected earnings of a company.•They offer financial performance insights and growth prospects of a company, and are often used in valuation models.Options•Options are financial derivatives allowing the buyer the right [not the obligation] to buy or sell an underlying asset at a predetermined price within a specified timeframe.•Options are used for various purposes, including hedging, speculation, and generating income.Derived Risk Factors•Derived risk factors are additional risk measures or indicators that are derived from other primary risk factors.•They help in assessing and quantifying the potential risks associated with an investment or portfolio.

Price Volume•OHLCV data•High frequency data•Recorded daily and intraday 1 minute bars as well•Some of the possible alpha ideas•Technical Indicators•Various types of indicators to capture trend/flows/oscillations•Reversion•Normally works better on shorter duration with sector/industry neutralization•Works better on large cap stocks•Momentum•Normally works better on longer duration with sector/industry group momentum•Works better on midcap stocks•Regression/ML•can be used to predict return/price/volume trends•Lead lag across stocks•Large cap or liquid stocks might lead midcap or illiquid stocks within same sectors/industry

Fundamentals•Relatively low frequency data•Quarter/annual frequency•Magnitude and units can be different so look for normalizing data to compare across stocks/sectors•Data Subcategories•Income Statement•Quarterly release •Sales/Profit/EBITDA growth along with expectations•Balance Sheet•Annual Data•Can track various fundamental ratios like ROE, Asset Turnover, Debt Equity etc•Cash Flow •Operating, Free cash flow etc•Ratios•Custom ratios can be created - such as divide by Mcap - to normalize the data•Ratios to capture Quality, leverage, growth etc•Combined with Price Volume Data to create multi factor models•

Earnings Estimates•Analyst consensus estimates of future earnings and price performance•Subcategories•Price Target•Expected price target of stock over next 1 year horizon•Rating on stocks•Buy/Sell rating of the stock•Sales/EPS/EBITDA estimates•Quarterly and year both•Alpha construction•Estimates are relatively higher frequency data and shall be updated almost daily•Estimate can lead fundamentals/price factors•Can look for various

estimates to understand sense of relative growth•Estimates can be used in conjunction with PV and fundamental datax

Options•High frequency data •Options provide huge leverage to traders/speculators•Data can possibly lead price data and give indication of flows•The data consists of a matrix/surface of virtual options contracts•Expiries(in weeks) – 6, 12, 18 , 36 ,73, 146•Deltas – 0.1 , 0.25, 0.5 , 0.75 , 0.9 •For each of these options there are 4 fields:•Implied Volatility, Premium, Strike price, Dispersion (Accuracy measure)•Possible Alpha ideas•Put call ratios of IV•Volatility skew/smile for call and puts•Comparing put calls across expiries•Changes in IV•Comparing HV with IVx

Derived Risk Factors•Known risk factors derived from fundamental, PV, Estimates etc., data•Examples of risk factors•Momentum•Various indicators to capture like 52W high, 250/120/60 day returns•Growth•Earnings/sales growth•Value•PE/PS/EV/EBITDA/PB•Size•Market cap, analyst coverage, turnover etc•Quality•Earnings quality factors like ROE, ROA, ROCE, CFO etc•Reversion•5/20 day returns/volume•Leverage•Debt/Equity, Beta, volatility etcRisk factors can also be used to enhance existing alpha:-Existing alpha score can be modified by risk factor.For example: multiply reversion score by mcap rank as reversion might work better on large cap stocksx

## AlphaVerse

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# Alpha Research & Data Analysis

Introduction and brief discussion

# Alpha Research & Data Analysis

GOAL: To distribute capital among a group of selected financial instruments that ensure high risk-adjusted returns over benchmarks Alpha is a mathematical expression that determines what is proportional to the capital allocated for the stock on that particular day. It transforms the input data into a matrix equal to the positions taken for the day.Each alpha would be a 2-D matrix, columns being symbols to trade on and rows being timestamps.

```
timestamp         Symbol_1   Symbol_2   Symbol_3   ...   Symbol_5863  Symbol_5864  Symbol_5865  Symbol_5866
---                                                       ---          ---          ---          ---
datetime[ns]      f64        f64        f64              f64          f64          f64          f64

2016-01-04 09:30:00  38.70533   9.679207   30.67      ...   null         null         9.66         null
2016-01-05 09:30:00  38.591156  9.240149   30.879999  ...   null         null         9.26         null
2016-01-06 09:30:00  38.743389  8.581565   29.950001  ...   null         null         9.11         null
2016-01-07 09:30:00  37.10688   8.252272   29.6       ...   null         null         8.75         null
...                  ...        ...        ...        ...   ...          ...          ...          ...
2021-12-27 09:30:00  158.740005 59.790001  null       ...   7.14         15.82        3.15         10.49
2021-12-28 09:30:00  159.149994 59.220001  null       ...   7.09         15.75        3.0485       10.05
2021-12-29 09:30:00  160.669998 59.639999  null       ...   6.55         15.21        2.9          9.97
2021-12-30 09:30:00  160.830002 59.220001  null       ...   6.77         16.18        2.91         10.19
```
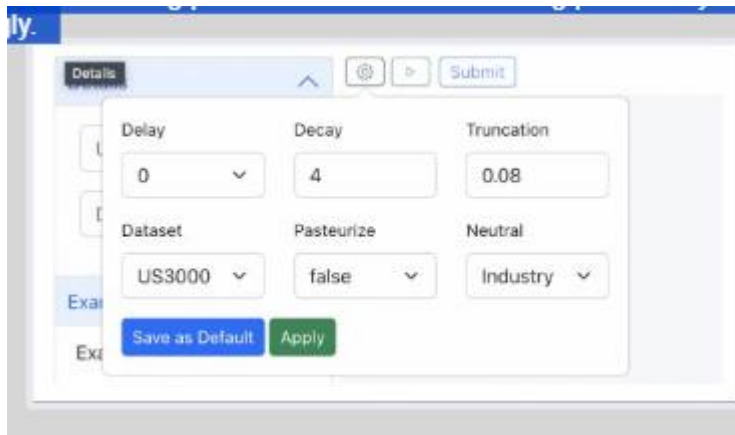
# Importance of Alphas

