



Algo Trading & Quantitative Investment Strategies

FINA6299 Module 6

Quantified Factors Investing

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Table of Contents

Declaration of Originality	3
Abstract.....	3
Introduction	4
• Relevance in Modern Financial Markets:.....	4
• Objectives and scope of this project.....	5
Investment Objectives and Strategy.....	7
• Workflow of strategies applies	8
Data Preparation	9
• Data sources.....	9
• Data extraction methods	9
• Data Management System flow	10
• Treasury Yield Data.....	15
• HIBOR and Monetary Base Data	15
• Southbound Shareholding Data	16
• CCASS Concentration Data.....	17
• Hang Seng Index industry constituents.....	17
• Financial Data	18
• Frontend web for visualization	19
Backtest and Data Period	21
• Data period	21
• Backtesting process	21
Initial Capital and Risk Management.....	24
Performance Evaluation and Interpretation.....	29
Conclusion	30
References	32

Declaration of Originality

I hereby declare that this project was entirely our own work and that any additional sources of information have been duly cited. I hereby declare that any internet sources, published or unpublished works from which I have quoted or drawn reference have been referenced fully in the text and in the contents list. I understand that failure to do this will result in failure of this project due to Plagiarism.

Declared by



LEE Ho Fu Honcy

Abstract

In this study, I explore the **application of algorithmic trading techniques** to enhance decision-making in financial markets. By leveraging advanced computational methods, I aim to optimize trade execution and minimize human error, leading to more efficient and accurate trading outcomes.

I focus on the **implementation of quantitative investment strategies** that utilize mathematical models to identify profitable opportunities. These strategies are designed to systematically analyse vast amounts of market data, enabling the development of robust portfolios that adapt to changing market conditions.

The research further involves a comprehensive **evaluation of investment performance**. I employ various metrics to assess the effectiveness of my strategies, ensuring they meet predefined benchmarks and deliver consistent results across different market environments.

Finally, my primary objective is to **gain excess return over the risk-free return and mimic a value investing mutual operating**. By strategically managing risk and capitalizing on market inefficiencies, my approach seeks to achieve returns that surpass those of traditional investment methods, providing significant value to investors.

Introduction

Overview of Algorithmic Trading

Algorithmic trading, often referred to as "algo trading," involves using computer algorithms to execute trades based on predefined criteria. These algorithms can analyse market data at speeds and complexities far beyond human capabilities, making them a powerful tool in today's financial markets.

Key Aspects:

1. Speed and Efficiency:

Algorithms can process vast amounts of data and execute trades in milliseconds, giving traders a significant edge in capturing favorable market conditions.

2. Precision:

By eliminating human error and emotional decision-making, algorithmic trading ensures more accurate and consistent execution of trading strategies.

3. Complex Strategies:

Algorithms can implement sophisticated strategies, such as statistical arbitrage and market-making, which might be too complex for manual execution.

4. Cost Reduction:

Automation reduces transaction costs by optimizing trade timing and minimizing market impact.

• Relevance in Modern Financial Markets:

1. Increased Liquidity:

Algorithmic trading contributes to market liquidity by facilitating a larger volume of trades, making it easier for participants to buy and sell assets without significant price changes.

2. Enhanced Market Efficiency:

By rapidly adjusting to new information, algorithmic trading helps markets reflect true asset values more quickly, reducing price discrepancies.

3. Risk Management:

Advanced algorithms can assess and mitigate risk by implementing real-time monitoring and adjustment of positions based on market conditions.

4. Accessibility:

Once limited to large financial institutions, algorithmic trading is now accessible to retail investors through various platforms, democratizing access to sophisticated trading tools.

5. Innovation and Competition:

The rise of algorithmic trading fosters innovation and competition among financial entities, leading to the development of new technologies and strategies.

• Objectives and scope of this project

My primary objective is to **gain excess return over the risk-free return**. By strategically managing risk and capitalizing on market inefficiencies, my approach seeks to achieve returns that surpass those of traditional investment methods, providing significant value to investors.

Scope of the Project

1. Development of Algorithmic Models:

- Design and implement algorithms to identify and exploit market inefficiencies.
- Incorporate risk management techniques to minimize potential losses.

2. Data Analysis and Integration:

- Gather and analyse historical and real-time market data.
- Use statistical methods to identify patterns and trends.

3. Strategy Implementation:

- Develop quantitative investment strategies tailored to different market conditions.
- Backtest strategies to ensure they provide excess returns over the risk-free rate.

4. Performance Evaluation:

- Establish metrics for assessing strategy performance.
- Regularly review and adjust strategies based on performance outcomes.

5. Risk Management:

- Implement tools for continuous risk assessment and mitigation.
- Ensure diversification to protect against market volatility.

6. Technology and Infrastructure:

- Utilize robust trading platforms for seamless execution.
- Ensure data security and system reliability.

7. Regulatory Compliance:

- Adhere to financial regulations and trading standards.
- Maintain transparency and ethical standards in all operations.

8. Investor Communication:

- Provide regular updates and reports on investment performance.
- Educate investors about the strategies and risk management practices.

Investment Objectives and Strategy

The baseline strategy of this project is factors investing with multi-factors strategy.

Factor investing is an investment strategy that involves targeting specific drivers of returns across asset classes. These factors are underlying characteristics that can explain the risk and return profile of a portfolio.

Multi-factor strategy is an approach that combines individual factors that have been known to perform well.

By using individual factors I can identify stocks and take position as per the signals generated by those factors, but when I combine these factors together I get better risk-adjusted returns as the drawbacks of one factor can be offset by the strengths of another factor. In addition to this, by using a multi-factor strategy I can create a portfolio that can withstand different phases of the market.

The cyclical nature of factor strategies means that individual factors can deliver a premium against the market over time but that any one factor can experience periods of underperformance.

Institutional investors can alleviate the effects of cycles by diversifying their portfolios across several factors:

Value: Identifying undervalued stocks using financial ratios.

Momentum: Time-series momentum and cross-sectional momentum.

Size: Taking positions based on the market capitalization of the company.

Quality: Identifying stocks which are stable, deliver consistent returns and possess potential for growth.

Volatility: Targeting stocks with lower volatility for risk management.

By systematically selecting assets based on these factors, investors aim to achieve better risk-adjusted returns compared to traditional investment methods. Factor investing is widely used to enhance portfolio diversification and optimize performance.

Factor Investing Strategies



There are many more factors could be taken into accounts. In this project I focus on the major ones.

- **Workflow of strategies applies**

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

Data Preparation

Data used in this project are free resources from Yahoo Finance, HKEX, HKMA, FRED, and HSI company. All these data will be manipulated and stored in private server for unifying better data preparation. Local storage allows for quicker data retrieval compared to making repeated API calls, which can speed up the training process. By storing data locally, it maintains a consistent dataset that won't change unexpectedly if the API data updates or becomes unavailable and allows for more extensive preprocessing and data cleaning before training, enhancing model performance.

- **Data sources**

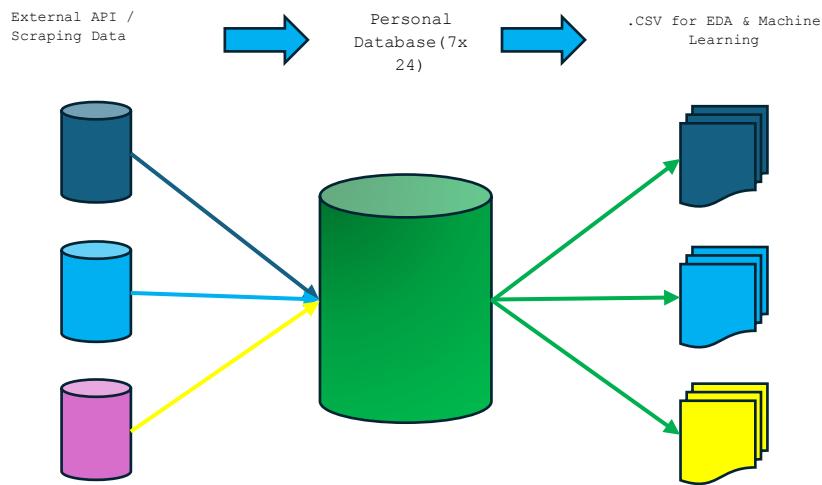
1. **Yahoo Finance** – stock price, financial data, news
2. **HKEX** – southbound holding, CCASS major institutes holding (top 10 concentration)
3. **HKMA** – base rate, HIBOR,
4. **FRED** – 2 & 10-year treasury bill
5. **HSI co.** – Industry Index Constituents (518 stocks)

- **Data extraction methods**

1. Extract CCASS and HKEX data from the source to PostgreSQL database everyday
2. HKEX offer 1 year data only. This project was starting from 1st Jan, 202, therefore the database has around 1.5 years HKEX CCASS data now.
3. Southbound eligible stock list was changed occasionally, this list was also reflected on daily report. Some of the stock may not have any transaction in some days.

