



Quantitative Analysis Challenge

Team 15

iiittm12-alpha1

Hypothesis

Stocks displaying recent volume momentum, lower closing prices, and revealing higher tail risk in market capitalization and returns may present an opportunity for exceptional market returns.

Alpha Expression:

```
rank(group_neutralize(rank(ts_decay_linear(volume/ts_sum(volume, 252), 20)) +rank(-ts_delta(close,20))  
+rank(ts_co_kurtosis(cap,returns, 252)), densify(pv13_h_min51_f3_sector)))
```

Simulation Settings:

Decay: 13

Neutralisation: Slow + Fast factors

Universe: Top 3000

Truncation: 0.08

■ Detailed Strategy Explanation

Volume Momentum and Decay :

- rank(ts_decay_linear(volume/ts_sum(volume, 252),20))
- Captures recent changes in trading volume, emphasizing the ratio of current volume to the sum of the previous year's volume.
 - A 20-day linear decay ensures recent trading activity holds greater weight in the ranking, providing insights into market momentum.

Recent Price Reversal :

- rank(-ts_delta(close,20))
- Identifies stocks that have experienced recent declines by calculating the difference between the current closing price and the closing price 20 days ago.
 - The ranking emphasizes recent losses, offering insights into stocks that have fallen in the past month.

Tail Correlation of Market Capitalization and Returns:

- rank(ts_co_kurtosis(cap,returns,252))
- Examines the co-occurrence of market capitalization and returns, measured by co-kurtosis over the last 252 days.
 - High co-kurtosis indicates a linked tail risk, suggesting that extreme returns coincide with significant market capitalization changes, potentially reflecting impactful news or events.

■ Detailed Strategy Explanation

Strategic Insight:

- This alpha strategy integrates insights from volume momentum, tail risk correlation, and recent price declines.
- By combining these elements, the strategy aims to provide a comprehensive tool for identifying stocks with potential momentum, tail risk sensitivity, and recent price movement, offering a nuanced perspective for strategic decision-making in dynamic financial markets.

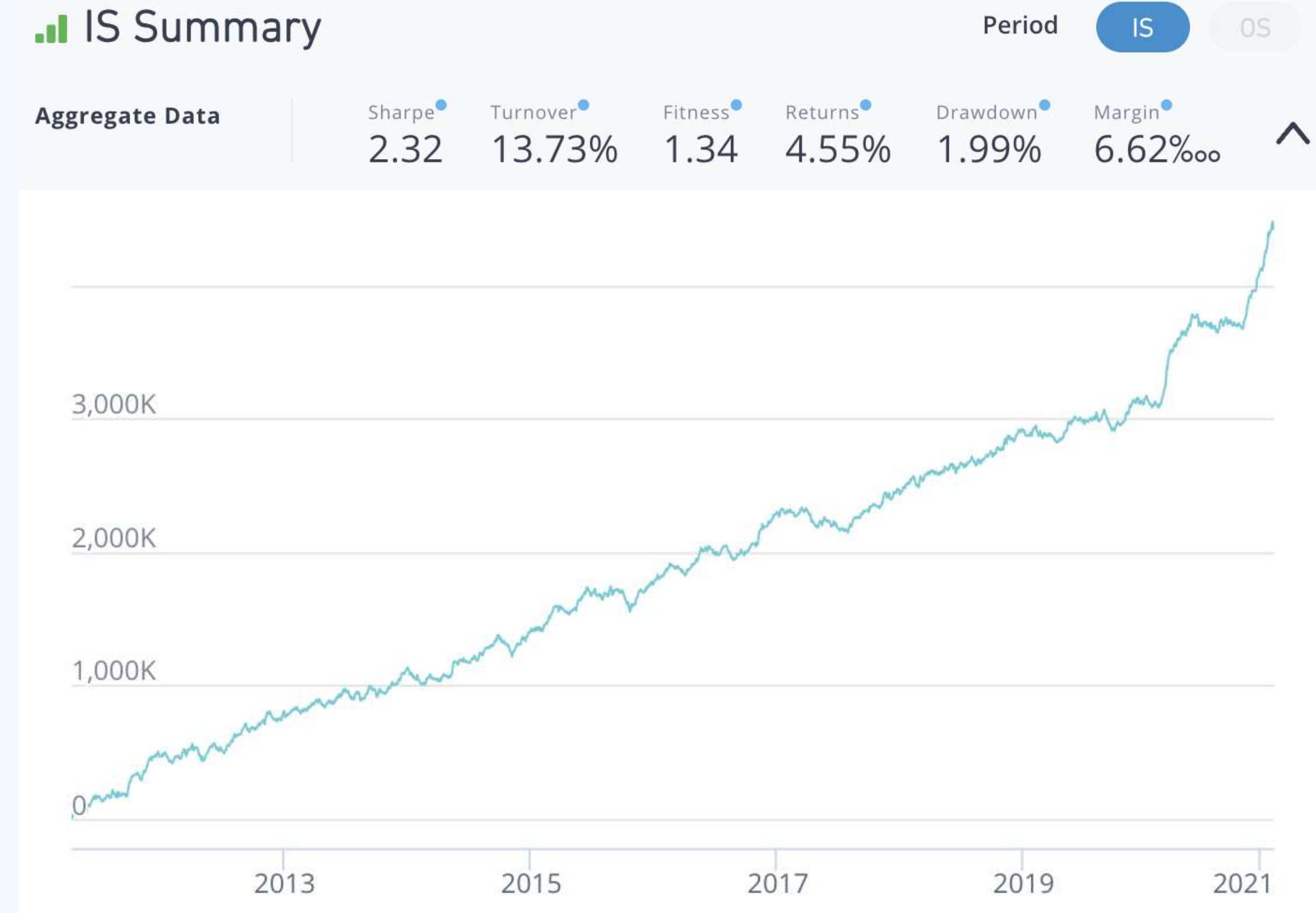
Machine Framework utilization:

- The combined alpha idea is finally neutralized against a customized grouping field from pv13 dataset obtained by comparing them using BRAIN API.

Steps to avoid overfitting:

- Implemented a careful feature selection process to include only relevant features aligned with the alpha hypothesis.
- Avoided overfitting by tuning parameters judiciously.

■ Performance Metrics



References:

Tail risk - Tail Risk in Momentum Strategy Returns by Kent D. Daniel, Ravi Jagannathan, Soohun Kim :: SSRN

Trading volume - Price Momentum and Trading Volume by Charles M.C. Lee, Bhaskaran Swaminathan :: SSRN

iiittm12-alpha2

Hypothesis

Inspired by the 'size effect' favouring smaller firms with higher risk-adjusted returns, the strategy capitalizes on increased volatility and potential downtrends to improve trading outcomes. Utilizing a moving average crossover signal, it identifies short-term trading opportunities in stocks with higher daily returns relative to market capitalization.

Alpha Expression:

```
signal = (ts_mean(close,20)/ts_mean(close,90))-1;  
trade_when(signal<0,-ts_rank(returns/cap,120),-1)
```

Simulation Settings:

Decay: 10

Neutralisation: Slow Factors

Universe: ILLIQUID_MINVOL1M

Truncation: 0.008

■ The “Size - Effect”

Theory :

The 'Size Effect' is a phenomenon observed in the stock market where the size or market capitalization of a company influences its risk-adjusted returns. Notably, smaller firms often exhibit superior risk-adjusted returns compared to larger counterparts. This suggests that factors beyond market capitalization play a significant role in determining a stock's performance.

Outperformance of Smaller Firms:

Research consistently shows that smaller firms tend to deliver higher risk-adjusted returns over time.

Implications for Trading Strategy:

Our strategy leverages the Size Effect by strategically selecting stocks based on the -returns/cap ratio, focusing on smaller firms that demonstrate superior risk-adjusted returns.

References : Shorting with size-effect

https://www.researchgate.net/publication/24070339_Short_Positions_Size_Effect_and_the_Liquidity_Hypothesis_Implications_for_Stock_Performance

■ Detailed Strategy Explanation

Signal Calculation:

- The trading signal is determined by comparing the 20-day and 90-day moving averages closing prices.
- A negative signal occurs when the 20-day average falls below the 90-day average, indicating a potential short-term downtrend.
- The signal can be used to take short position based on our alpha idea.