Alphas represent the excess return of an investment over its benchmark,Alphas are a measure of the value that a portfolio manager adds through their investment decisions Creating Alphas:1.All alpha expressions must be declared $alpha = <final\_expression>$2.The platform supports time-series and cross-sectional operations on the fields          a) Provides predefined fields and functions          b) Defines custom functions using Python, NumPy, and Pandas (versions 3.8, 1.23.5, and 1.5.2 respectively).3. User can select different settings for each alpha ( settings panel on the top left hand corner) • Universe • Delay • Decay • Pasteurize • Neutral• Truncation4. Test Period: From 2016-01-01 till 2021-12-31Let's understand different metrics used to evaluate the performance of an Alpha - Sharpe Ratio, Information Ratio, and Drawdown. Also, sharing an overview of the different charts and graphs that can be used to visualize the results.

# ALPHA SETTINGS

DECAYCombines current and decayed value for past 'decay' days to consider past performance and prevent sudden changes in strategy.TRUNCATIONLimits investment in an instrument to control risk.DATASETFixed set of trading instruments for the simulation.PASTEURIZEReplaces invalid data with NaN to ensure valid data for trading instruments is consideredNEUTRALTransforms alpha to have no net exposure towards the market/sector, reducing risk.DELAYConsiders lag in data availability for trading decisions, either Delay 0 or Delay 1 simulation

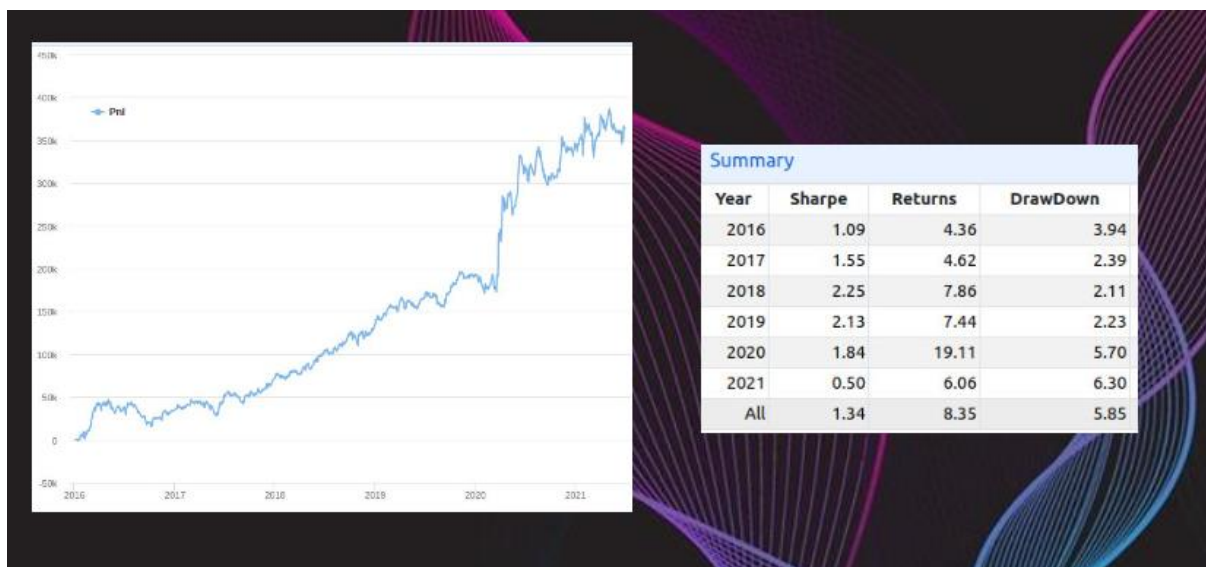# TRAINING SERIES : Use Of Basic Alphaverse Operators & Parameters

Let's start with a hypothesis of a stock showing bearish sentiment for the last week implies bullish sentiment in the coming month. To implement the above idea, we can start with a bunch of operators in the help-sectionLet's start with simpler versions: alpha = -1 * ts_delta(close , 5)The above alpha uses a time - series operator which subtracts the closing price of a stock with its closing price 5 days before. The settings for the alpha can be selected accordingly. We can simulate the alpha and see the results.





| Year | Sharpe | Returns | DrawDown |
|------|--------|---------|----------|
| 2016 | 1.09 | 4.36 | 3.94 |
| 2017 | 1.55 | 4.62 | 2.39 |
| 2018 | 2.25 | 7.86 | 2.11 |
| 2019 | 2.13 | 7.44 | 2.23 |
| 2020 | 1.84 | 19.11 | 5.70 |
| 2021 | 0.50 | 6.06 | 6.30 |
| All | 1.34 | 8.35 | 5.85 |