4. Extract financial data semiannually.
5. Extract HSI constituents quarterly
6. Access API data from FRED with SDK library
7. Access API data from HKMA

- **Data Management System flow**



The diagram illustrates a database schema structure. At the top level is a folder icon labeled "Schemas". Inside "Schemas" is a red diamond icon labeled "public". Below "public" is a blue folder icon labeled "Tables". The "Tables" folder contains 21 entries, each represented by a blue table icon followed by a table name: auth_group, auth_group_permissions, auth_permission, authentication_user, authentication_user_groups, authentication_user_user_permissions, blog_article, cron_ccassholding, cron_concentration, cron_sbstocklist, django_admin_log, django_content_type, django_migrations, django_plotly_dash_dashapp, django_plotly_dash_statelessapp, django_session, news_news, quote_findata, quote_fullstocklist, quote_indexdata, quote_pricedata, quote_snapshot, and spatial_ref_sys.

phpPgAdmin: PostgreSQL: fintech1_maindb: public:													
Tables?		Views?		Sequences?		Functions?		Full Text Search?		Domains?		Privileges?	
	Table	Owner	Tablespace	Estimated row count	Actions						Comment		
	auth_group	fintech1_maindb		0	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	auth_group_permissions	fintech1_maindb		0	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	auth_permission	fintech1_maindb		56	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	authentication_user	fintech1_maindb		2	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	authentication_user_groups	fintech1_maindb		0	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	authentication_user_user_permissions	fintech1_maindb		0	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	blog_article	fintech1_maindb		0	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	cron_cassholding	fintech1_maindb		316485	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	cron_concentration	fintech1_main		3472322	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	cron_sbstocklist	fintech1_maindb		771	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	django_admin_log	fintech1_maindb		258	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	django_content_type	fintech1_maindb		14	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	django_migrations	fintech1_maindb		27	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	django_plotly_dash_dashapp	fintech1_maindb		0	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	django_plotly_dash_statelessapp	fintech1_maindb		0	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	django_session	fintech1_maindb		4	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	news_news	fintech1_main		440	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	quote_findata	fintech1_main		2902	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	quote_fullstocklist	fintech1_main		2666	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	quote_indexdata	fintech1_main		45930	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	quote_pricedata	fintech1_main		6934620	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	quote_snapshot	fintech1_main		0	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex
	spatial_ref_sys	fintech1_maindb		8500	Browse	Select	Insert	Empty	Alter	Drop	Vacuum	Analyze	Reindex

```
SELECT * FROM "public"."quote_findex";
```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 Next > Last >>

Actions	id	stockcode	dateupdate	earningpershare	bookvalpershare	revenuepershare	cashpershare	profitmargin	returnonequity	returnonasset	debttoequity	quickratio	outstandingshare	industry
Edit	Delete	2197 10	2024-02-21	2.06	69.3	8.084	4.658	0.25536	0.0317	0.01976	32.902	0.631	136200000	
Edit	Delete	2198 11	2024-02-21	7.21	85.53	17.852	118.31	0.42445	0.08364	0.008169999	NULL	NULL	1911840000	
Edit	Delete	2199 12	2024-02-21	2.15	66.983	5.438	2.862	0.39566	0.03115	0.00794	44.668	0.342	484099936	
Edit	Delete	2191 4	2024-02-21	-0.35	47.646	5.885	2.899	-0.059270002	-0.00561	0.01709	15.992	0.346	305600000	
Edit	Delete	2192 5	2024-02-21	10.8	8.56	3.425	55.519	0.42446	0.15654999	0.00979	NULL	NULL	19105800192	
Edit	Delete	2200 13	2024-02-21	-0.39	0.922	0.895	1.012	-0.03886	-0.03396	-0.04981	5.018	3.006	871256000	
Edit	Delete	2201 14	2024-02-21	-1	66.922	3.442	0.648	-0.16916999	-0.01134	0.013789999	37.724	0.42	102700984	
Edit	Delete	2202 16	2024-02-21	8.25	207.748	24.569	5.467	0.33580002	0.0405	0.02116	21.103	0.55	2897999872	
Edit	Delete	2203 17	2024-02-21	0.39	77.903	37.834	27.617	0.036140002	0.01466	0.01001	72.965	0.453	2516600064	
Edit	Delete	2204 18	2024-02-21	0.05	0.722	0.282	0.222	0.16673	0.06703	0.020189998	2.539	4.726	2397920000	
Edit	Delete	2205 19	2024-02-21	4.5	177.886	67.045	9.325	0.06606	0.025799999	0.01661	27.383	0.482	848385024	
Edit	Delete	2206 20	2024-02-21	-0.21	0.797	0.12	0.385	-1.57067799	-0.20857	-0.08930001	19.86	6.029	25948798976	
Edit	Delete	2207 21	2024-02-21	0.01	0.213	0.006	0.009	1.77903	0.0496	-0.003880002	2.707	0.041	3975229952	
Edit	Delete	2208 22	2024-02-21	-0.01	0.2	0.088	0.03	-0.07851	-0.03469	-0.01908	34.868	0.817	1966390016	

```
SELECT * FROM "public"."cron_concentration";
```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Actions	id	date	stockcode	pid	shareholding	marketratio
Edit	Delete	81	2022-12-30	9997	C00100	427438477 0.3506170537
Edit	Delete	82	2022-12-30	9997	C00019	317637971 0.2605504547
Edit	Delete	83	2022-12-30	9997	B01224	216654935 0.177716605
Edit	Delete	84	2022-12-30	9997	B01901	58169500 0.0477149808
Edit	Delete	85	2022-12-30	9997	B01130	51848000 0.042529613
Edit	Delete	86	2022-12-30	9997	B01590	23117789 0.018962942
Edit	Delete	87	2022-12-30	9997	A00003	20677000 0.0169608241
Edit	Delete	88	2022-12-30	9997	A00004	15835000 0.012989053
Edit	Delete	89	2022-12-30	9997	C00033	10124000 0.0083044631
Edit	Delete	90	2022-12-30	9997	C00010	9283593 0.0076150983
Edit	Delete	91	2022-12-31	9997	C00100	427438477 0.3506170537
Edit	Delete	92	2022-12-31	9997	C00019	317637971 0.2605504547

```
SELECT * FROM "public"."news_news";
```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 Next > Last >>

