Algo Trading & Quantitative Investment Strategies

Honcy LEE

Content

1. Factors Investing

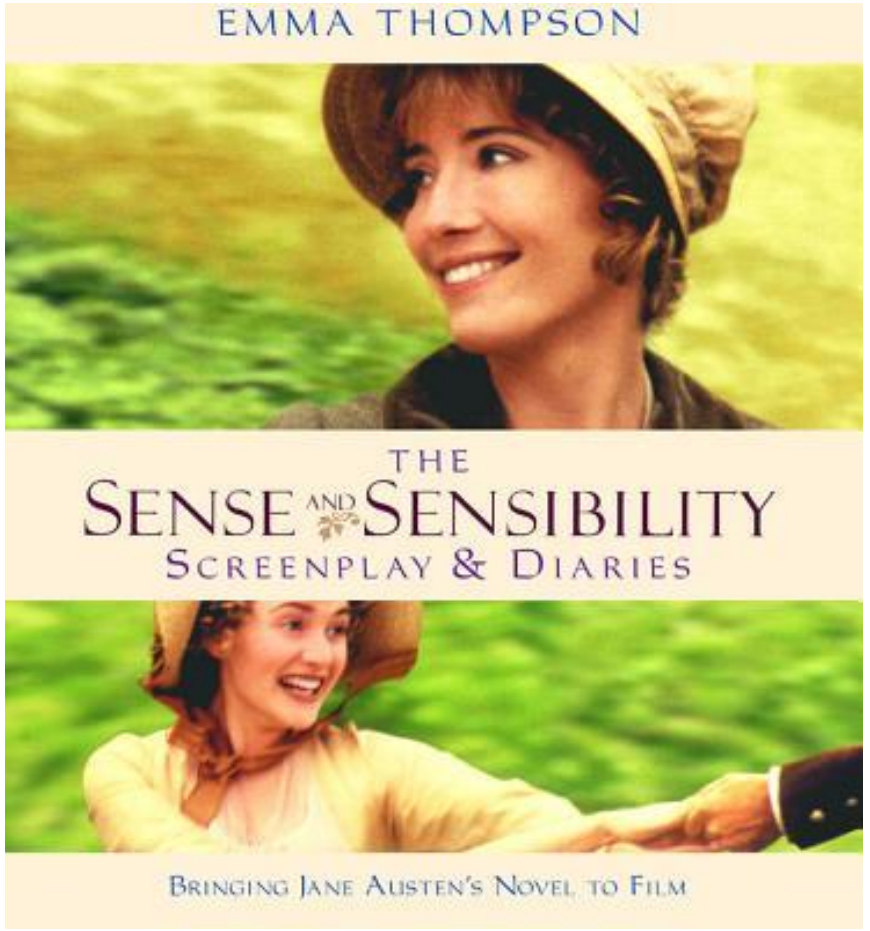
2. Factors Ranking

3. Portfolio Sizing

4. Performance Monitoring

5. Portfolio Rebalancing

How do you choose your lifetime partner?



Novel by Jane Austen

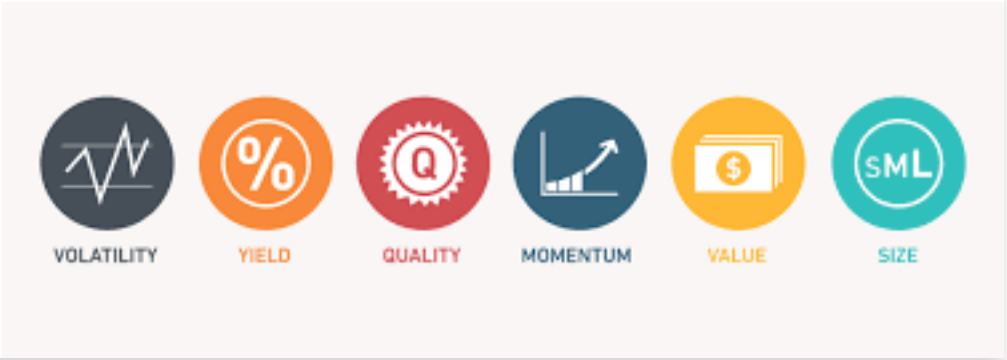
Given info below, how to choose the best prospect?

Prospect	Handsome	Character Similarity	Capability	Other Criteria
A	90	80	80	55
B	60	85	89	60
C	75	60	78	53
D	55	72	95	30

Rank All Criteria of Prospects

Prospect	Handsome Rank	Character Similarity Rank	Capability Rank	Others Rank	Comprehensive Rank
A	1	2	3	2	2
B	3	1	2	1	1.75
C	2	4	4	3	3.25
D	4	3	1	4	3

Factors Investing



- Factor investing is an investment approach that involves targeting specific drivers of return across asset classes. Investing in factors can help improve portfolio outcomes, reduce volatility and enhance diversification.

Factor Investing Strategies

Momentum Factor

Investing in assets exhibiting strong recent performance

Growth Factor

Investing based on potential earnings growth and future expansion.

Value Factor

Investing based on price-to-earnings (P/E) ratio or price-to-book (P/B) ratio.