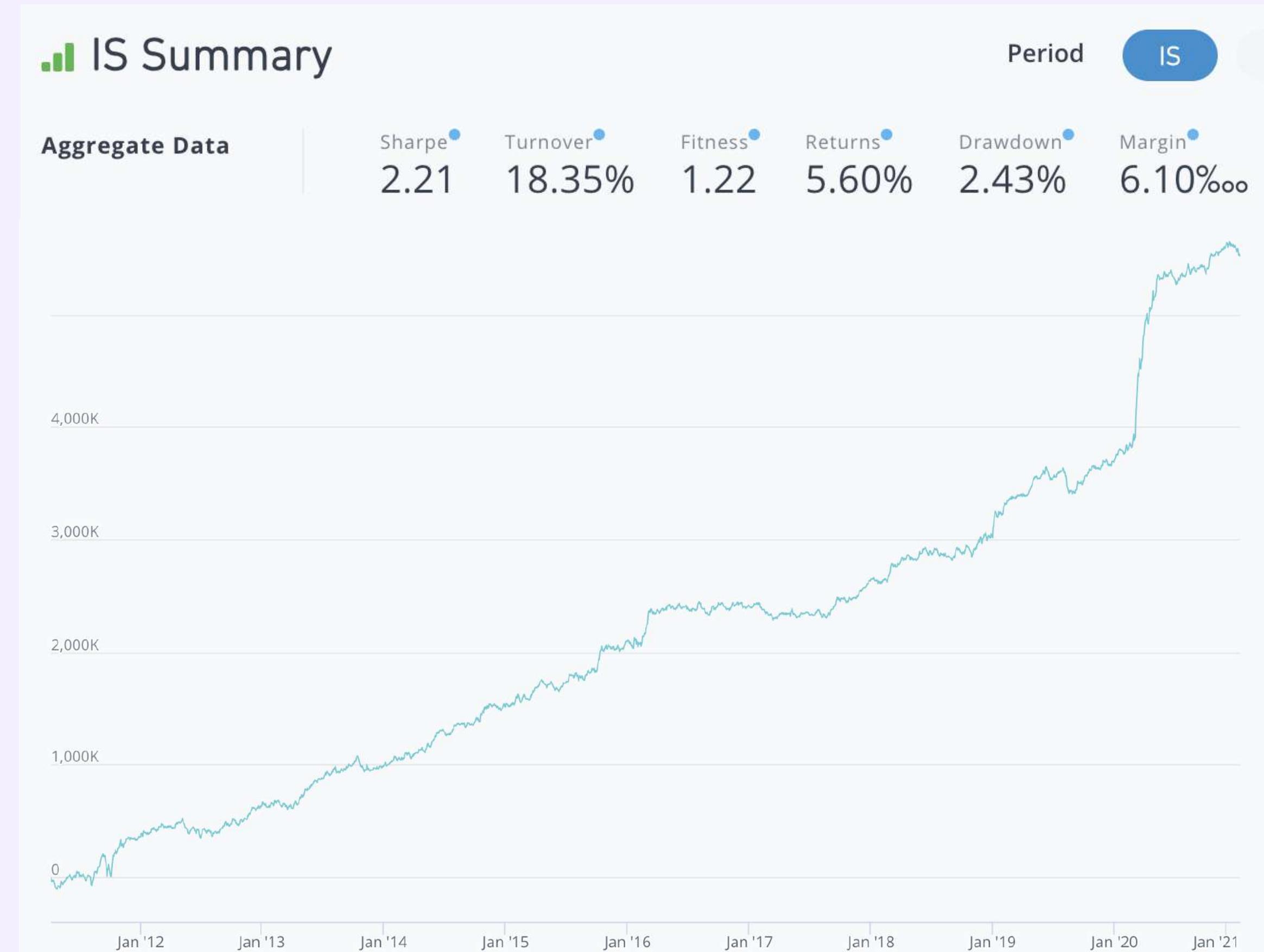
Trade Condition:

- The alpha idea involves ranking the ratio of returns to market capitalization over a 120-day period, then inverting this rank.
- The primary focus is on shorting stocks that show strong recent performance relative to their market capitalization, leveraging the negative momentum implied by the signal.