Actions	id	uuid	datetime	source	newstype	title	tags
Edit	Delete	15 d73a6862-0e81-3eb8-89d6-b114dbce28b	2024-02-15 15:41:42-05	Associated Press Finance	STORY	Stock market today: Asian shares track Wall Street...	{'GSPC', 'COMP', '^RUT', '^HSI'}
Edit	Delete	16 ea965eddd-868b-3b22-939e-48cc77d5ba6	2024-02-15 10:38:31-05	Reuters	STORY	Stocks climb, yields and dollar ease after US ret...	{'^HSI'}
Edit	Delete	19 7fa6c038-4b62-3dec-b266-77539c64172a	2024-02-19 04:13:44-05	Reuters	STORY	EMERGING MARKETS-FX flat in holiday-affected trad...	{'^HSI'}
Edit	Delete	20 16460d41-3704-3ab7-bfab-cb8cd7fabd5c	2024-02-19 04:02:31-05	CNN Business	STORY	China reports 'record' holiday travel data. But c...	{'^HSI'}
Edit	Delete	21 d50317d9-f13a-3a74-acb6-67fb2928e97	2024-02-16 14:07:44-05	The Telegraph	STORY	FTSE 100 jumps amid US inflation shock	{'FTSE', 'NWG', 'COMP', '^GSF'}
Edit	Delete	22 5bc36acd-6773-3d12-b457-4573362e5ea1	2024-02-16 05:02:47-05	CNN Business	STORY	Despite a recession, Japan's stocks are partying ...	{'COMP', 'GSPC', '^DJI', '^HSI'}
Edit	Delete	23 0cea8a83-b415-3442-b06d-1bbcbbae6649	2024-02-16 04:30:00-05	South China Morning Post	STORY	Hong Kong stock index compiler leaves blue chip H...	{'^HSI'}
Edit	Delete	24 a040ac4c-b9eb-37b5-95bc-a32e4fce09a4	2024-02-16 02:42:03-05	Reuters	STORY	Exclusive-HSBC to improve ties with Hong Kong uni...	{'HSBC', '^HSI'}
Edit	Delete	25 064d22d5-1f69-304b-bd9d-151c3c223399	2024-02-16 01:17:41-05	Reuters	STORY	GLOBAL MARKETS-Nikkei within reach of all-time hi...	{'GSPC', 'COMP', '^HSI', '^DJI'}
Edit	Delete	26 8a9ea0c8-6c9d-3d59-b8e24-4900231e8d9f	2024-02-15 23:43:37-05	Reuters	STORY	Hong Kong stocks rise, China markets reopen next ...	{'^HSI'}
Edit	Delete	27 c7bf6df5-590a-3297-ae2b-f3af2d560d01	2024-02-20 13:03:42-05	The Telegraph	STORY	German offices suffer biggest slump in value acro...	{'BCS', '^FTSE', 'COMP', '^GSPC'}
Edit	Delete	28 37b0750e-406c-3801-8754-c487059d1753	2024-02-20 12:28:54-05	Reuters	STORY	GLOBAL MARKETS-Dollar, stocks slip as rate cut ex...	{'COMP', '^DJI', '^HSI', '^GSPC'}
Edit	Delete	29 a5464129-3af3-3d9d-b736-300a4471349	2024-02-20 08:20:18-05	Reuters	STORY	GLOBAL MARKETS-European, Japanese shares hover cl...	{'GSPC', '^HSI'}
Edit	Delete	30 e6d1659a-d17b-34d9-9eca-6633d811231c	2024-02-20 07:40:21-05	Barrons.com	STORY	Muted Response From Chinese Stocks to Latest Stim...	{'^HSI'}
Edit	Delete	31 204ed4ad-f6a1-3727-b966-0fcf0c42da58	2024-02-19 13:06:01-05	The Telegraph	STORY	French strikes force closure of Eiffel Tower	{'FTSE', 'CURYY', 'AZN', 'JD', 'R'}
Edit	Delete	32 c4637213-334e-39c5-811a-64dc52f2a751	2024-02-21 01:36:37-05	Reuters	STORY	GLOBAL MARKETS-China boosts Asian shares as inves...	{'NVDA', '^HSI', 'GSPC'}

```
SELECT * FROM "public"."cron_sbstocklist";
```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 Next > Last >>

Actions	id	stockcode	stockname	dateupdate	is_onlist
Edit	Delete	907 1	CK HUTCHISON HOLDINGS LIMITED	2023-12-28	TRUE
Edit	Delete	900 10	HANG LUNG GROUP LIMITED	2023-12-28	TRUE
Edit	Delete	876 101	HANG LUNG PROPERTIES LIMITED	2023-12-28	TRUE
Edit	Delete	656 1024	KUAISHOU TECHNOLOGY -HKD TRADED SHARES	2023-12-28	TRUE
Edit	Delete	655 1028	C.BANNER INTERNATIONAL HOLDINGS LIMITED	2023-12-28	TRUE
Edit	Delete	654 1030	SEAZEN GROUP LIMITED	2023-12-28	TRUE
Edit	Delete	653 1033	SINOPEC OILFIELD SERVICE CORPORATION	2023-12-28	TRUE
Edit	Delete	652 1038	CK INFRASTRUCTURE HOLDINGS LIMITED	2023-12-28	TRUE
Edit	Delete	651 1044	HENGAN INTERNATIONAL GROUP COMPANY LIMITED	2023-12-28	TRUE
Edit	Delete	650 1052	YUEXIU TRANSPORT INFRASTRUCTURE LIMITED	2023-12-28	TRUE
Edit	Delete	649 1053	CHONGQING IRON & STEEL COMPANY LIMITED	2023-12-28	TRUE
Edit	Delete	648 1055	CHINA SOUTHERN AIRLINES COMPANY LIMITED	2023-12-28	TRUE

```
SELECT * FROM "public"."cron_ccassholding";
```

1 2 3 4 5 6 7 8 9 >

Actions	id	date	stockcode	shareholding	ratio	is_listed
Edit	Delete	1 2022-12-28	1	37547105	0.0097	TRUE
Edit	Delete	2 2022-12-28	2	5984678	0.0023	TRUE
Edit	Delete	3 2022-12-28	3	43790220	0.0023	TRUE
Edit	Delete	4 2022-12-28	4	6282950	0.002	TRUE
Edit	Delete	5 2022-12-28	5	1898390733	0.0935	TRUE
Edit	Delete	6 2022-12-28	6	6777272	0.0031	TRUE
Edit	Delete	7 2022-12-28	8	11862096	0.0014	TRUE
Edit	Delete	8 2022-12-28	10	26835000	0.0196	TRUE
Edit	Delete	9 2022-12-28	11	3443623	0.0017	TRUE

PostgreSQL 9.6.22 running on /var/run/postgresql:5432 -- You are logged in as user "fintech1"

phpPgAdmin: PostgreSQL: fintech1_maindb: public: quote_fullstocklist:

Columns Browse Select? Insert? Indexes? Constraints? Triggers? Rules? Admin Info Privileges? Import

```
SELECT * FROM "public"."quote_fullstocklist";
```

Submit

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 Next > Last >>

Actions	id	stockcode	stockname	category	subcat	boardlot	industry	sseligible	option	is_hsi	tradecur	is_onlist
Edit	Delete	2947 1	CKH HOLDINGS	Equity	Equity Securities (Main Board)	500	Conglomerates	TRUE	TRUE	TRUE	HKD	TRUE
Edit	Delete	2948 2	CLP HOLDINGS	Equity	Equity Securities (Main Board)	500	Utilities	TRUE	TRUE	TRUE	HKD	TRUE
Edit	Delete	2949 3	HK & CHINA GAS	Equity	Equity Securities (Main Board)	1000	Utilities	TRUE	TRUE	TRUE	HKD	TRUE
Edit	Delete	2950 4	WHARF HOLDINGS	Equity	Equity Securities (Main Board)	1000	Properties & Construction	TRUE	TRUE	FALSE	HKD	TRUE
Edit	Delete	2951 5	HSBC HOLDINGS	Equity	Equity Securities (Main Board)	400	Financials	TRUE	TRUE	TRUE	HKD	TRUE
Edit	Delete	2952 6	POWER ASSETS	Equity	Equity Securities (Main Board)	500	Utilities	TRUE	TRUE	TRUE	HKD	TRUE
Edit	Delete	2953 7	WISDOM WEALTH	Equity	Equity Securities (Main Board)	10000	Nan	FALSE	FALSE	FALSE	HKD	TRUE
Edit	Delete	2954 8	PCCW	Equity	Equity Securities (Main Board)	1000	Telecommunications	TRUE	FALSE	FALSE	HKD	TRUE
Edit	Delete	2955 9	KEYNE LTD	Equity	Equity Securities (Main Board)	6000	Nan	FALSE	FALSE	FALSE	HKD	TRUE
Edit	Delete	2956 10	HANG LUNG GROUP	Equity	Equity Securities (Main Board)	1000	Nan	TRUE	FALSE	FALSE	HKD	TRUE
Edit	Delete	2957 11	HANG SENG BANK	Equity	Equity Securities (Main Board)	100	Financials	TRUE	TRUE	TRUE	HKD	TRUE