Quality Factor

Investing in companies with strong financials, stable earnings and low debt

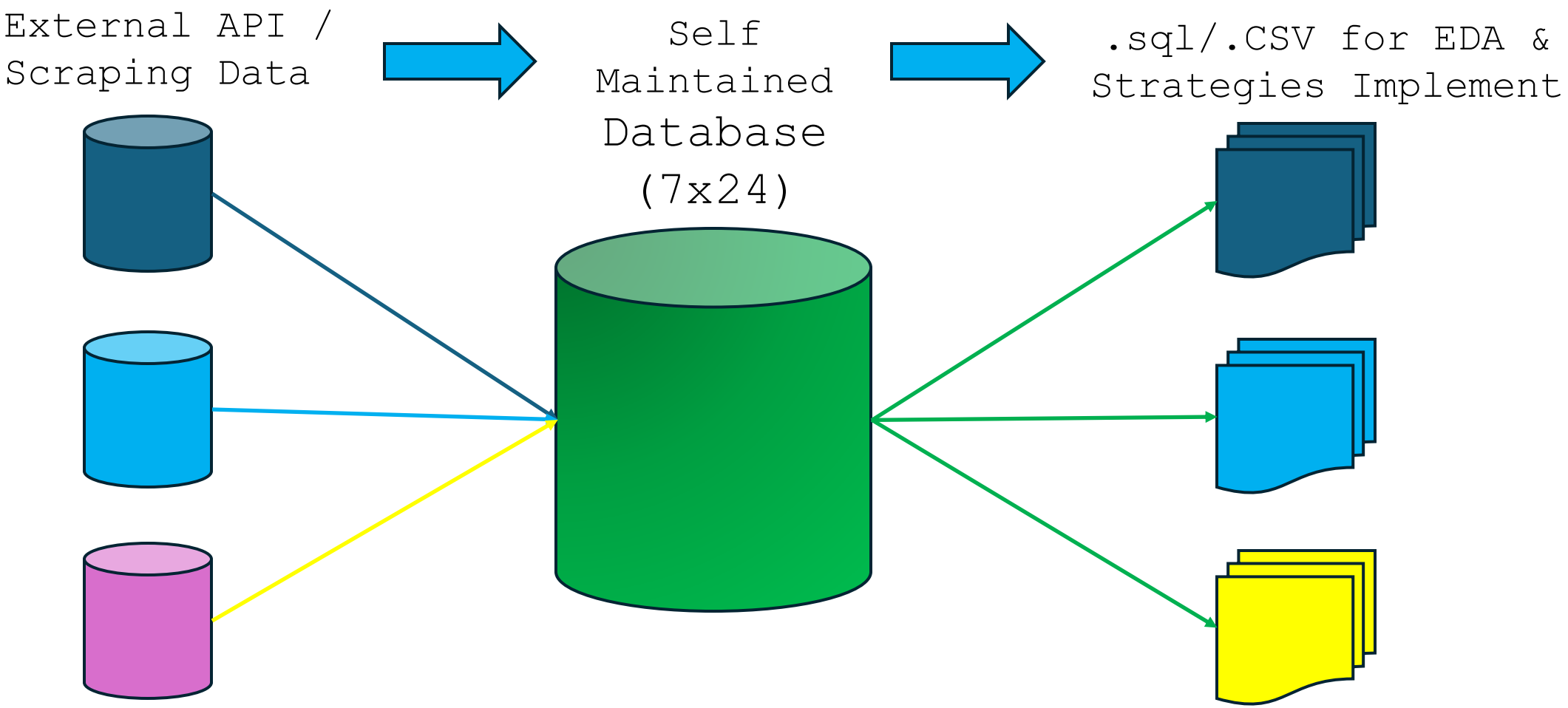
Multi-Factor

Strategies combining multiple factors to achieve diversification and capture sources of returns

Dividend Yield Factor

Investing based on higher dividend yield

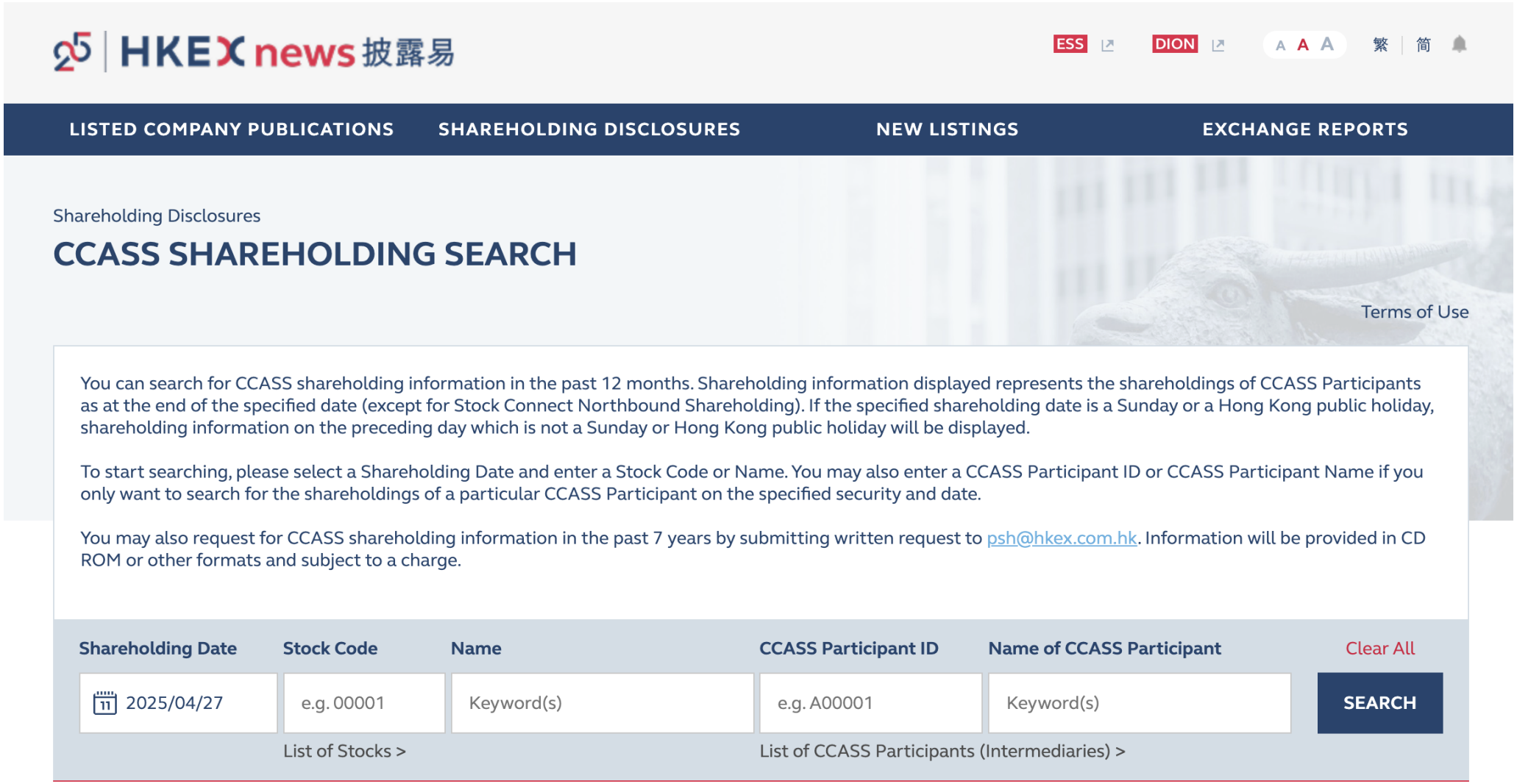
Data Collection and Utilization



Data Sources

- **Yahoo Finance** – stock price, financial data
- **HKEX** – southbound holding, CCASS major institutes holding (top 10 concentration)
- **HKMA** – base rate, HIBOR,
- **FRED** – 2 & 10-year treasury bill
- **HSI co.** – Industry Index Constituents (518 stocks)