The idea can be improved by changing new parameters or we can also use the functions by making it robust. The alpha can be made more robust by negating small changes. This can be done by cs_rank operator with ranks the alpha cross-sectionally across all the groups for each dayalpha = cs_rank(-1*ts_delta(close , 5))We can simulate the alpha and see the results!
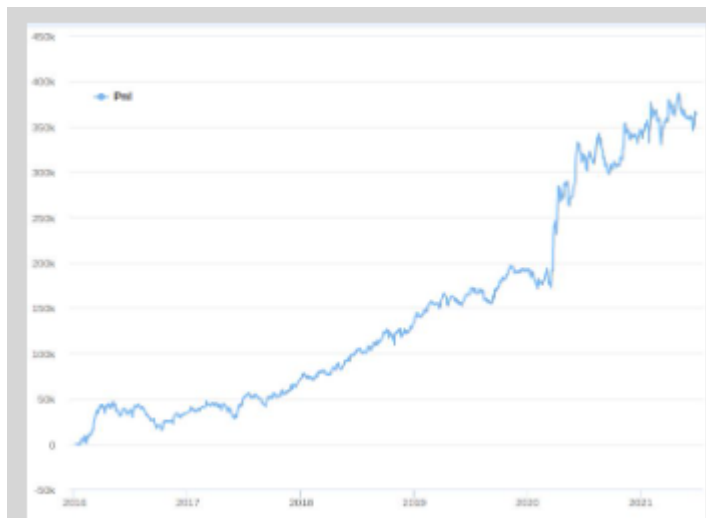
| Year | Sharpe | Returns | DrawDown |
|------|--------|---------|----------|
| 2016 | 0.54 | 2.26 | 3.65 |
| 2017 | 1.40 | 3.51 | 1.75 |
| 2018 | 1.91 | 5.12 | 1.56 |
| 2019 | 2.01 | 6.44 | 2.29 |
| 2020 | 2.60 | 25.14 | 4.24 |
| 2021 | 0.31 | 3.57 | 3.85 |
| All | 1.46 | 7.98 | 4.23 |

On submission each alpha is tested for sub-universe check and if it passes, OS-test is performed on it.All testing statuses can be seen on the Alphas page



# Operators

Operators are a set of mathematical functions used to analyze financial data and generate investment signals. We provide different types of operators you can play with: - Vector operators - Arithmetic operators - Cross sectional operators - Group operators - Logical operators - Mathematical operators - Time series operatorsEach operator has its own benefits. For example: - Momentum: Measures the rate of

change of an instrument's price over time.                    - Correlation: Measures the degree of similarity between two instruments' price movements

Correlation Operator: Used to measure strength of the linear relationship between two variables. It calculates the covariance between two variables and divides it by the product of their standard deviations. This produces a value between -1 and 1; where a value of 1 indicates a perfect positive correlation, a value of -1 indicates a perfect negative correlation, and a value of 0 indicates no correlation.Ex : alpha = ts_corr(ts_rank(high , 20) , ts_rank(volume , 20) , 20)Rank Operator: Assigns a rank to each value in a set. It can be used to identify outliers or rank stocks based on their performance. This operator helps spot the best-performing stocks or identifying potential risks.Ex : alpha = -1*(ts_rank(high , 20) - ts_rank(low , 20))Scale Operator: Standardizes a set of values by subtracting the mean and dividing by the standard deviation. This allows different data sets to be compared on a common scale.Ex : alpha = -1*cs_rank(ts_delta(close , 5))Group Mean Operator: Calculates the mean of a set of values within a group. It can be used to group stocks by sector and calculate the mean performance of each sector.Ex: alpha = group_rank(close , sector)Ultimately, these operators are essential tools in quantitative finance to analyze large and complex data sets. By understanding and utilizing these operators effectively, analysts can gain valuable market trend insights and make informed decisions.

Lets try out an idea using the different operators:HYPOTHESIS: If a stock has closed below its open price more frequently in the past month than in the past year, there is a possibility of a price reversal, potentially leading to a short-term increase in the stock price.IMPLEMENTATION: To implement this strategy, one should buy more shares of stocks that have experienced such occurrences more often (measured by "ts_sum") in the last 20 days compared to the previous 250 days.ALPHA: val1 = (open - close) > 0val2 = (open - close) < 0alpha = ts_sum( val1 , 20) / ts_sum(val2, 20)



| Summary | | | |
| --- | --- | --- | --- |
| Year | Sharpe | Returns | DrawDown |
| 2016 | 3.09 | 15.13 | 1.77 |
| 2017 | 1.57 | 4.22 | 1.83 |
| 2018 | -1.05 | -2.58 | 3.43 |
| 2019 | 1.98 | 7.31 | 3.00 |
| 2020 | 1.12 | 23.04 | 13.70 |
| 2021 | 2.59 | 17.16 | 2.48 |
| All | 1.15 | 9.94 | 13.78 |

# Introduction to Time-Series Operators

Time-series operators are mathematical or statistical functions used to analyze time-series data, which is data that is recorded over time at regular intervals.1. Helps identify patterns and trends in time-series data         a. Provide insights into market movements        b. Help make predictions about future trends2. Examples:        a. Moving Average        b. Exponential Moving Average        c. Rank operators3. Each operator has its own unique strengths and weaknesses, depending on the type of data being analyzed and the desired outcomes.
a. Eg: MA is typically used to smooth out short-term fluctuations and identify longer-term trends in the data.
b. EMA gives more weight to recent data points, making it better suited for short-term predictions.         c. Rank operator assigns a rank to each value in a set. This operator is particularly useful for identifying outliers in the data and ranking stocks based on their performance.
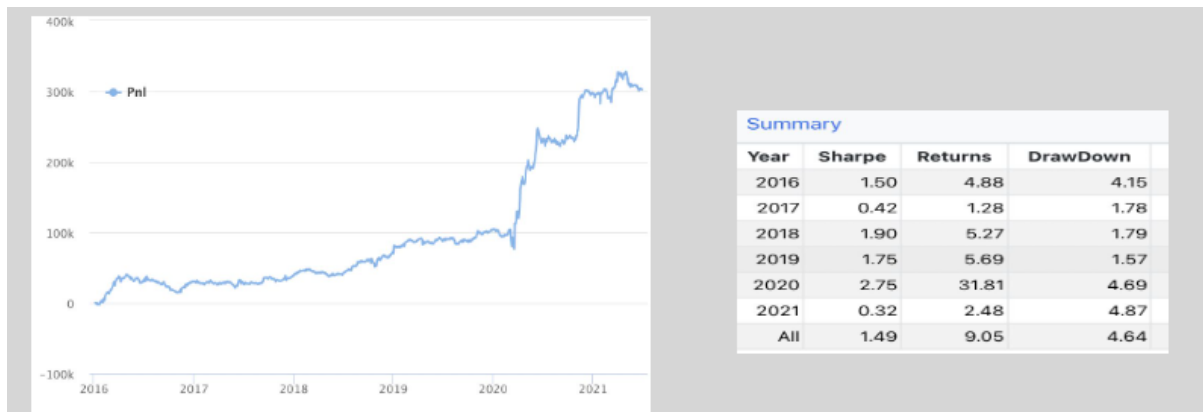
# Arg-max and Argmin operators