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

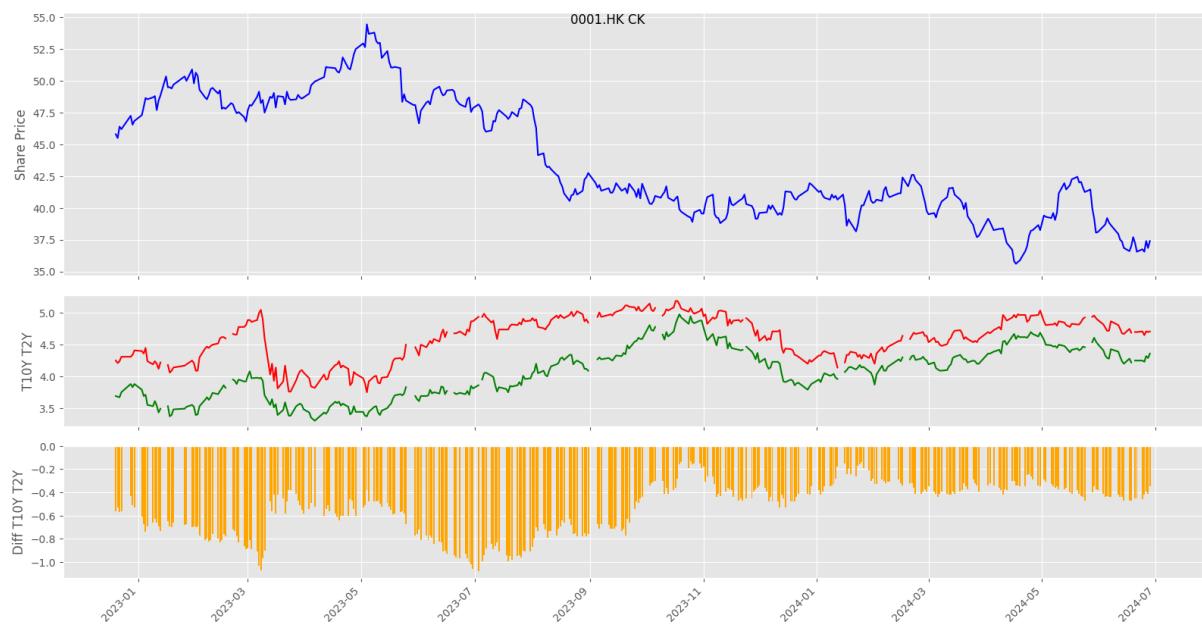
Submit

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	4165581	2024-08-02	700	B01274	Morgan Stanley Hong Kong Securities Limited
Edit	Delete	4165583	2024-08-02	700	A00004	428151872 0.0601377823
Edit	Delete	4165578	2024-08-02	700	C00100	609413442 0.0855976005
Edit	Delete	4165577	2024-08-02	700	C00019	2721927159 0.3823191574
Edit	Delete	4165579	2024-08-02	700	C00019	The Hongkong and Shanghai Banking Corporation Limited
Edit	Delete	4165583	2024-08-02	700	B01451	404487110 0.0568138536
Edit	Delete	4165586	2024-08-02	700	B01130	198904320 0.0279379012

- **Treasury Yield Data**

I collected yield data from the US Treasury market through the Federal Reserve Economic Data (FRED). This dataset provides insights into changes in US interest rates, which serve as a crucial factor in our hypothesis. They provide an API that easily extract the Market Yield on U.S. Treasury Securities at 2-Year, 10-Year and 10-Year Treasury Constant Maturity Minus 2-Year Treasury Constant Maturity. It means I can observe the different on short term and long terms different in the yield.



- **HIBOR and Monetary Base Data**

This project obtained data from the Hong Kong Monetary Authority (HKMA) on HIBOR (Hong Kong Interbank Offered Rate), monetary base, and interbank liquidity through their API. These datasets will assist us in understanding the broader monetary conditions in Hong Kong and whether they align with the trends observed in the US Fred rate. According to the HKMA's website, the primary objective of Hong Kong's monetary policy is to maintain currency stability. This entails maintaining a stable exchange

value of Hong Kong's currency against the US dollar within a band of HK\$7.75–7.85 to US\$1 in the foreign exchange market. The monetary system in Hong Kong operates under Currency Board arrangements, where the Monetary Base is required to be fully backed by US dollar reserves held in the Exchange Fund, and changes in the Monetary Base must be matched by corresponding changes in US dollar reserves. This indicates that the stability of Hong Kong's financial market closely follows the trends in the US market, particularly with regard to exchange rates and interest rates."

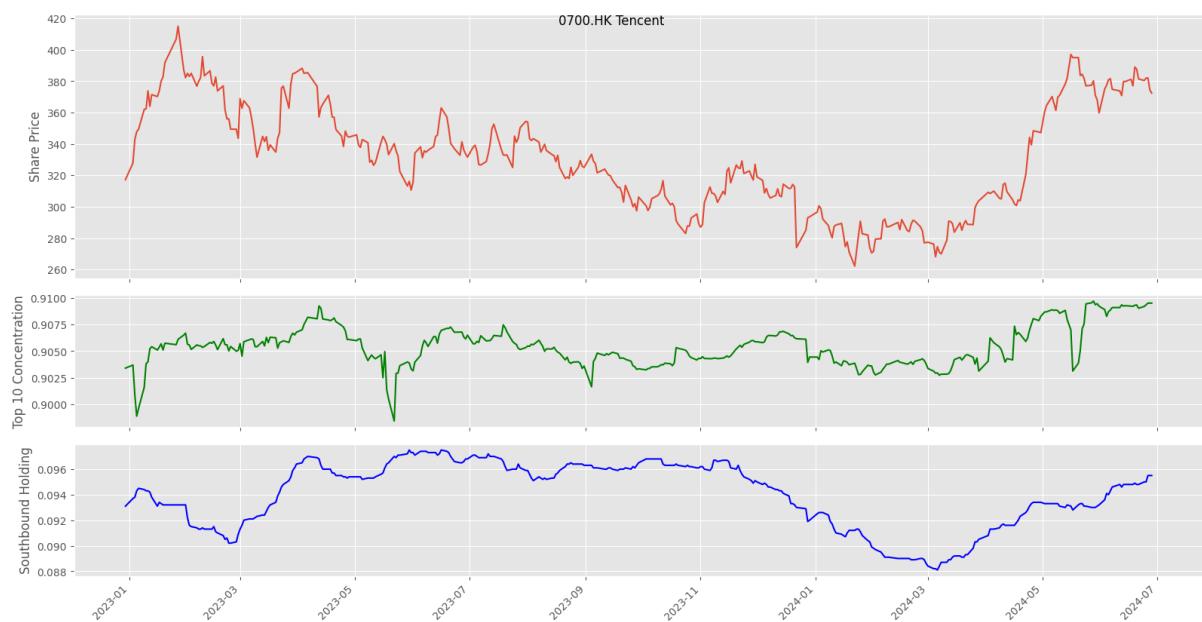
- **Southbound Shareholding Data**

Stock Connect Southbound is a trading link that allows mainland Chinese investors to trade stocks listed on the Hong Kong Stock Exchange (HKEX). It was launched in 2014 as part of the Shanghai-Hong Kong Stock Connect program. Stock Connect Southbound has been a major source of capital for the HKEX, and it has helped to increase the liquidity of Hong Kong stocks.

This project obtained data on shareholding movements from mainland China investors. This data helps us track the flow of money into the Hong Kong market, specifically focusing on the selected stocks. The shareholding information displayed represents the shareholdings of China Securities Depository and Clearing (CCASS Participant ID: A00003 and A00004) in aggregate as at the end of the specified date. However, the specific period is only limited to one year.

- **CCASS Concentration Data**

This project obtained data on shareholding concentration from HKEX. This data may provide some indications of the public flow on the selected stocks. The CCASS Concentration displayed represents the percentage of shareholdings held by top 5 shareholdings CCASS participants in aggregate as at the end of the specified date. However, the specific period is only limited to one year.



- **Hang Seng Index industry constituents.**

The Hang Seng Composite Index ("HSCI") is sub-divided into 12 Industry Indexes, reflecting the performance of different sectors of the Hong Kong stock market.

Hang Seng Composite Industry Index - Consumer Discretionary

Hang Seng Composite Industry Index - Consumer Staples

Hang Seng Composite Industry Index - Healthcare

Hang Seng Composite Industry Index - Conglomerates

Hang Seng Composite Industry Index - Information Technology

Hang Seng Composite Industry Index - Properties & Construction

Hang Seng Composite Industry Index - Financials

Hang Seng Composite Industry Index - Utilities

Hang Seng Composite Industry Index - Telecommunications

Hang Seng Composite Industry Index - Industrials

Hang Seng Composite Industry Index - Materials

Hang Seng Composite Industry Index - Energy

• Financial Data

From yFinance API, there are 18 financial data were scraped and maintained in the private database. In this project earning-per-share and book-value-per-share two data will be take into account.

stockcode	earningpershare	bookvalpershare	beta	revenuepershare	finData.info()
1	7.52	140.298	0.935	69.030	<class 'pandas.core.frame.DataFrame'> Index: 518 entries, 2198 to 4363 Data columns (total 21 columns): # Column Non-Null Count Dtype --- -- -- -- -- 0 stockcode 518 non-null object 1 dateupdate 518 non-null object 2 earningpershare 516 non-null float64 3 bookvalpershare 517 non-null float64 4 revenuepershare 514 non-null float64 5 cashpershare 517 non-null float64 6 profitmargin 503 non-null float64 7 returnonequity 481 non-null float64 8 returnonasset 484 non-null float64 9 debttoequity 494 non-null float64 10 quickratio 486 non-null float64 11 outstandingshare 518 non-null int64 12 insidersharehold 488 non-null float64 13 institutionsharehold 518 non-null float64 14 dividendyield 338 non-null float64 15 payoutratio 326 non-null float64 16 beta 479 non-null float64 17 latedividenddate 387 non-null object 18 latedividend 387 non-null float64 19 adjearningsgrowth 515 non-null float64 20 valuationprice 517 non-null float64 dtypes: float64(17), int64(1), object(3) memory usage: 89.0+ KB
2	4.29	41.772	0.551	38.144	
3	0.29	3.126	0.588	3.237	