HKEX Central Clearing and Settlement System (CCASS) Share Holding



https://www3.hkexnews.hk/sdw/search/searchsdw.aspx

CCASS SHAREHOLDING SEARCH 700.HK TENCENT

- Web scrape daily CCASS data and store in own database

Shareholding Date	Stock Code	Name	CCASS Participant ID	Name of CCASS Participant	Clear All
2025/04/26	00700	TENCENT HOLDINGS LIMITED -HKD TRADED SHA	e.g. A00001	Keyword(s)	SEARCH
	List of Stocks >		List of CCASS Participants (Intermediaries) >		

		CENTRAL HONG KONG		
B01274	MORGAN STANLEY HONG KONG SECURITIES LTD	46/F INTERNATIONAL COMMERCE CENTRE 1 AUSTIN ROAD WEST KOWLOON	347,881,793	3.77%
B01161	UBS SECURITIES HONG KONG LTD	47-52/F TWO INTERNATIONAL FINANCE CENTRE 8 FINANCE STREET CENTRAL HONG KONG	286,177,767	3.10%
B01130	BOCI SECURITIES LTD	22/F GRAND MILLENNIUM PLAZA 181 QUEEN'S ROAD CENTRAL HONG KONG	209,888,668	2.28%
C00093	BNP PARIBAS	21/F PCCW TOWER TAIKOO PLACE 979 KING'S ROAD QUARRY BAY HONG KONG	79,533,102	0.86%

https://www3.hkexnews.hk/sdw/search/searchsdw.aspx

```
SELECT * FROM "public"."cron_concentration"
where stockcode='700' order by date desc;
```

Submit

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Actions		id	date	stockcode	pid	shareholding	marketratio
Edit	Delete	4165584	2024-08-02	700	B01274	369103252	0.0518438724
Edit	Delete						
Edit	Delete						
Edit	Delete						
Edit	Delete	4165578	2024-08-02	700	C00100	609413442	0.0855976005
Edit	Delete	4165577	2024-08-02	700	C00019	2721927159	0.3823191574
Edit	Delete						
Edit	Delete						
Edit	Delete						
Edit	Delete	4165586	2024-08-02	700	B01130	198904320	0.0279379012

B01274	Morgan Stanley Hong Kong Securities Limited

C00019	The Hongkong and Shanghai Banking Corporation Limited

STOCK CONNECT SOUTHBOUND (南向-滬港通及深港通) SHAREHOLDING SEARCH

HKEXnews 披露易 | LISTED COMPANY PUBLICATIONS | SHAREHOLDING DISCLOSURES | NEW LISTINGS | EXCHANGE REPORTS

Shareholding Date: 2025/04/26

Detail of Shareholding:

Stock Code	Name	Shareholding in CCASS	% of the total number of Issued Shares/Units
1	CK HUTCHISON HOLDINGS LIMITED	131,331,573	3.42%
2	CLP HOLDINGS LIMITED	45,751,278	1.80%
3	HONG KONG AND CHINA GAS COMPANY LIMITED, THE	628,186,603	3.35%
4	WHARF (HOLDINGS) LIMITED, THE	5,508,950	0.17%
5	HSBC HOLDINGS PLC	1,558,368,339	8.81%
6	POWER ASSETS HOLDINGS LIMITED	152,829,185	7.16%
8	PCCW LIMITED	243,191,834	3.13%

https://www3.hkexnews.hk/sdw/search/mutualmarket.aspx?t=hk

Factors in Factors Investing

- **Momentum** – Stock price movement: SMA, EMA, MACD, RSI, Z-score, Fibonacci, Stochastic, Volatility, Volume, VWAP, Fourier Transfer
- **Growth** – Return, ROE, ROA,
- **Value** – PB, Net Asset,
- **Financial Quality** – PE, Cash Flow, Sales, Acid Ratio, Turn Around Cycle
- **Dividend Yield** – Dividend,
- **Multifactor** – Combination of various strategies that might or might not be shown above, i.e. Sentiment, News, Event, Satellite image, Industry Index, etc.

Basic Strategies

- Locate 517 Hang Seng Industry Component stocks' financial data
- Extract P/E, P/B, Revenue per Share, Dividend per Share
- Grab price data and prepare Sharpe Ratio
- Rank the above five core factors and unify one final rank number
- Build 6 stocks portfolio and optimize their size portion
- Monitor performance and compare with benchmark HSI

Time Span

2023-01-01 to 2023-12-31	Price data for primary analysis
2023-12-31	Financial data
2024-01-01	Rank factors ,and optimize size, build portfolio
2024-01-01	Implement portfolio, fill trade order within capital
2024-01-01 to 2025-04-28	Monitor and compare with HSI
Monthly	Review portfolio (rebalance if needed)

Financial Data

source: yFinance

```
financialData.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 335 entries, 2188 to 4821
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   stockcode        335 non-null    object
 1   earningpershare  335 non-null    float64
 2   bookvalpershare  335 non-null    float64
 3   dividendyield    335 non-null    float64
 4   revenuepershare  335 non-null    float64
dtypes: float64(4), object(1)
memory usage: 15.7+ KB
```

```
finData.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 517 entries, 2198 to 4363
Data columns (total 21 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   stockcode             517 non-null    object
 1   dateupdate            517 non-null    object
 2   earningpershare       515 non-null    float64
 3   bookvalpershare       516 non-null    float64
 4   revenuepershare       513 non-null    float64
 5   cashpershare          516 non-null    float64
 6   profitmargin          502 non-null    float64
 7   returnonequity        480 non-null    float64
 8   returnonasset         483 non-null    float64
 9   debttoequity          493 non-null    float64
 10  quickratio            485 non-null    float64
 11  outstandingshare      517 non-null    float64
 12  insidersharehold      487 non-null    float64
 13  institutionsharehold  517 non-null    float64
 14  dividendyield         337 non-null    float64
 15  payoutratio           325 non-null    float64
 16  beta                  478 non-null    float64
 17  latedividenddate      387 non-null    object
 18  latedividend          387 non-null    float64
 19  adjearningsgrowth     514 non-null    float64
 20  valuationprice        516 non-null    float64
dtypes: float64(18), object(3)
memory usage: 88.9+ KB
```