●"argmax" and "argmin" are operators used to identify the time points at which a given time series achieves its maximum or minimum value, respectively.●The "argmax" operator returns to the time point at which the time series reaches its highest value, whereas the "argmin" operator returns the time point at which the time series reaches its lowest value.●These operators help identify optimal times for trading or making investment decisions based on historical data.Overall, understanding the "argmax" and "argmin" operators in time series analysis will offer traders and investors valuable insights based on historical data.Lets tryout same alphas with arg-max and arg-min operatorsHypothesis: A potential future outcome is that a company's stock price may decrease if it has experienced an increase in the past two days.alpha = cs_rank(-1*ts_delta(close , 2))



| Summary | | | |
|------|--------|---------|----------|
| Year | Sharpe | Returns | DrawDown |
| 2016 | 1.50 | 4.88 | 4.15 |
| 2017 | 0.42 | 1.28 | 1.78 |
| 2018 | 1.90 | 5.27 | 1.79 |
| 2019 | 1.75 | 5.69 | 1.57 |
| 2020 | 2.75 | 31.81 | 4.69 |
| 2021 | 0.32 | 2.48 | 4.87 |
| All | 1.49 | 9.05 | 4.64 |

What can be a possible improvement?Improvement: When multiplying by rank (volume/average volume over last 30 days), it increases the number of long/short (buy/sell) stock positions with higher volume today in comparison to the preceding 30-day period.Try this possible improvement and check how the alpha perform( alpha = -rank(ts_delta(close,2)) * rank(volume / ts_sum(volume, 30) / 30))

# Max and min operators

- The "max" operator identifies the maximum value of a time series, while the "min" operator determines the minimum value of a time series. - These operators are helpful in identifying the highest and lowest values of a time series, which can provide useful insights for traders and investors- To use the functions with above functionalities, users can use ts_max , ts_min operators or they can use ".rolling" method to identify the maximum value of a time series over a specific period of time. - Similarly, the "min" operator can be used with the ".rolling" method to identify the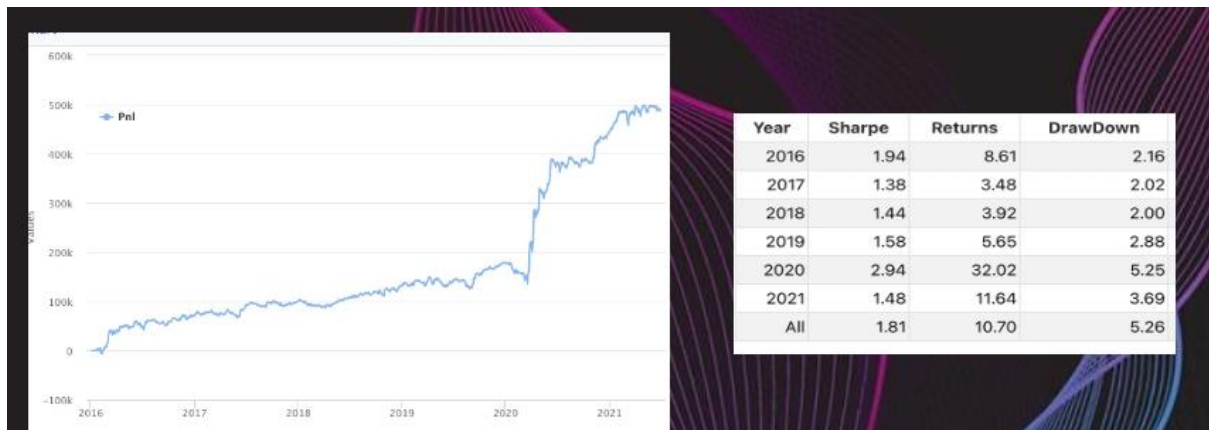 minimum value of a time series over a specific period of timeLets try an idea with the above operator:Hypothesis: A stock has higher probability of reversion if the difference between the close price today and min price of close for last 10 days is large . This is because investors have acquired profit and will try to square of positions.val = close - ts_min(ts_exp_mean(close , 10))alpha = cs_rank(val)

| Year | Sharpe | Returns | DrawDown |
|------|--------|---------|----------|
| 2016 | 1.94 | 8.61 | 2.16 |
| 2017 | 1.38 | 3.48 | 2.02 |
| 2018 | 1.44 | 3.92 | 2.00 |
| 2019 | 1.58 | 5.65 | 2.88 |
| 2020 | 2.94 | 32.02 | 5.25 |
| 2021 | 1.48 | 11.64 | 3.69 |
| All | 1.81 | 10.70 | 5.26 |

# Performance Parameters

RETURNS: Measure of gain or loss on an investment portfolio expressed as a % of invested capital . SHARPE: Measures the risk-adjusted return of the investment strategy, Returns: Total Pnl generated by the alpha with respect to the booksize (1 million $)BPS: Observed loss from a peak to a trough of a portfolio, before a new peak is attainedTURNOVER: Rate at which assets in a fund are bought and sold. We compute the absolute sum of total transaction with respect to the booksizeChoice of performance parameter for an alpha- Depends on the investment strategy and the goals of the investor.- Provides useful information for evaluating its effectiveness in achieving the desired investment objectives.