- Frontend web for visualization

Around 75% of the backend data was display in the domain
<https://fintechhost.com/>

Fintechhost ticker 5,700

Latest Financial News

Oct. 19, 2024, 2:01 a.m. Zacks
Q4 Is The Best Quarter Of The Year For Stocks!
Q GSPC, RUT, HSI

Oct. 19, 2024, 6:06 a.m. The Telegraph
Pound hits two-year high against euro
Q FTSE, COMP, GSPC, DJI, HSI, LNSTY, SDIPF

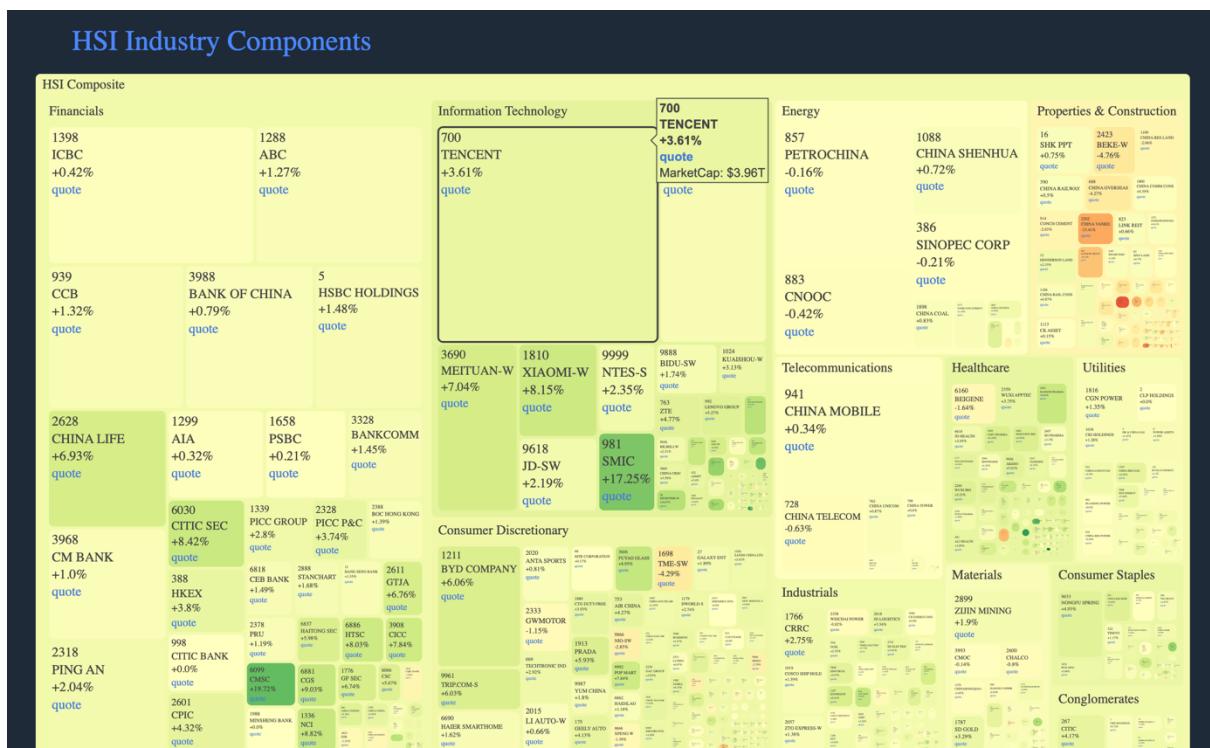
Oct. 18, 2024, 6:53 p.m. MT Newswires
Beijing Outlook Lifts Asian Stock Markets
Q HSI

Oct. 18, 2024, 5:33 p.m. Barrons.com
Hong Kong Stocks Close Up, Boosted by China Stimulus Hopes and TSMC Earnings
Q HSI

Oct. 18, 2024, 1:57 p.m. Associated Press Finance
Stock market today: World stocks gain as China releases plan to finance share buybacks
Q COMP, HSI, GSPC, DJI, GDAXI, HSI, FCHI

Oct. 18, 2024, 6:29 a.m. Fortune
Wall Street hovers near records as chipmakers soar
Q COMP, GSPC, DJI, GDAXI, HSI, FCHI

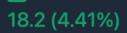
Oct. 18, 2024, 4:36 a.m. The Telegraph
Netflix boosted by new shows as it shrugs off strikes
Q FTSE, GSPC, COMP, TSM, DJI, YH103, HSI



The financial data last updated on February 2024.

Fintechhost ticker 5,700 

700 TENCENT  18 Oct, 2024

430.8  18.2 (4.41%)

Quote Technicals Financials Quant Analysis

18.OCT. 2024 FINANCIALS

	Day High	435.6	Day Low	411.4	Earning per Share(ttm)	21.96	P/E	19.62
Open	412.6		Volume	25,963,857				
52 Week High	482.4		52 Week Low	260.2	Earning Growth	-0.09%	PEG (?)	19.63
CAGR (?)	54.08%		Sharpe (?)	1.6	BookValue per Share	81.307	P/B	5.3
Maximum Drawdown			Calmar (?)		Revenue per Share	63.177	Cash per Share	38.351
Benchmark Correlation			Sector Ranking		Profit Margin	32.48%	Valuation Price (?)	164.3517
Shortsell Eligible	✓		Option Admitted	✓	Return on Equity	23.9%	Return on Assets	5.37%
SouthBound Eligible (?)	✓		Sector Information Technology		Debt to Equity	44.88%	Quick Ratio	1.131
Trade Currency	HKD		Board Lot	100	Outstanding Shares	9.4 billion	Market Capitals	4.1 trillion
					Insiders Shareholdings	34.12%	Institutions Shareholdings	23.4%
					Ratio		Ratio	
					Dividend Yield	0.84%	Payout Ratio	10.84%
					Latest	May 24,	Latest	
					Dividend Date	2021	Dividend	1.6



Backtest and Data Period

- Data period

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 2024-10-15	Monitor and compare with HSI
Monthly	Review portfolio (rebalance if needed)

- Backtesting process

 - Collect stock list from HKEX

Merged with HSI industry components stocks with industry type label

```
stockList = pd.read_csv('dataset/fullstocklist.csv', index_col=0)
# select 518 HSI industry component stocks
stockList = stockList.loc[~stockList['industry'].isna()]
stockList['stockcode'] = stockList['stockcode'].apply(convert2yf)
```

```
# test the data
stockList.loc[stockList['stockcode']=='0700.HK', 'industry'].values[0]
```

'Information Technology'

 - Collect stocks financial data from yFinance

export from pre-fetch cloud Postgres database

```
finData = pd.read_csv('dataset/findata.csv', index_col=0)
finData['stockcode'] = finData['stockcode'].apply(convert2yf)
inspect_columns(finData)
```

	unique	cardinality	with_null	null_pct	1st_row	random_row	last_row	dtype
stockcode	True	2901	False	0.0	0010.HK	1368.HK	83128.HK	object
dateupdate	False	1	False	0.0	21/2/2024	21/2/2024	21/2/2024	object
earningpershare	False	460	False	0.0	2.0600000000000001	0.4299999999999999	\N	object
bookvalpershare	False	1940	False	0.0	69.29999999999997	3.4580000000000002	\N	object
revenuepershare	False	1809	False	0.0	8.083999999999996	5.46	\N	object
cashpershare	False	1369	False	0.0	4.658000000000004	1.478	\N	object
profitmargin	False	2424	False	0.0	0.2553599999999998	0.07238	\N	object
returnonequity	False	2160	False	0.0	0.0316999999999999	0.11612	\N	object

- Prepare Stocks Factors and Ranking

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

0% | 0/335 [00:00<?, ?it/s]
CPU times: user 12.9 s, sys: 936 ms, total: 13.8 s
Wall time: 49.8 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 each factor and calculate a comprehensive ranking of all

```
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

- Select the top 6 ranking stock with positive PE, PB, dividend yield and Sharpe ratio