Generate Factors

```
%%time
df_factors = pd.concat([ factorsPrep(ticker, STARTDATE, ENDDATE) for ticker in tqdm(tickers)])
df_factors
```

```
100% |████████████████████████████████| 335/335 [00:47<00:00, 8.92it/s]
CPU times: user 10.2 s, sys: 748 ms, total: 11 s
Wall time: 47.6 s
```

	PE	PB	DividendYield	RevPerShareDollar	Sharpe
0001.HK	6.077265	0.325743	0.0682	1.510469	-0.683691
0002.HK	13.730471	1.410124	0.0393	0.647565	0.583611
0003.HK	22.474637	2.084979	0.0589	0.496652	-1.195862
0004.HK	-54.277568	0.398714	0.0151	0.309783	0.308802
0005.HK	5.458161	6.886465	0.0665	0.058102	1.150195
...	...	...	...	...	...

Rank and Comprehensively rank in ONE Column

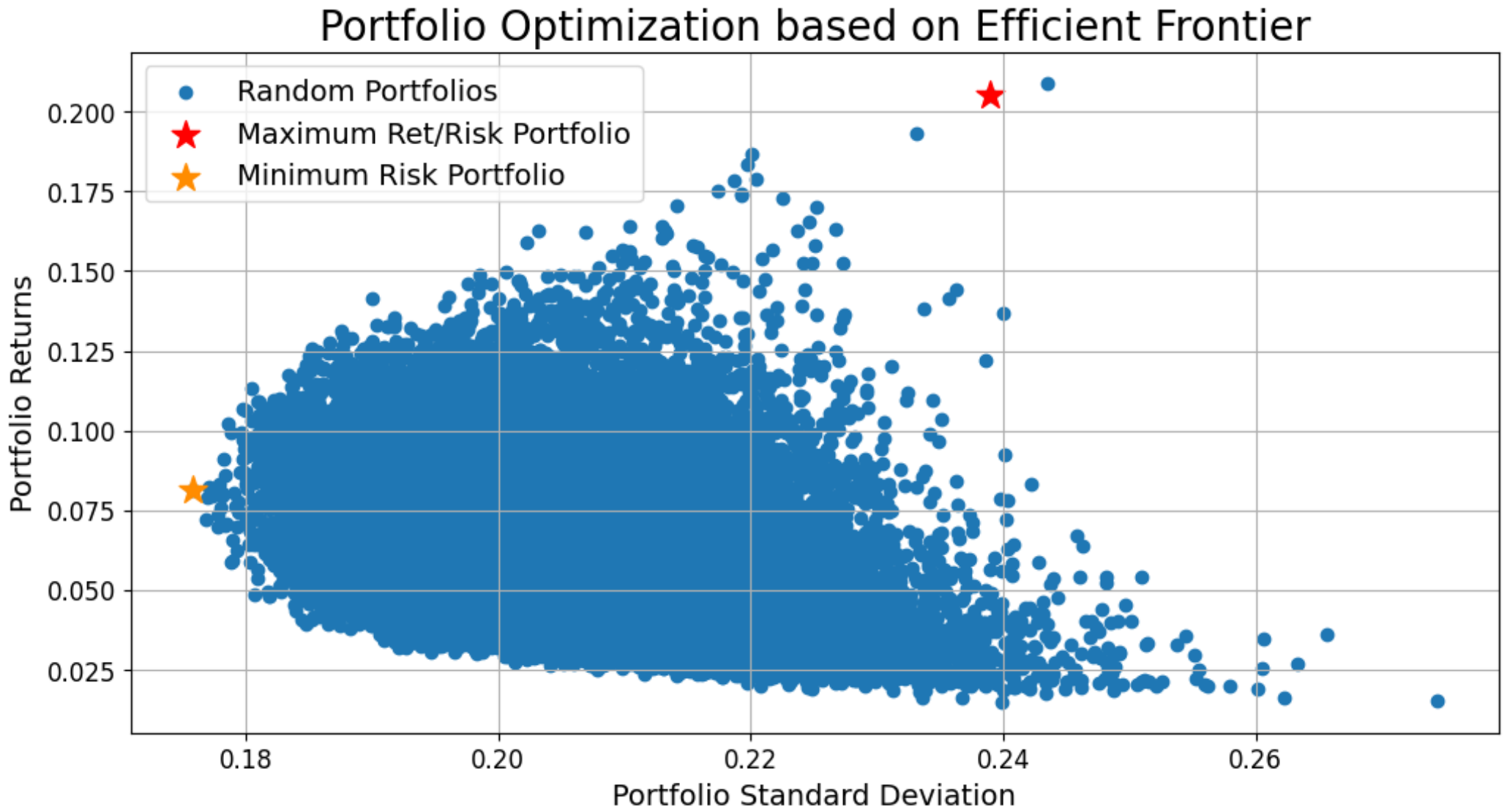
Pick top 6 stocks for sizing optimization

```python
def factorsRank(df_factors) -> pd.DataFrame :
    """Rank all factors and generate in one comprehensive one"""
    _df = df_factors.copy()
    _df.loc[_df.index, 'PE_Rank'] = _df['PE'].rank(method='min')
    _df.loc[_df.index, 'PB_Rank'] = _df['PB'].rank(method='min')
    _df.loc[_df.index, 'Dividend_Rank'] = _df['DividendYield'].rank(method='max')
    _df.loc[_df.index, 'Revenue_Rank'] = _df['RevPerShareDollar'].rank(method='max')
    _df.loc[_df.index, 'Sharpe_Rank'] = _df['Sharpe'].rank(method='max')
    _df.loc[_df.index, 'All_Rank'] = _df.eval('(PE_Rank+PB_Rank+Dividend_Rank+Sharpe_Rank)/5')
    return _df
```

```python
df_ranked = factorsRank(df_factors)
temp = df_ranked.nsmallest(200, 'All_Rank')
# pick top n stocks
top_stocks = temp.loc[(temp.PE>0)&(temp.PB>0)&(temp.DividendYield>0)&(temp.Sharpe>0)][:6].index.tolist()
temp.loc[(temp.PE>0)&(temp.PB>0)&(temp.DividendYield>0)&(temp.Sharpe>0)][:6]
```