# SIMULATION PARAMETERS

"Unlocking Insights: Unveiling the Impact of Parameters on Results"



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The platform offers a range of simulation settings that allow traders and investors to customize their strategies for optimal performance. These settings provide the flexibility required to adapt strategies to different market conditions and risk preferences.List of different settings: 1. Dataset2. Delay3. Neutral4. Truncation5. Pasteurize6. Decay Simulation Parameters

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The dataset here refers to the collection of trading instruments (such as stocks) that are available for analysis and investment. The "Universe" represents the specific set of instruments that are being considered for trading. In the below example, "US3000" represents the top 3000 most liquid stocks in the US market, which would make up the symbols we trade.We provide 3 different datasets (US1000 ,US2000 ,US3000) where users can backtest their strategies. It is expected for strategies to perform worse in smaller alphas, however if an alpha performs significantly worse, it implies that the alphais overfitted to few

instruments. DATASET

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Delay in trading strategies refers to the time gap between the availability of market data and the point at which trading decisions are executed. It reflects the real-world scenario where traders have to base their decisions on historical data and may not have immediate access to the most recent information.In the context of Delay 1 simulation, strategies are formulated using data up to the previous day's information. For instance, when trading stocks, the decisions are made based on the data available up until the previous day.The actual execution of these decisions, known as taking positions,occurs on the subsequent day. This introduces a one-day lagbetween decision-making process and the action taken in

market. DELAY

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Neutralization, in trading strategies, aims to minimize biases and exposures to specific market or sector influences. It ensures that the strategy's performance is not overly influenced by external factors and provides a foundation for risk management.Our platform provides five different neutralization options:1.Market2.Sector3.Industry4.Sub-Sector5.Sub-IndustryFor instance when the alpha is market neutralized the alpha is adjustedby subtracting the mean alpha value across all instruments. Neutralized Alpha = Alpha - Mean(Alpha) The outcome of this operation offers the strategy's overall exposure to the broader market being diminished, contributing to reduced risk. NEUTRAL

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This parameter allows to exert control over the maximum amount of investment allocated to a specific trading instrument. It sets a limit on the percentage of a portfolio that can be invested in a single instrument.Consider a scenario where truncation is set at 0.04 (or 4%). This implies that no more than 4% of the total investment can be allocated to a single instrument. If the strategy aims to invest in a particular stock, its allocation cannot exceed 4% of the entire portfolio.Truncation is used to manage risk and promote diversification. By placing an upper limit on individual allocations, this metric ensures thatportfolios are not excessively concentrated in single instrument. This approach reduces the potential impact of poor performanceby any one of the the assets on the overall portfolio. TRUNCATION

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Pasteurize on being set to True replaces input values with "nan" (not a number) when a particular trading instrument is not actively traded within the current universe or dataset.The primary goal of pasteurization is to ensure consistent and reliable analysis, even in cases where specific trading instruments are missing from the dataset. By replacing missing values with "nan," pasteurization prevents these absent instruments from skewing the results of calculations and analyses.For example, if a trading strategy involves a specific stock that isnot a part of the current universe being traded, pasteurizationwill replace the absence of trading data for that stock with "nan."This treatment isolates the impact of missing data, maintainingthe integrity of calculations that involve other traded instruments.PASTEURIZE

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Decay is a mechanism used to adjust the influence of past data on a trading strategy calculations. It involves applying a linear reduction in the significance of historical data over a specified number of days.When decay is applied, today's alpha value is combined with the decayed values of the previous days. The degree of decay is determined by the number of days specified ('decay' days). By intelligently applying decay, traders can mitigate the impact ofexcessive alpha turnovers and enhance strategy stability.DECAY

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Let us analyze the impact of altering the simulation parameters on resulting outcomes . The two tables presented below feature identical alphas and settings, differing only in the neutral selection of industry in Table 1 and sub-industry in Table 2. Upon scrutinizing the Sharpe ratios for both tables, it becomes evident that significant disparities arise in sharpe for the years 2013, 2016, 2018, and 2019. This observation underscores the notion that even minor adjustments to settings yield substantial variations in outcomes.Notably, Table 1 demonstrates more consistent outcomes, predominantly evaluating Sharpe ratios greater than 1 across multiple years, thus affirming its comparative stability in terms of Sharpe-based analysis.TABLE- 1TABLE-2FINE TUNING ALPHAS