```
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

- Calculate Portfolio Weights with maximum Sharpe Ratio

```
df_trial = pd.concat([download_yf(ticker, STARTDATE, ENDDATE) for ticker in tqdm(top_stocks)], axis=1)
df_trial
```

0%| 0/6 [00:00<?, ?it/s]
0087.HK 0998.HK 1898.HK 0392.HK 6881.HK 3988.HK

Date						
2023-01-03	10.38	3.50	6.44	25.850000	3.86	2.86
2023-01-04	10.38	3.56	6.21	26.100000	3.95	2.91
2023-01-05	10.38	3.57	6.22	26.250000	4.03	2.88
2023-01-06	10.12	3.59	6.18	26.400000	3.96	2.90
2023-01-09	10.24	3.62	6.28	26.750000	4.04	2.91

- Calculate one-year daily return and standard deviation

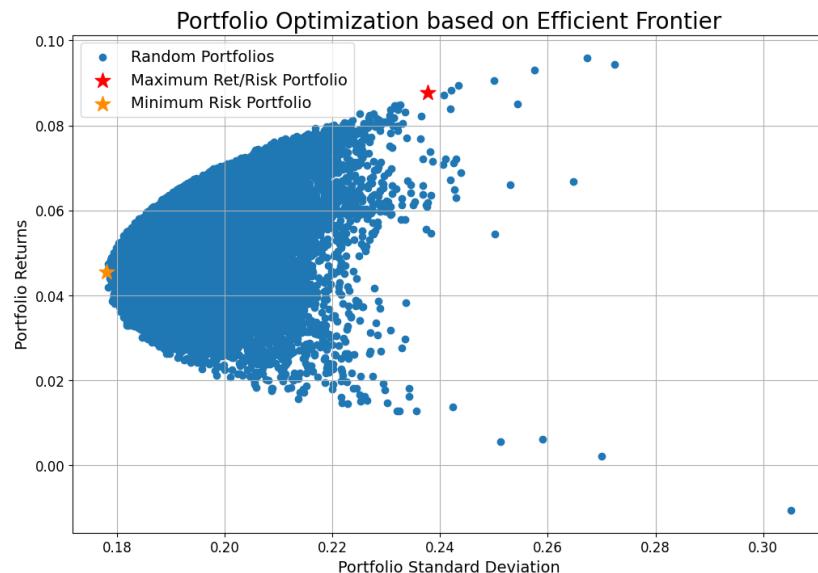
```
annualizedRtn = (((df_trial.iloc[-1]-df_trial.iloc[0]) / df_trial.iloc[0]) + 1)**(252/df_trial.index.unique().shape[0] - 1)
```

0087.HK -0.015981
0998.HK 0.053383
1898.HK 0.106476
0392.HK 0.052201
6881.HK 0.072631
3988.HK 0.043545
dtype: float64

```
dailyRtn = df_trial.pct_change().dropna()
dailyRtn
```

	0087.HK	0998.HK	1898.HK	0392.HK	6881.HK	3988.HK
Date						
2023-01-04	0.000000	0.017143	-0.035714	0.009671	0.023316	0.017483
2023-01-05	0.000000	0.002809	0.001610	0.005747	0.020253	-0.010309
2023-01-06	-0.025048	0.005602	-0.006431	0.005714	-0.017370	0.006944
2023-01-09	0.011858	0.008357	0.016181	0.013258	0.020202	0.003448
2023-01-10	0.013672	-0.002762	-0.003185	-0.005607	0.002475	-0.003436

- Portfolio Optimization based on Efficient Frontier



- Calculate Portfolio Weights with maximum Sharpe ratio (2023-01-04 to 2023-12-29)

```
# Print the portfolio with the maximum Sharpe ratio
print("The portfolio metrics for the maximum return/std dev. portfolio:")
print(max_ret_by_std_dev)
ben_ret = (benchmark.loc[benchmark.index[-1], '^HSI'] / benchmark.loc[benchmark.index[0], '^HSI'])**((252/benchmark.shape[0]) - 1)
print(f"\nBenchmark Return {ben_ret:.6f}")
print("\nThe portfolio weights for each stock in the maximum return/std dev. portfolio is as:")
for i,j in zip(df_trial.columns, wts_max_ret_by_std_dev):
    print("{} {}".format(i,round(j*100,2)))

The portfolio metrics for the maximum return/std dev. portfolio:
returns      0.087692
std_dev       0.237628
returns/std_dev 0.369032
Name: 6085, dtype: float64

Benchmark Return -0.186844

The portfolio weights for each stock in the maximum return/std dev. portfolio is as:
0087.HK 0.2%
0998.HK 6.5%
1898.HK 59.52%
0392.HK 7.9%
6881.HK 18.87%
3988.HK 7.01%
```

Initial Capital and Risk Management

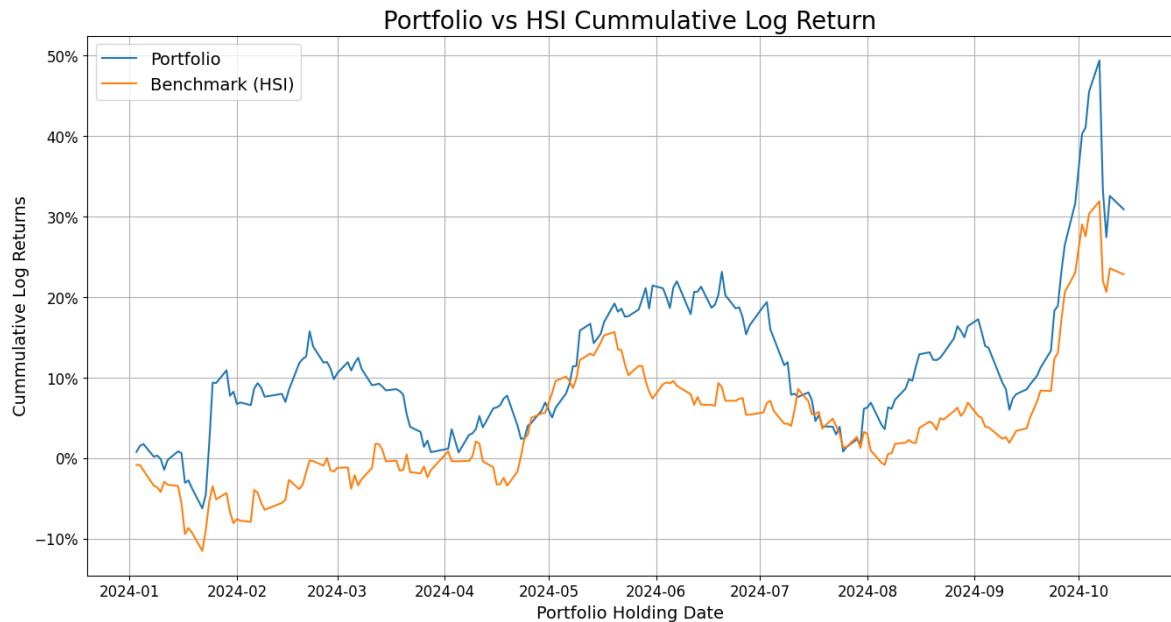
- Establish portfolio with optimised weighting

Date	0087.HK	0087.HK_size	0998.HK	0998.HK_size	1898.HK	1898.HK_size	0392.HK	0392.HK_size	6881.HK	6881.HK_size	3988.HK	3988.HK_size
2024-01-02	10.16	199.47628	3.64	17869.119781	7.42	80216.819039	27.450001	2876.139646	4.08	46245.441054	2.95	23759.148198
2024-01-03	10.14	199.47628	3.65	17869.119781	7.48	80216.819039	28.100000	2876.139646	4.10	46245.441054	2.95	23759.148198
2024-01-04	10.14	199.47628	3.70	17869.119781	7.57	80216.819039	28.400000	2876.139646	4.06	46245.441054	2.97	23759.148198
2024-01-05	10.18	199.47628	3.77	17869.119781	7.56	80216.819039	28.549999	2876.139646	4.09	46245.441054	2.97	23759.148198
2024-01-08	9.94	199.47628	3.70	17869.119781	7.47	80216.819039	28.350000	2876.139646	3.97	46245.441054	2.92	23759.148198
...
2024-10-07	11.08	199.47628	5.46	17869.119781	10.62	80216.819039	29.900000	2876.139646	11.00	46245.441054	3.90	23759.148198
2024-10-08	10.46	199.47628	5.13	17869.119781	9.85	80216.819039	27.200001	2876.139646	7.46	46245.441054	3.69	23759.148198
2024-10-09	10.18	199.47628	4.98	17869.119781	9.34	80216.819039	26.100000	2876.139646	6.79	46245.441054	3.64	23759.148198
2024-10-10	10.30	199.47628	5.12	17869.119781	10.08	80216.819039	26.950001	2876.139646	6.84	46245.441054	3.75	23759.148198
2024-10-14	10.40	199.47628	5.19	17869.119781	9.93	80216.819039	26.650000	2876.139646	6.55	46245.441054	3.84	23759.148198