Holding Strategy:

- If the signal is not negative, the algorithm adopts a neutral position because the exit condition is false indicated by -1 in the trade_when function.
- This neutral stance is maintained until a negative signal re-emerges, at which point the trade condition is reactivated.

■ Performance Metrics



■ Performance Metrics by Visualization Tools

Sharpe Ratio by Capitalization:

- Clear trend in Sharpe ratio performance.
- Highest Sharpe ratio observed in the 0-20% capitalization range.

Alpha Validation:

- Signifies positive outcomes for our alpha.
- Affirms the strategy's efficacy, especially in smaller firms.

Hypothesis Consistency:

- Aligns with the 'size effect' hypothesis.
- Demonstrates the strategy's proficiency in generating superior risk-adjusted returns in smaller capitalization segments.



■ Performance Metrics by Visualization Tools

P&L by Capitalization:

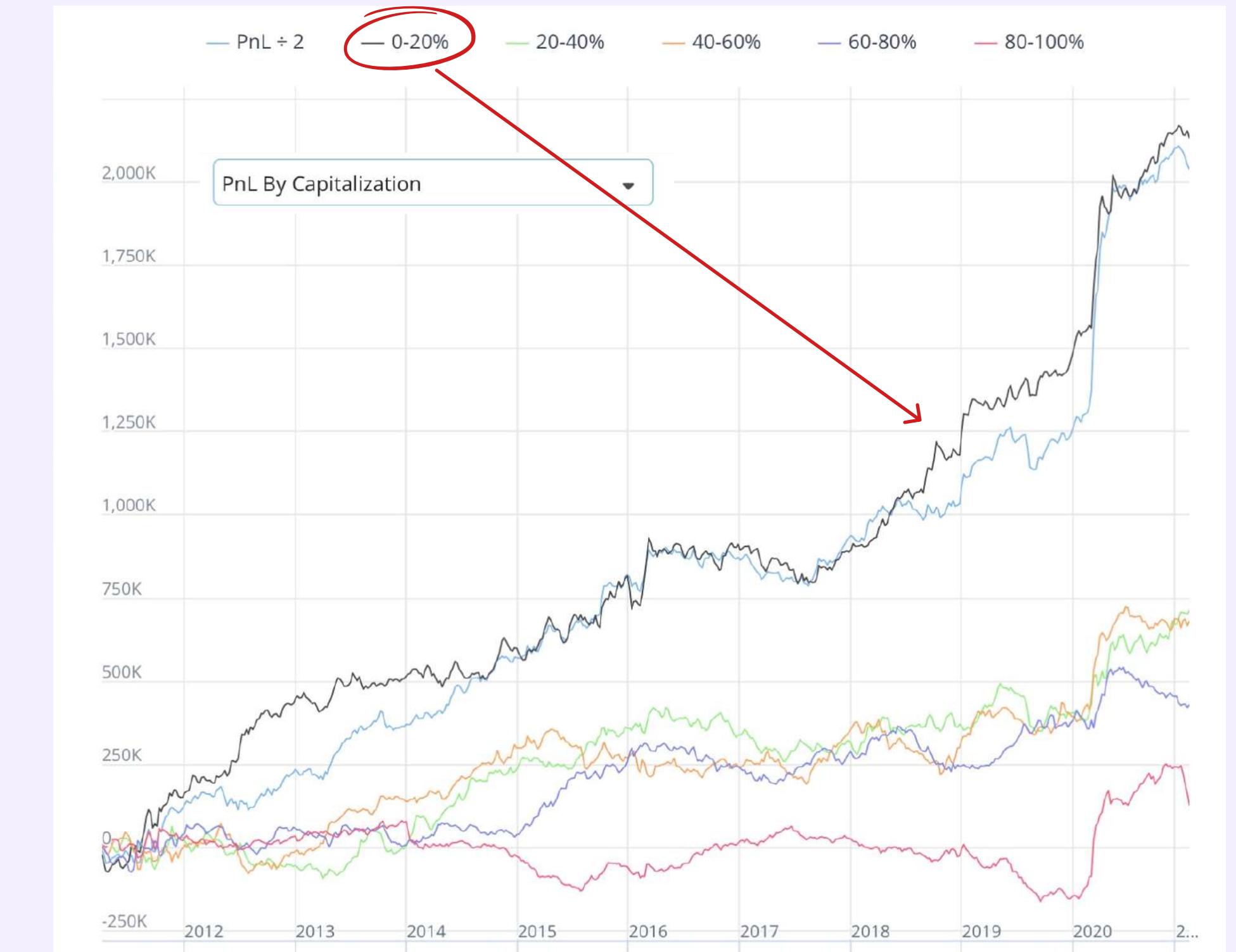
- Notable performance trend observed.
- Highest P&L in the 0-20% capitalization range.