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# ALPHA EXECUTION After

## Executing Alpha: The Subsequent Steps Unfold

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Users can create their own alpha strategies using a code editor within the platform. Once satisfied, users can customize the settings to align with specific requirements. When ready, simply click on the 'Run' button to kickstart the simulation.During the simulation process, the platform performs essential checks to ensure the integrity of the strategies. CHECKS 1 . Lookahead Check: This test prevents from using future data to develop alpha strategies. It's important since in actual trading we can't predict future data at the time of decision-making.2. Dimensionality Check: This test is a crucial step in our simulation process, ensuring that arithmetic operations involving two fields or functions are meaningful and accurate.If all the above tests are
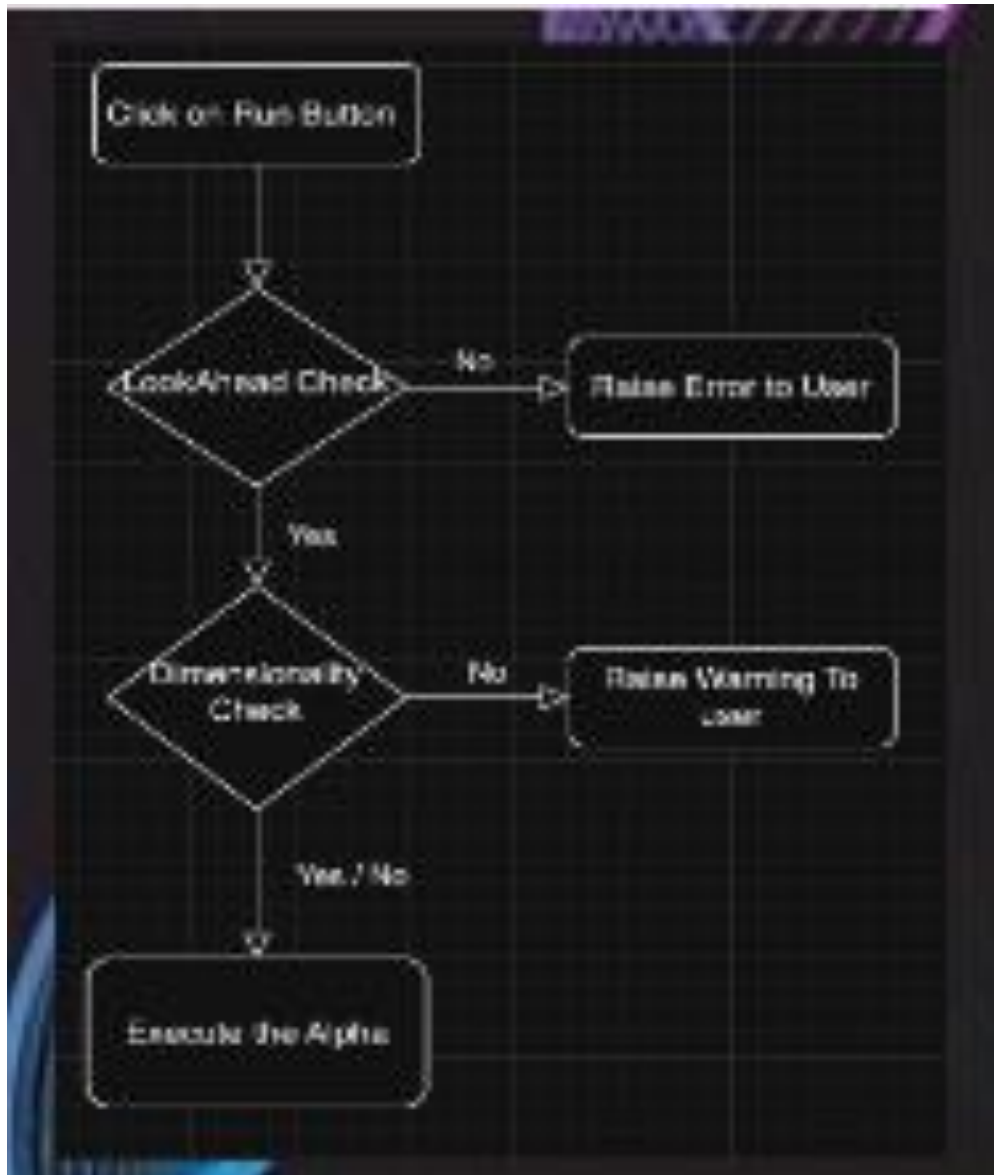
passed, the alpha is submitted for backtesting from a period of 2012-2019. STEPS FOLLOWING ALPHA EXECUTIONX

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LOOKAHEAD TEST : The lookahead test is a mechanism to prevent the use of future data when creating alpha trading strategies. Using future data to create strategies would lead to unrealistic results because in real trading, future data is unknown at the time of decision-making. By ensuring that users don't use data from the future to formulate their strategies, the platform helps maintain the integrity of simulations.Let us observe the outcomes that transpire upon the execution of an alpha with lookahead in it.

DIMENSIONALITY CHECK : During the development of alpha trading strategies, we often perform arithmetic operations on different variables or functions. However, it's essential to verify that these operations are valid and aligned in terms of their units and dimensions. In other words, we want to avoid situations where we're adding or subtracting values that aren't compatible in terms of their units or interpretations.In such cases we are warning the users. Let us observe the outcomes that transpire upon the execution of a dimensional incompatible alpha.

# METRICS AND PLOTS
Elevating Your Investment Game with Numbers that Matter

## METRICS

SHARPE: Sharpe ratio, is used to assess the risk-adjusted performance of investments or portfolios. It takes into consideration both the return generated by an investment and the amount of risk associated with achieving that return.Formula : sharpe = mean(returns)/std(returns)RETURNS: It refers to the gains or losses generated by an investment over a specific period of time. Returns can be expressed as a percentage or a monetary value, and they reflect the change in value of an investment. Formula : returns = pnl / Investment * 1/years

DRAWDOWN:This matrix refers to the peak-to-trough decline in the value of an investment or portfolio over a specific period of time. It represents the extent to which the investment's value has decreased from its previous high point (peak) before eventually recovering. Drawdowns are often used to measure the risk and potential losses associated with an investment.TURNOVER: Parameter referring to the ratio of average traded amount per day with the booksize. Turnover is often used as a measure to assess the trading activity or the level of trading within a portfolio. It can be expressed as a percentage and provides insights into how actively the portfolio manager is managing the assets.BASIS POINTS: "Basis points," often abbreviated as "bps," are a common unit of measurement used in finance to describe small percentage changes or differences in interest rates, yields, and other financial metrics. One basis point is equal to one one-hundredth of a percentage point, or 0.01%. In our context it refers to average pnl gained for every 10000 dollars traded.