	PE	PB	DividendYield	RevPerShareDollar	Sharpe	PE_Rank	PB_Rank	Dividend_Rank	Revenue_Rank	Sharpe_Rank	All_Rank
0087.HK	2.095675	0.053014	0.0643	7.109351	0.001902	29.0	1.0	216.0	320.0	248.0	98.8
0998.HK	3.034557	0.275950	0.0885	1.036980	0.181294	35.0	19.0	289.0	202.0	273.0	123.2
1898.HK	4.773560	0.569384	0.0511	2.466428	0.357659	65.0	82.0	177.0	282.0	295.0	123.8
0392.HK	4.979049	0.399136	0.0706	2.644308	0.179330	69.0	44.0	244.0	287.0	271.0	125.6
6881.HK	5.559174	0.459588	0.0626	0.744475	0.257492	80.0	60.0	208.0	170.0	282.0	126.0
3988.HK	3.651291	0.396987	0.0831	0.618617	0.133083	45.0	42.0	276.0	146.0	268.0	126.2

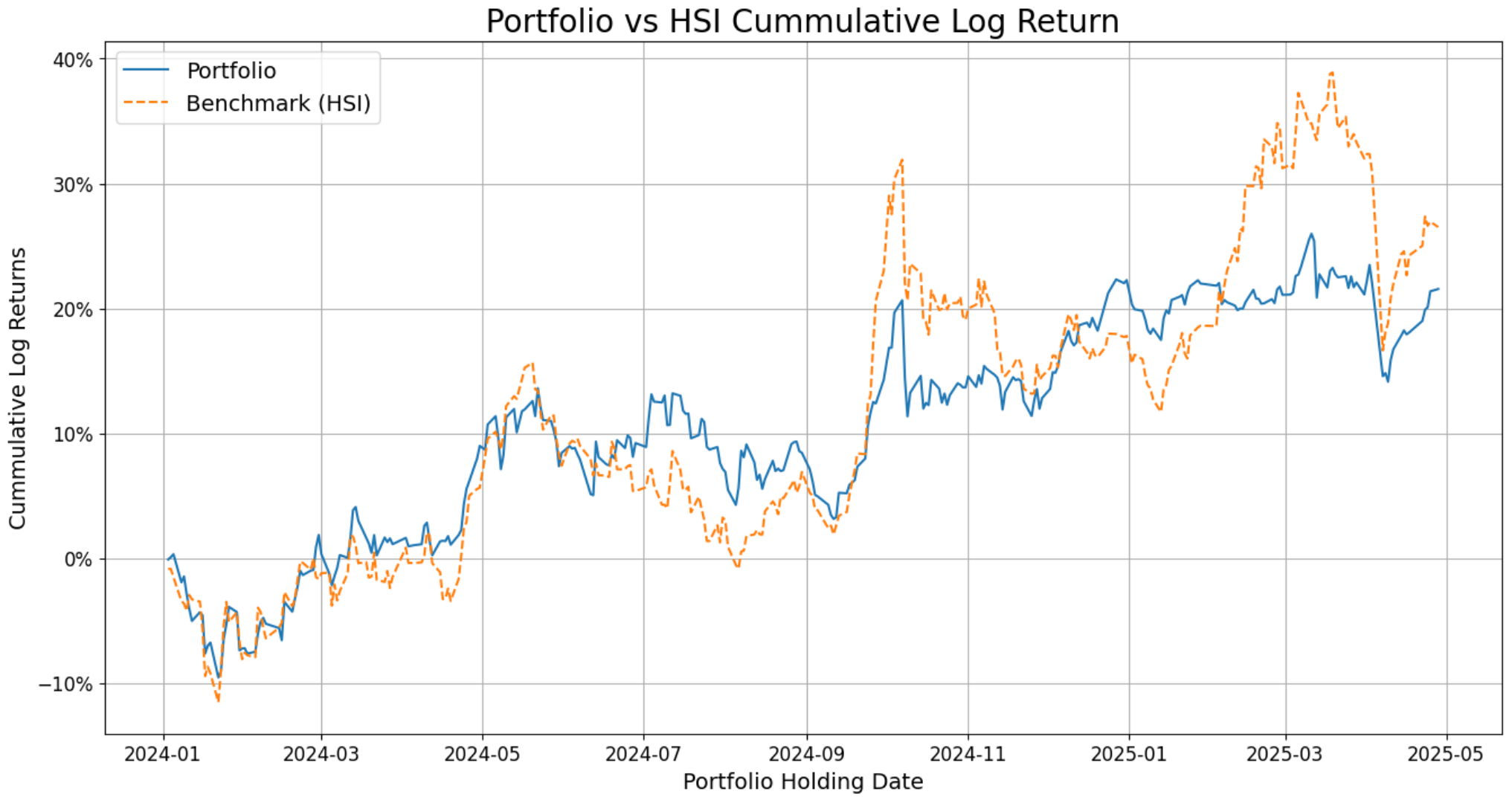
Portfolio Optimization



Optimize Portfolio Weightings

```
The portfolio weights for each stock in the maximum return/std dev. portfolio is as:
1186.HK 10.51%
0087.HK 77.57%
6818.HK 7.81%
1988.HK 2.2%
0267.HK 1.27%
1398.HK 0.64%
```

Portfolio (allocated by efficient frontier) vs Benchmark



Portfolio Monitoring and Performance Comparison with Benchmark

2024-01-01 to 2025-4-28

```
1 get_performance_metrics(df_test1, bench_test1)
```

	PortfolioCAGR	PortfolioSD	PortfolioSharpe	BenchCAGR	BenchSD	BenchSharpe	ExposureDays
2025-04-28	0.284103	0.2042	1.2199	0.348949	0.2771	1.133	323