Positive Signal for Alpha:

- Highest P&L reinforces the effectiveness of our alpha.
- Validates strategy's ability to excel, especially in smaller firms.

Hypothesis Alignment:

- Outcome supports the 'size effect' hypothesis.
- Demonstrates strategy's strength in generating superior risk-adjusted returns in smaller capitalization segments.



■ Steps taken to avoid Overfitting

Sound Ideation:

- We made sure that ratio involved in our alpha idea has proper significance in financial markets rather than just looking at good results.

Robust Parameter Optimization:

- Avoided over-optimizing strategy parameters based on historical data.

Rank Test:

- In the end, a rank() test was conducted on our final alpha expression to check for overfitting risks.

References:

Returns/Cap : <https://www.sciencedirect.com/science/article/abs/pii/0304405X81900180>

Shorting with size-effect : https://www.researchgate.net/publication/24070339_Short_Positions_Size_Effect_and_the_Liquidity_Hypothesis_Implications_for_Stock_Performance

iiitmm12-alpha3

Hypothesis

High implied volatility, coupled with a significant deviation from its mean, indicates potential long-term trends in certain stocks. The strategy involves assessing dispersion across various option prices to capitalize on mispricing arising from traders' differing views amid market uncertainty.

Alpha Expression:

```
trade_when(rank(implied_volatility_call_150)>0.35, zscore(ts_rank(implied_volatility_call_150, 360))  
+ ts_rank(opt4_30_call_dis_delta40, 30), -1)
```

Simulation Settings:

Decay: 10

Neutralisation: Slow Factors

Universe: Top 3000

Truncation: 0.08

■ Detailed Strategy Explanation

Implied Volatility (IV):

- Implied volatility represents market predictions about future stock price fluctuations.
- High implied volatility signals expects significant price changes, while low implied volatility suggests stable prices.

Dispersion in Call Options:

- Measures the accuracy and variability in implied volatility estimates.
- Higher dispersion signifies greater market uncertainty and opinion divergence.