LONGNUM: "Longnum" represents the average number of stocks or securities in which a trader or investor has taken a long position. A "long position" refers to the ownership of an asset with the expectation that its value will increase over time, allowing the investor to profit from the price appreciation.SHORTNUM: "Shortnum" represents the the average number of stocks or securities in which a trader or investor has taken a short position. A "short position" involves borrowing and selling an asset with the expectation that its value will decrease over time.

Analysis Plots

DRAWDOWN PLOT:A drawdown plot is a powerful visualization tool used in finance to depict the performance trajectory of an investment portfolio over a specific time period. It offers insights into the extent of losses suffered by the portfolio from its previous peak value. Drawdown plots are essential for assessing risk tolerance, analyzing investment strategies, and understanding the impact of market fluctuation.MONTHLY HEATMAP RETURNS PLOT:It is a visual representation to display the performance of various assets, such as stocks, indices, or mutual funds, over the course of multiple periodics. This type of plot provides a quick overview of how different assets have performed each month and allows easy comparison of returns. This type of visualization is useful for identifying seasonal trends, market anomalies, and potential correlations between different assets. It allows investors and analysts to make informed decisions based on historical performance patterns.

PnL HISTOGRAM:A "PnL Histogram" is a graphical representation of the distribution of profits and losses (PnL) from a trading strategy, portfolio, or investment over a certain period of time. It provides a clear visual representation of how profits and losses are distributed across different ranges or bins. PnL can reveal anomalies in the trading results.SECTOR PERFORMANCE:It refers how different sectors within an economy or financial market are performing over a specific period of time. In the context of finance, sectors represent distinct segments of the economy that consist of companies engaged in similar businesses or industries.

# DEcay

FACTOR LOADING:It measures the sensitivity of an asset's returns to a specific factor. Factors are underlying variables or drivers that influence the returns of various investments. It's a measure of how much an asset's return is impacted by changes in the factor being analyzed. A positive factor loading indicates that the asset tends to move in the same direction as the factor, while a negative factor loading suggests an inverse relationship.LONG-SHORT ALPHA:It helps to analyze and understand the relative performance contributions of the long and short sides of the strategy.If the majority of the alpha generated in a trading strategy is coming from short positions, it can indeed present challenges in terms of execution and feasibility. Even if short positions are available, executing short trades can be more complex and time-consuming compared to long trades. Finding suitable lending partners and managing the logistics of shorting multiple stocks can be challenging.

# CRITERIAS FOR ALPHA SUBMISSION

Submitting an alpha involves a meticulous evaluation process, where specific test cases act as checkpoints to ensure the robustness and viability of your strategy. Here's a breakdown of the essential conditions your alpha needs to satisfy:1.Sharpe Ratio Test2.BPS Test3.Turnover Test4.Weight Concentration Test5.Global Correlation TestBy meeting these criteria, an alpha demonstrates its potential to be a valuable addition to the platform's collective strategies. These tests safeguard against common pitfalls while promoting diversity among strategies and enhancing the probability of generating meaningful and unique insights.

SHARPE RATIO TEST:Sharpe Ratio is a measure of risk-adjusted return, indicating how much return an investment generates for each unit of risk it carries. Different market segments have varying requirements:BASIS POINTS TEST:Basis Points (BPS) serve as a metric to gauge the profit and loss generated in relation to each $10,000 traded. When the BPS value reaches 3 or higher, it signifies a positive connection between trading activity and earnings. This highlights a beneficial outcome on a per-dollar basis, especially after transaction costs have been accounted for. In essence, a BPS value of 3 or above reinforces the notion that the alpha strategy is yielding meaningful returns after considering trading expenses.

TURNOVER TEST:Turnover refers to the frequency of buying and selling assets within the portfolio. To strike a balance between transaction costs and strategy activity, the turnover rate should fall between 1 and 70. This range ensures effective trading while managing costs.Note: A high Sharpe ratio might indicate strong risk-adjusted returns, it doesn't necessarily guarantee a profitable strategy when transaction costs are factored in. A strategy with high turnover but high Sharpe ratio could incur substantial transaction costs that may outweigh its potential gains. This underscores the importance of considering both risk-adjusted returns and transaction costs when assessing the viability and profitability of a strategy.WEIGHT CONCENTRATION TEST:This check ensures that your alpha avoids an excessive concentration of weight on any single asset. Concentrating too much on one asset can increase vulnerability to its specific risks. A diversified approach mitigates this risk and enhances the overall stability of your portfolio.x

CORRELATION TEST:Correlation measures the statistical relationship between two variables. In the context of alphas, a correlation below 0.7 is required. This stipulation safeguards against overly similar strategies that might contribute to a lack of diversification in your portfolio.It's vital to highlight that the correlation calculation encompasses all alphas submitted by all users. This collective assessment ensures that the overall pool of strategies remains diverse and distinct, enhancing the effectiveness and resilience of the entire trading ecosystem.After an alpha has successfully passed all the requisite tests, users can proceed to click the "Submit" button. However, the journey of the submitted alpha doesn't end there. It progresses through a series of steps to ensure its robustness and suitability for scoring:1.Sub-universe test2.OS-testAmong the submitted alphas, those that have successfully passed the tests and have generated OS test results are considered for scoring.