Performance of individual stocks

Performance of individual stocks As of 2024-01-02 to 2025-04-28

1186.HK 16.76%

0087.HK 14.17% 

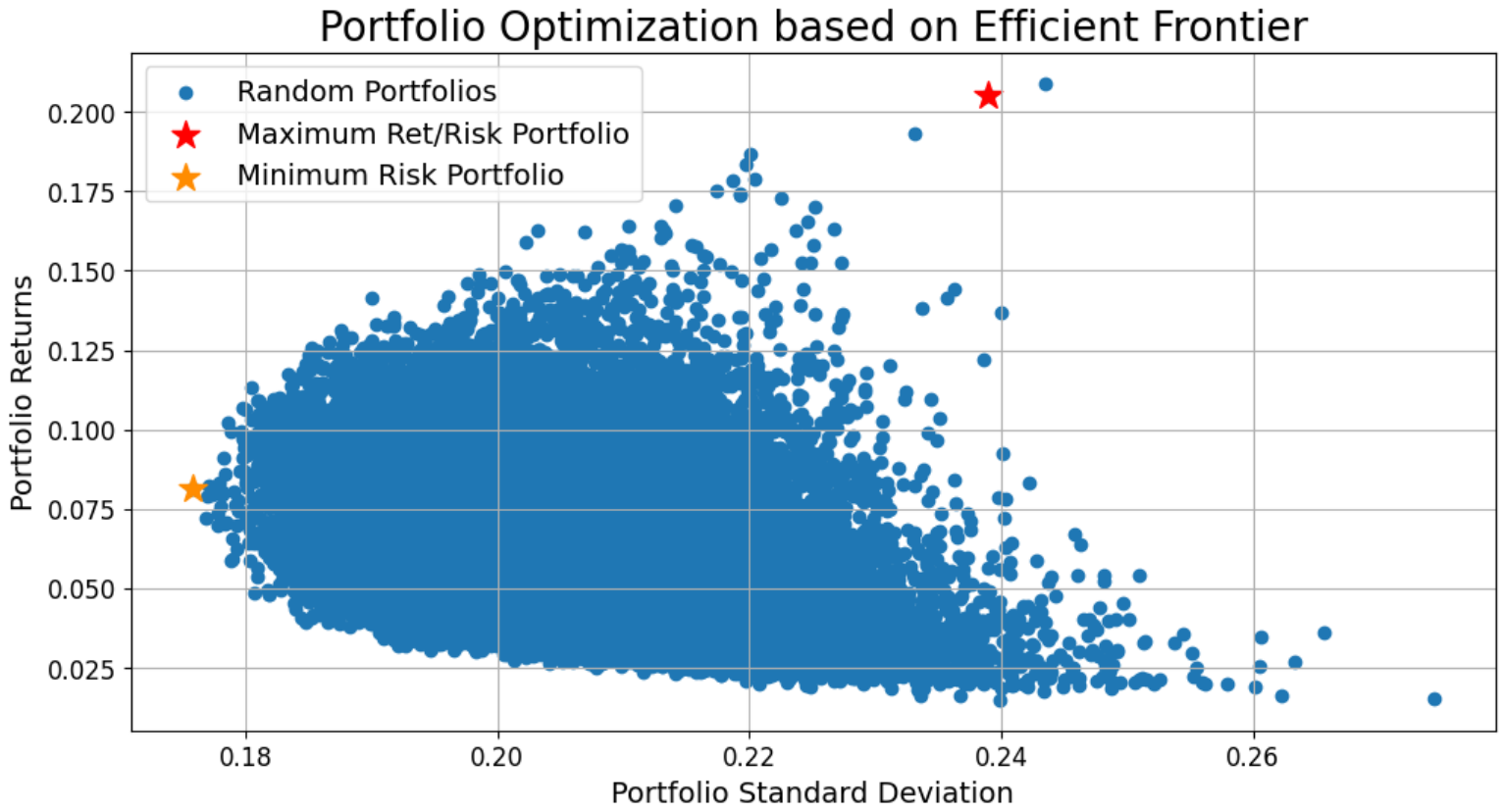
6818.HK 61.75% 

1988.HK 55.20% 

0267.HK 28.70%

1398.HK 62.93% 

Efficient Frontier Still Works?



Vote

Stock Return vs Stock Return's Standard Deviation

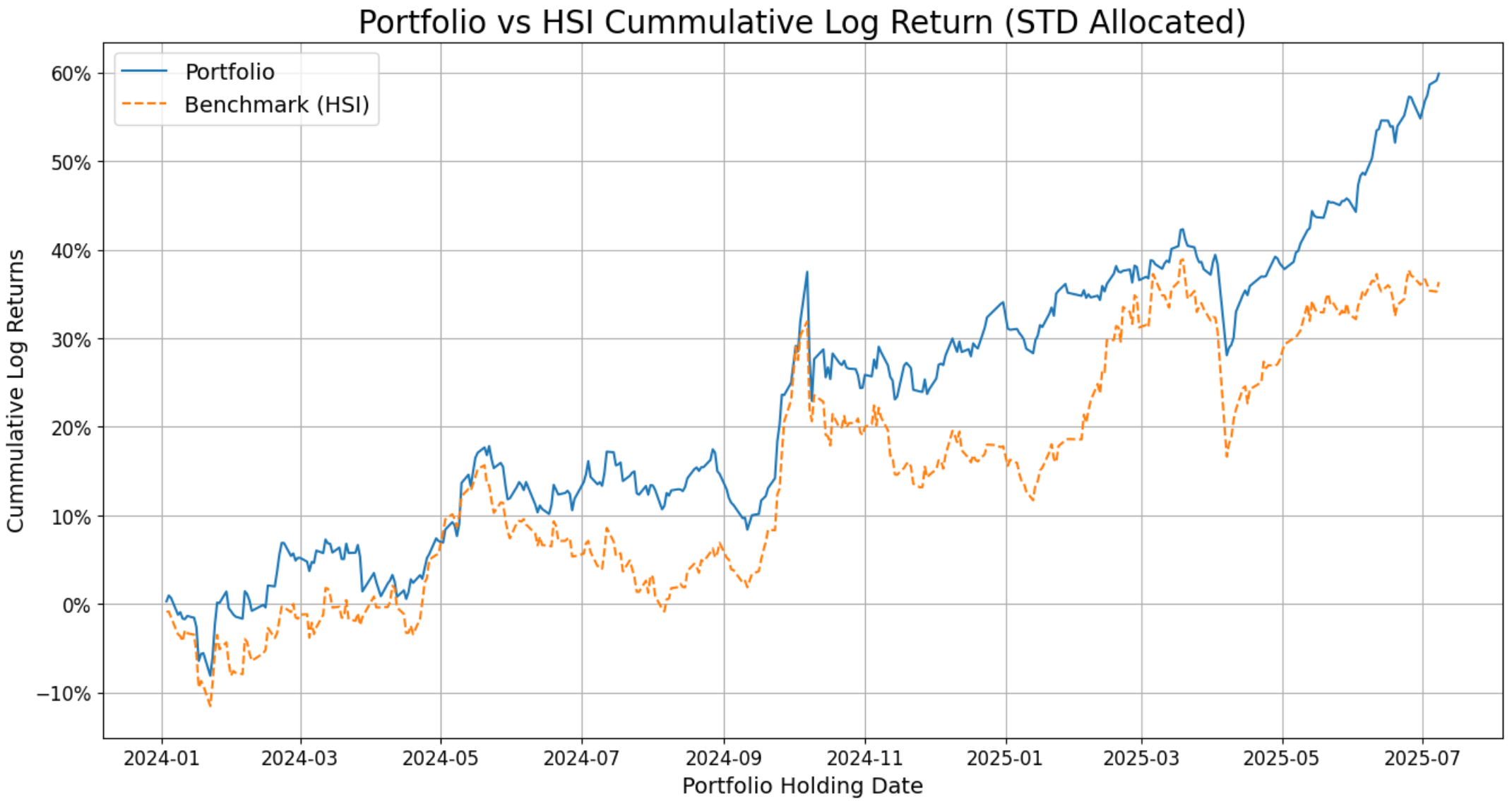
Which one will be more stable and predictable?