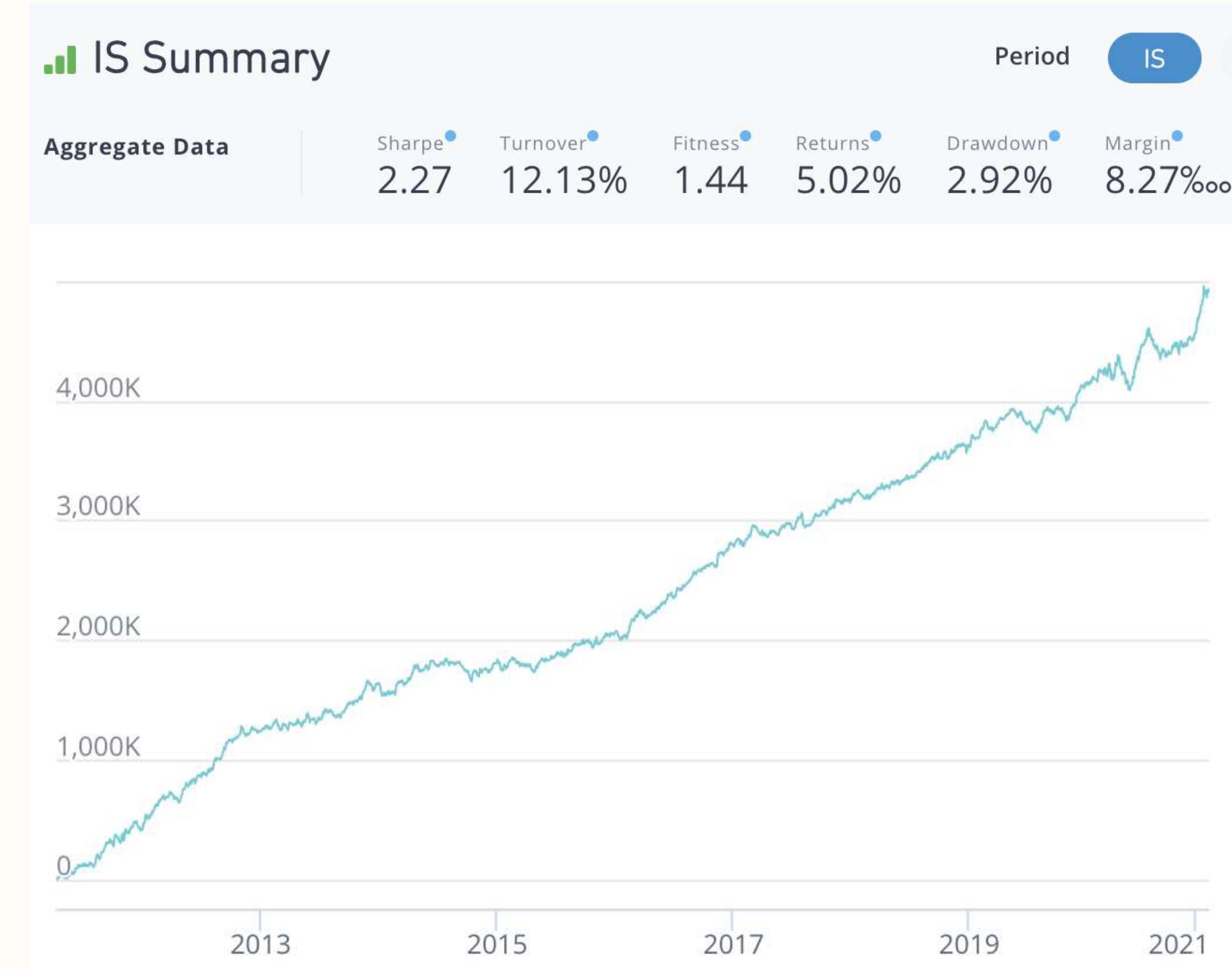
Signal:

- The strategy initiates trades with stocks above the 35th percentile based on high implied volatility.
- Leads to combining volatility z-scores and dispersion ranks for trade decisions under market uncertainty.

Positioning:

- A combined position is calculated from implied volatility and dispersion aiding trade decisions.
- The goal is to capture pricing differences in options, utilising both implied volatility trends and dispersion.

■ Performance Metrics



References:

[Option Returns and Volatility Mispicing by Amit Goyal, Alessio Saretto :: SSRN](#)

■ Utilization of Machine Framework

1 Identified High-Performance Data Fields

Selected data fields that had historically demonstrated strong performance.

2 Constructed a Time Series-Based Framework

Developed a framework that utilized time series operators to analyze and interpret the selected data fields.

3 Optimized Alpha Expression via Neutralization

Determined the most effective neutralization strategy to optimize the final alpha expression, ensuring minimal market impact and maximized returns.

4 Developed a Turnover Reduction Framework

Established a secondary framework dedicated to identifying and implementing the most efficient operators for minimizing portfolio turnover.

Steps taken to avoid overfitting:

- While improving the idea we did not just look at the best option, instead we considered the top 3 or top 5 expressions.
- We started with basic settings and focused on making our idea strong instead of constantly tweaking details along the way.
- In the end, a rank() test was conducted on our final alpha expression to check for overfitting risks.

Thank You



Team 15