- Calculate daily portfolio return

87.HK	0087.HK_size	0998.HK	0998.HK_size	1898.HK	1898.HK_size	0392.HK	0392.HK_size	6881.HK	6881.HK_size	3988.HK	3988.HK_size	portfolioAmount	PortfDailyRe
10.16	199.47628	3.64	17869.119781	7.42	80216.819039	27.450001	2876.139646	4.08	46245.441054	2.95	23759.148198	1.000000e+06	0.00000
10.14	199.47628	3.65	17869.119781	7.48	80216.819039	28.100000	2876.139646	4.10	46245.441054	2.95	23759.148198	1.007782e+06	0.00778
10.14	199.47628	3.70	17869.119781	7.57	80216.819039	28.400000	2876.139646	4.06	46245.441054	2.97	23759.148198	1.015383e+06	0.00754
10.18	199.47628	3.77	17869.119781	7.56	80216.819039	28.549999	2876.139646	4.09	46245.441054	2.97	23759.148198	1.017659e+06	0.00224
9.94	199.47628	3.70	17869.119781	7.47	80216.819039	28.350000	2876.139646	3.97	46245.441054	2.92	23759.148198	1.001828e+06	-0.01555

- Compare portfolio cumulative return with benchmark Hang Seng Index



- Summary of the key performance metrics

```
def get_performance_metrics(portf, bench) :
    """Calculate portfolio performance ratio"""
    portfRet = portf['portfolioAmount'].pct_change(portf.shape[0]-1).values[-1]**np.sqrt(252/portf.shape[0])
    portfSD = round(np.std(portf['PortfDailyRet']), 4)
    portfSharpe = round((portfRet-HKRISKFREE) / portfSD, 4)

    benchRet = bench['^HSI'].pct_change(bench.shape[0]-1).values[-1]**np.sqrt(252/bench.shape[0])
    benchSD = round(np.std(bench['DailyRet']), 4)
    benchSharpe = round((benchRet-HKRISKFREE)/benchSD, 4)

    exposureDays = portf.shape[0]

    performance_metrics = pd.DataFrame({
        'PortfCAGR' : portfRet,
        'portfSD' : portfSD,
        'portfSharpe' : portfSharpe,
        'benchCAGR' : benchRet,
        'benchSD' : benchSD,
        'benchSharpe' : benchSharpe,
        'exposureDays' : exposureDays,
    }, index=[portf.index[-1]])
    return performance_metrics
```

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

	PortfCAGR	portfSD	portfSharpe	benchCAGR	benchSD	benchSharpe	exposureDays
2024-10-14	0.311413	0.0236	11.7124	0.210281	0.0164	10.6879	191

- Year to date Portfolio Balance

```
print(f"As of {df_test1.index[0].date()} to {df_test1.index[-1].date()}, \
Portfolio Balance (HKD): {df_test1.iloc[-1]['portfolioAmount']:.2f}")
print(f"Portfolio year to date return: {((df_test1.iloc[-1]['portfolioAmount']/INITCAPITAL)-1)*100:.2f}%")
```

As of 2024-01-02 to 2024-10-15, Portfolio Balance (HKD): 1295603.13
 Portfolio year to date return: 29.56%

- Year to date individual stocks performance

```
print(f'Performance of individual stocks As of {df_test1.index[0].date()} to {df_test1.index[-1].date()}')
for ticker in top_stocks:
    print(f'{ticker} {(df_test1[ticker].iloc[-1]/df_test1[ticker].iloc[0]-1)*100:.2f}%')

Performance of individual stocks As of 2024-01-02 to 2024-10-15
0087.HK -0.20%
0998.HK 38.19%
1898.HK 29.65%
0392.HK -5.46%
6881.HK 50.49%
3988.HK 27.80%
```

portfolio_wts

```
{'0087.HK': 0.003972375349164551,
 '0998.HK': 0.20366087214196119,
 '1898.HK': 0.5449998123573663,
 '0392.HK': 0.11058482481921242,
 '6881.HK': 0.10695189962465941,
 '3988.HK': 0.029830215707636065}
```

Comparing the optimised weight and stocks performance, it is easy to find out that the overall top weights stocks have better performance.

	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

The weights are optimised with the stocks Sharped ratio which expected having greatest Sharpe of portfolio as a result. An efficient frontier optimized portfolio offers several benefits for risk management and downside risk control. It identifies the best possible return for a given level of risk, allowing investors to make informed decisions based on their risk tolerance and investment goals. By promoting diversification, it combines uncorrelated assets to reduce overall portfolio risk and minimize the impact of poor-performing assets.

Additionally, it focuses on reducing potential losses by optimizing asset allocation, using historical data to mitigate the risk of significant downturns. This approach ensures efficient use of capital, where each unit of risk is compensated by an appropriate level of expected return. The efficient frontier also allows for dynamic portfolio adjustments in response

to market changes, providing a framework for ongoing risk management and performance evaluation.

```
stockList.loc[stockList.stockcode.isin(top_stocks)]
```

	stockcode	stockname	category	subcat	boardlot	industry
	id					
3022	0087.HK	SWIRE PACIFIC B	Equity	Equity Securities (Main Board)	2500	Conglomerates
3282	0392.HK	BEIJING ENT	Equity	Equity Securities (Main Board)	500	Utilities
3733	0998.HK	CITIC BANK	Equity	Equity Securities (Main Board)	1000	Financials
4396	1898.HK	CHINA COAL	Equity	Equity Securities (Main Board)	1000	Energy
5141	3988.HK	BANK OF CHINA	Equity	Equity Securities (Main Board)	1000	Financials
5278	6881.HK	CGS	Equity	Equity Securities (Main Board)	500	Financials

Balancing diversification and concentration in a portfolio involves assessing the risk tolerance and investment goals. By diversifying across asset classes, sectors, industries, and geographies, you spread risk and protect against specific downturns. Concentrating on a few high-conviction investments can enhance potential returns. Regular portfolio reviews and rebalancing help maintain this balance. Utilizing mutual funds can provide broad exposure and built-in diversification, effectively managing risk while positioning for growth.

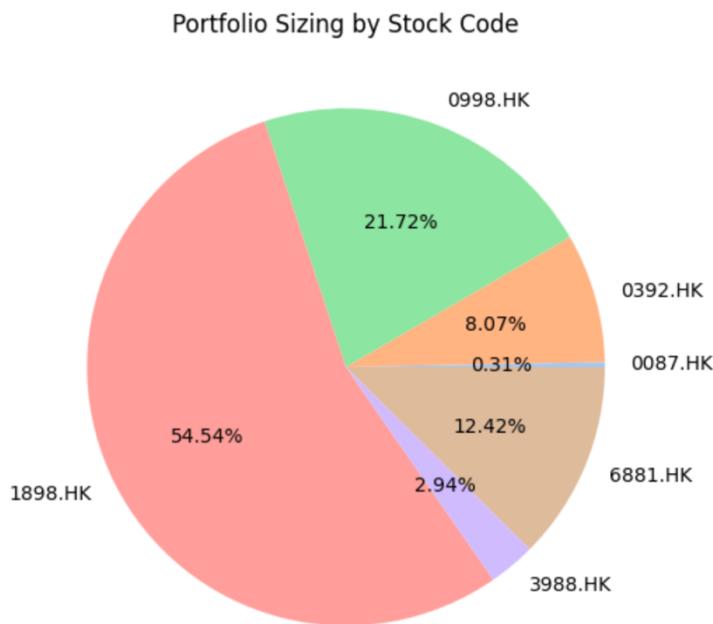
```
portf_size['StockBalance'] = portf_size['stockcode'].apply(\n    lambda x: df_test1.iloc[[x]]*df_test1.iloc[[x]]['size'])\nportf_size
```

	id	stockcode	stockname	industry	StockBalance
0	3022	0087.HK	SWIRE PACIFIC B	Conglomerates	3964.555906
1	3282	0392.HK	BEIJING ENT	Utilities	104541.938385
2	3733	0998.HK	CITIC BANK	Financials	281432.472550
3	4396	1898.HK	CHINA COAL	Energy	706590.037547
4	5141	3988.HK	BANK OF CHINA	Financials	38122.003672
5	5278	6881.HK	CGS	Financials	160952.122965

```

palette_color = seaborn.color_palette('pastel')
plt.figure(figsize=(6,6))
plt.pie(portf_size['StockBalance'], labels=portf_size['stockcode'], colors=palette_color, autopct='%.2f%%')
plt.title('Portfolio Sizing by Stock Code')
plt.show()