Asset re-allocate by Standard Deviation

```
1 std_weights = dict(( 1 / top_stocks_factors.STD ) / ( 1 / top_stocks_factors.STD ).sum())
2 std_weights
```

```
{'1186.HK': 0.12497788428662905,
 '0087.HK': 0.15099696766229684,
 '6818.HK': 0.2300716147353278,
 '1988.HK': 0.1599219079350396,
 '0267.HK': 0.13677194533491732,
 '1398.HK': 0.1972596800457893 4}
```

Portfolio (allocated by STD) vs Benchmark



Portfolio Monitoring and Performance Comparison with Benchmark

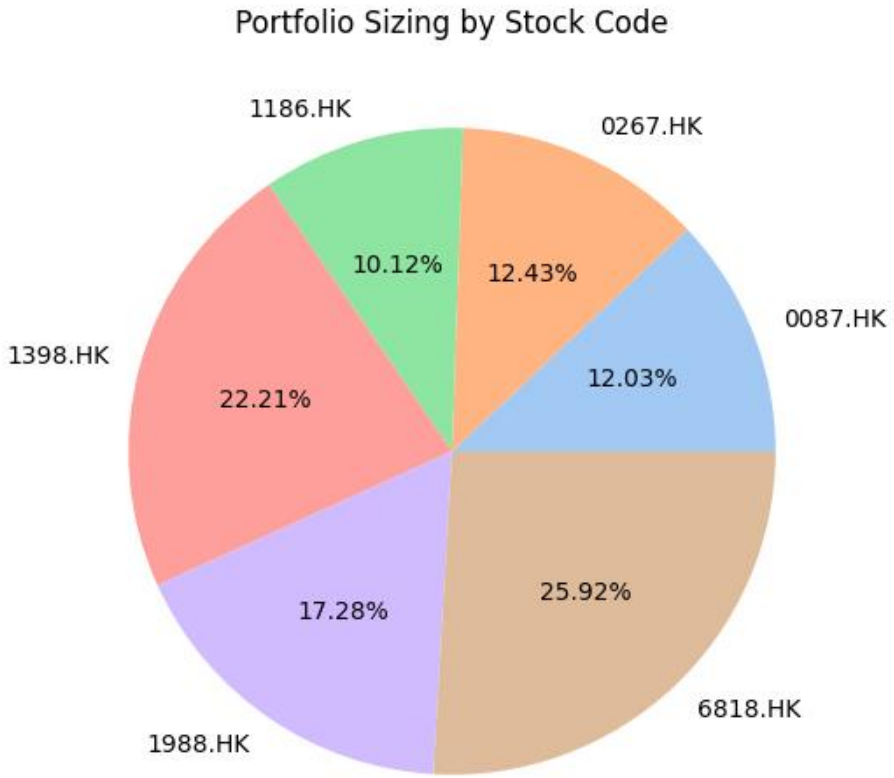
Allocated by Standard Deviation

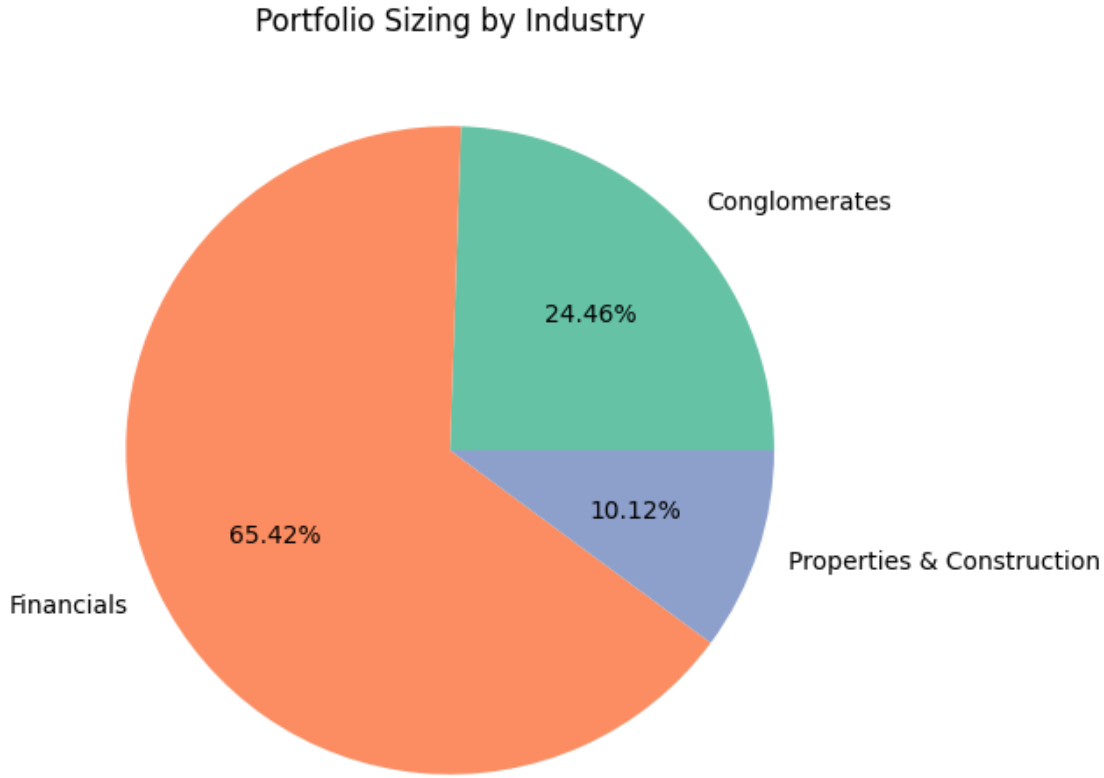
2024-01-01 to 2025-07-09

```
get_performance_metrics(df_test2, bench_test2)
```

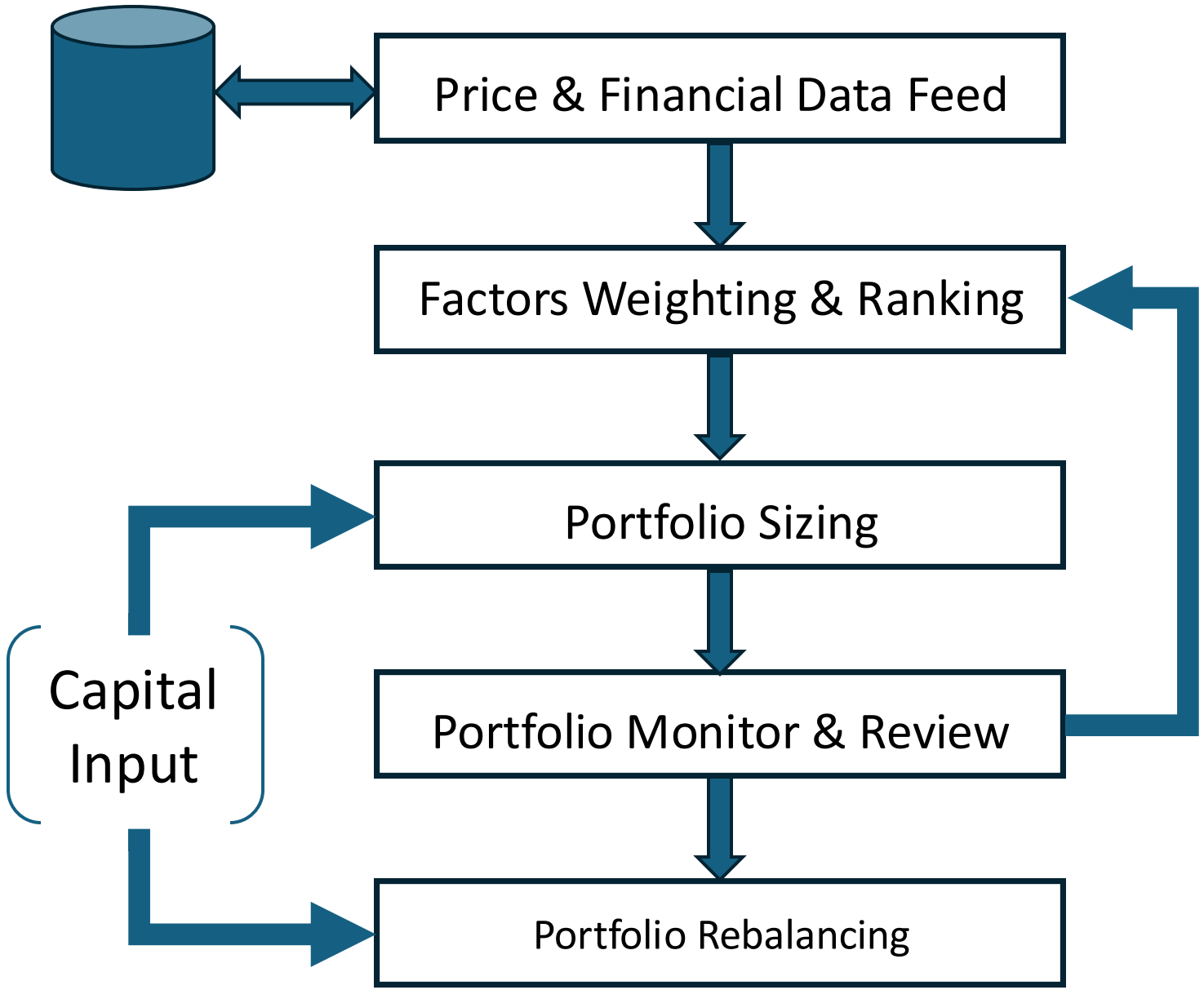
	PortfolioCAGR	PortfolioSD	PortfolioSharpe	BenchCAGR	BenchSD	BenchSharpe	ExposureDays
2025-07-08	0.849009	0.2384	3.4145	0.506774	0.266	1.7736	371

Portfolio Sizing by stocks and industries





Flowchart of Strategic Investment



References

1. Eugene F. Fama and Kenneth R. French. "Value versus Growth: The International Evidence." The Journal of Finance, Volume 53, No. 6, 1988, Pages 1975-1999.
2. Eugene F. Fama and Kenneth R. French. "Multifactor Explanations of Asset Pricing Anomalies." The Journal of Finance, Volume 51, No. 1, 1996, Pages 55-84.
3. Journal of Financial Economics. "A Five-Factor Asset Pricing Model." https://www.sciencedirect.com/science/article/abs/pii/S0304405X14002323 Accessed Aug. 30, 2021.

Thank You