SUB-UNIVERSE TEST:Its primary objective is to ensure that the profitability of your alpha isn't predominantly driven by illiquid instruments. This essential evaluation helps filter out potentially skewed results that could arise from trading in less liquid instruments.When you submit an alpha, the sub-universe test comes into play by analyzing the profit and loss (PNL) generated by your strategy. By conducting this assessment, the sub-universe test guarantees that your alpha's effectiveness remains consistent across a broader array of equities, reinforcing its robustness and applicability. As a result, your alpha is positioned to deliver reliable performance across varying market conditions, contributing to your overall trading success.DIMENSIONALITY CHECK: The out-of-sample (OOS) test is a pivotal stage in assessing the reliability and real-world adaptability of your alpha strategy. This evaluation ensures that your strategy's performance isn't a product of overfitting to historical data, but rather holds its ground when exposed to new, unseen market conditions.When you subject your alpha to the OOS test, the platform examines how well your strategy performs on data that falls outside the timeframe it was initially developed on. his safeguard against overfitting enhances the confidence in your alpha's potential to navigate real-time trading challenges and deliver consistent results, ultimately bolstering your investment strategies' effectiveness.x

# ENHANCING ALPHAS A Multi-Faceted Approach

## COMBINATION OF FACTORS

Singular factors can only unveil part of the market's complexity. By combining factors like reversion, momentum, growth, quality, and others, we tap into a broader spectrum of insights.Different factors capture

diverse aspects of market behavior. Synergizing these factors will create models that harness multiple dimensions of data, leading to more accurate predictions.Each factor might contain noise specific to its dataset. When combined, noise cancellation can occur, yielding more reliable signals and reduced volatility in alpha performance.

# SPECIALIZED CONDITIONS FOR IMPROVEMENT

To provide a specific example, let's direct our attention towards enhancing reversion alphas.Reversion alphas tend to shine when applied to stocks with significant market capitalization.Larger companies may exhibit stronger tendencies to revert their average values, creating favorable conditions for reversion strategies.Stocks traded frequently – ones with substantial trading volumes – can provide more reliable signals for reversion strategies. Increased trading activity enhances the chances of price corrections towards their average values.Stocks experiencing elevated implied volatility, indicating larger price movements, offer fertile ground for reversion alphas. These price fluctuations may trigger reversions back to the mean, aligning with the strategy's core principles.

# FUNDAMENTAL FACTORS AS FILTERS

In the realm of alpha strategies, fundamental factors act as filters that refine your strategies and guide you to the most promising opportunities.Fundamental metrics like price-to-earnings (P/E), price-to-book (P/B), and debt-to-equity ratios act as filters that add insightful layers to your alpha strategies. Imagine you're seeking high-growth stocks. By incorporating fundamental factors like high P/E or P/B ratios, you narrow down your search to stocks that align with your target.Utilizing fundamental filters will align your alpha strategies with specific attributes, potentially improving accuracy and aligning them with prevailing market dynamics. Similar to using a magnifying glass to uncover details in a vast landscape, these filters enhance your ability to spot potential winners amid the market's complexity.

# SCORING

the ranking of users on the platform is determined by a blend of the quality and quantity of alphas they have submitted. A unique aspect that significantly contributes to the score is the originality of an alpha. This entails rewarding alphas that exhibit minimal correlation with other submitted strategies. Universe Impact: The "universe of the alpha" pertains to the set of assets or instruments your alpha is applied to. Distinct alphas might perform diversely within various universes. Alphas constructed within smaller universe sets are adjusted with a factor greater than 1. Smaller universes correspond to higher adjustment factors, thereby rewarding participants for their achievements in restricted environments.Alpha Multiplicity: Participants are motivated to submit multiple alphas to enhance their "in-sample" performance score. However, a note of caution lies in overfitting, which involves excessively fine-tuning alphas based on training data. This could compromise the "out-of-sample" performance score. Prioritizing the "out-of-sample" score ensures a fair assessment that values alphas capable of generalizing beyond training data, bolstering the reliability of the strategies on the platform.

## Score Calculation:

$$OS\_score = portfolio\_OS\_sharpe * \left( \sum_{i \in U} adj_i * frac_i \right)$$

$IS\_score$ is calculated the similarly

$$Total\_Score = (1/2 * OS\_score + 1/2 * IS\_score) * 1000$$

Where -

| Keywords | Description |
|---|---|
| $portfolio\_OS\_sharpe$ | This is the out-of-sample Sharpe ratio for the portfolio built by summing the PnL (Profit and Loss) of all the submitted alphas. |
| $adj_i$ | This represents the adjustment factor for the universe i. It is used to account for the difficulty of building successful alphas in a smaller universe. A smaller universe will have a higher $adj_i$ value, making it more challenging to achieve high sharpe values. |
| $frac_i$ | This denotes the fraction of submitted alphas that belong to universe i. |

FAQ 1.Whenistheleaderboardupdated?Ans:Leaderboardsareupdatedeveryhour.Thelastupdateispresentonthepage.2.CanIwritemyownfunctions?Ans:Yes,weallowuserstowritetheirownfunctions.Butfewthingsshouldbetakenintoaccount:-Thefunctionshouldn'tchangethefieldvariables.Ex:close=close*2-Itshouldn'tchangetheshapeofthematrix.Ex:x=close.dropna()-Eachalphaexpressionshouldhavealpha=<finalexpression>elseitwouldraiseerrordefts_sum(inp,window):returninp.rolling(window,axis=0,).sum()alpha=ts_sum(close,10)3.Isanalphaconsideredforscoringifitdoesn'tpassthesubuniversetest?Ans:Alphawhicharerejectedinsub-universetestsarenotconsideredforscoring.4.Ihavesubmittedtheexamples.Whyisthescorestill0?Ans:Wedonotconsidertheexamplesforscoring.5.Whyisthisexpressionraisinganerror?alpha=if_then_else(close>100,1,0)Ans:Alltheargumentsoftheif_then_elsefunctionshouldbeadataframewhosesizeshouldbeexactlythesameasoffieldclose.Sothecorrectexpressionwouldbe:one=pd.DataFrame(1,index=close.index,columns=close.columns)zero=pd.DataFrame(0,index=close.index,columns=close.columns)alpha=if_then_else(close>100,one,zero)

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