```

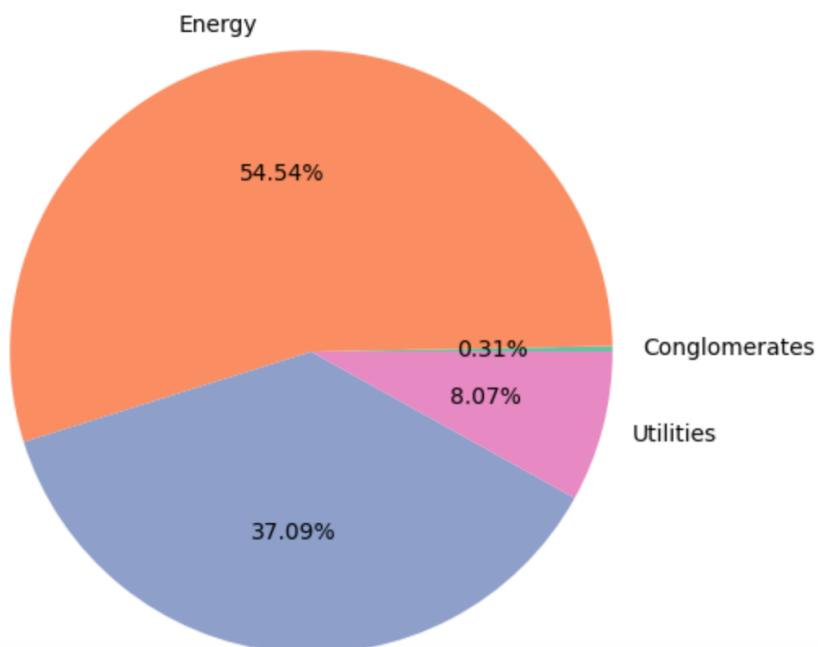


```

palette_color = seaborn.color_palette('Set2')
plt.figure(figsize=(6,6))
plt.pie(portf_size_industry['StockBalance'], labels=portf_size_industry.index.tolist(),
        colors=palette_color, autopct='%.2f%%')
plt.title('Portfolio Sizing by Industry')
plt.show()

```

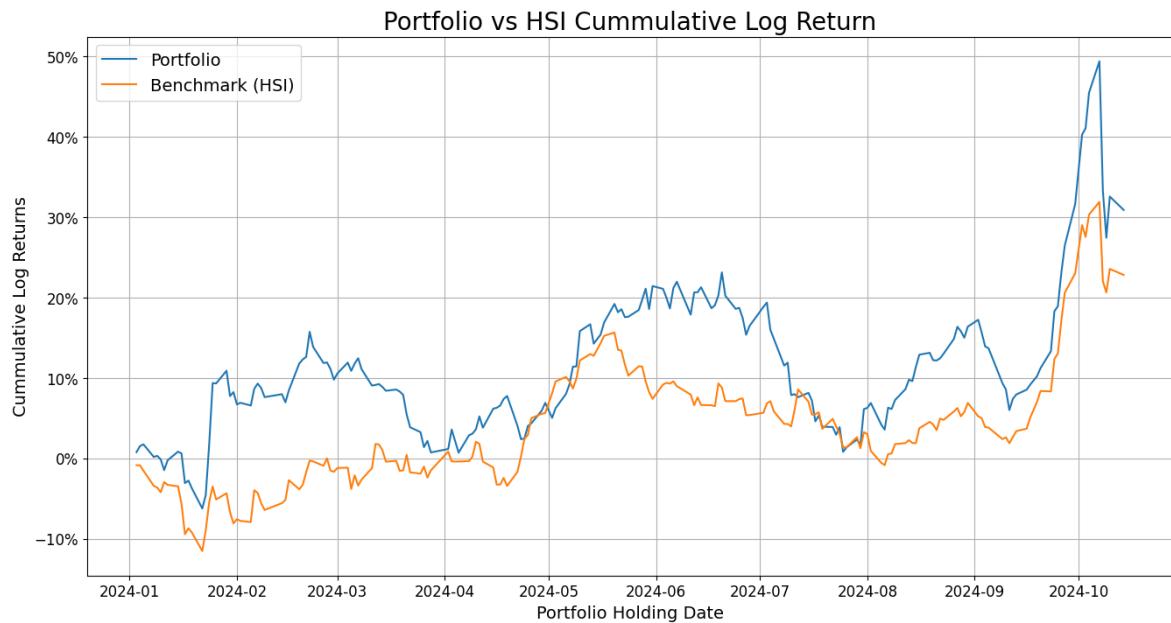
Portfolio Sizing by Industry



Performance Evaluation and Interpretation

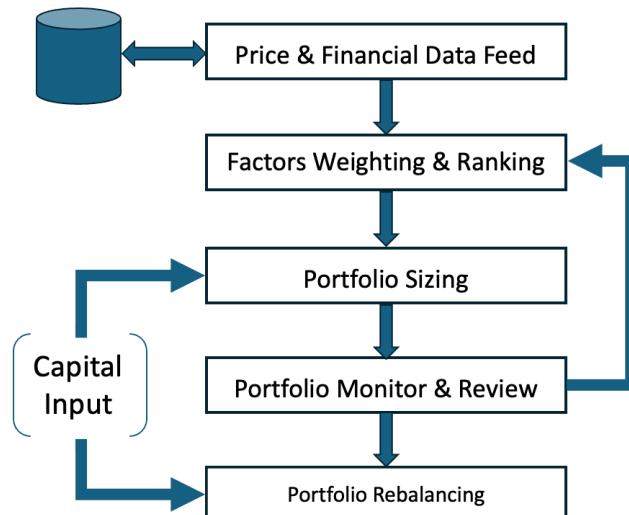
```
get_performance_metrics(df_test1, bench_test1)
```

	PortfCAGR	portfSD	portfSharpe	benchCAGR	benchSD	benchSharpe	exposureDays
2024-10-15	0.247526	0.0214	9.9311	0.168334	0.0166	8.0322	192



In most of the portfolio holding period, its performance was better than the benchmark HSI, although the standard deviation is slightly bigger. The portfolio final return 24.75% is almost 50% bigger than the HSI 16.83%

This portfolio is created for buy and hold. If there was dividend paid out, the fund will be re-invest in the portfolio before recalculate the new weighting.



The strategy's strengths lie in its balanced approach to risk management and growth potential. By diversifying across asset classes, sectors, and geographies, it effectively mitigates risk and cushions against market volatility. Concentrating on high-conviction investments can enhance returns by leveraging well-researched opportunities. Additionally, the use of mutual funds provides easy access to a wide range of investments, offering built-in diversification with lower costs. Regular reviews and rebalancing allow for flexibility and adaptability in response to changing market conditions.

However, the strategy also faces several weaknesses and challenges. Over-diversification can dilute returns, reducing the impact of successful investments. The complexity of analysing vast data and identifying high-conviction opportunities requires significant effort and expertise. Streamlining data analysis and rebalancing processes would also enhance efficiency, making the strategy more robust and effective.

Conclusion

Backtesting provides valuable insights by simulating how a trading strategy would have performed using historical data. It helps identify patterns and validate the effectiveness of strategies, revealing potential strengths and weaknesses. For instance, if a strategy consistently performs well in various market conditions, it suggests robustness and adaptability. Conversely, if it underperforms during specific periods, it highlights areas needing adjustment.

These insights can inform future trading decisions by guiding strategy refinements. Understanding which factors contribute to success or failure allows for targeted improvements, such as adjusting risk parameters or fine-tuning entry and exit points. Additionally, backtesting helps set

realistic expectations for returns and risk, aiding in better risk management and strategic planning for future trades.

Factor investing is an investment strategy that involves targeting specific drivers of returns across asset classes. These factors are underlying characteristics that can explain the risk and return profile of a portfolio.

Multi-factor strategy is an approach that combines individual factors that have been known to perform well. With ease of efficient frontier for optimising portfolio, outperformed portfolio comes easy.

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