



THE CHINESE UNIVERSITY OF HONG KONG, SHENZHEN

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FIN3210 Fintech Theory and Practice

**PROJECT 2 QUANT FUND**

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## **1. Business Model and AI-based Strategy**

### **1.1 Business Model**

The High-Flyer Quant Investment Management company in Hangzhou has crafted an innovative business model that seamlessly blends artificial intelligence, machine learning, and big data into its investment strategy. This distinctive approach manifests in three principal areas: portfolio construction, trading, and risk management.

In the realm of portfolio construction, High-Flyer Quant employs numerous AI algorithms to identify asset pricing errors and leverages extensive datasets and neural network models to analyze financial behaviors. This method enables them to craft more scientifically-grounded investment portfolios to counteract the market's irrational fluctuations. Additionally, their investment and research team comprises experts from various fields, including Olympic gold medalists and senior researchers. This interdisciplinary team equips High-Flyer Quant with the capability to tackle complex issues in deep learning, big data modeling, parallel computing, and fundamental quantification.

In the aspect of trading, High-Flyer Quant has also made breakthroughs. Since 2008, the company has been exploring fully automated quantitative trading, and since 2016, has been utilizing deep learning algorithms for trade execution, enhancing both efficiency and accuracy. Moreover, High-Flyer Quant has established a robust R&D platform, the Fire-Flyer series of AI deep learning platforms, to support its quantitative research. Today, their data warehouse has grown to over 10PB, updating daily from thousands of different data points.

Finally, A data-driven approach forms the cornerstone of High-Flyer Quant's risk management strategy, with ongoing adjustments to their models and control scale to manage risks. Additionally, the company operates through subsidiaries regulated by the Asset

Management Association of China (AMAC) and the Securities and Futures Commission (SFC) of Hong Kong. This regulatory oversight ensures that High-Flyer Quant adheres to industry standards in risk management. However, High-Flyer Quant also faces challenges. For instance, in 2021, High-Flyer Quant publicly acknowledged shortcomings in its AI models regarding timing in trades, leading to significant asset losses. The company indicated that its models tend to take on higher risks during market volatility, exacerbating downturns.

## **1.2 AI-based Strategy**

At its core, High-Flyer Quant uses deep neural networks to train models. From the initial data collection, processing and analysis to the overall modeling and training of artificial intelligence models based on neural networks in the middle, to the generation of investment portfolios, and finally to the completion of transactions with refined programmatic transactions, all these links have realized the whole process operation based on AI platform. There are three main sources of data for the company's model: first, market data, including a series of volume and price indicators; The second is the fundamental data covering the whole market; The third is alternative data that is structured. It uses these three types of data as inputs to train a machine model to predict how stocks will change in price over a given cycle, and then constructs a portfolio based on that.

According to the needs of its quantitative financial business development, High-Flyer Quant gradually developed a high-performance deep learning training platform - Fire-Flyer, which provides task-level time-sharing scheduling management. Fire-Flyer is the culmination of a series of AI infrastructures, which is the window for High-Flyer Quant to open its surging deep learning computing power, including: Task-level time-sharing scheduler, high-speed file reading and writing system “3FS”, model parallel training tool “hfreduce”, high-performance

deep learning operator “hfai.nn”, and various underlying high-performance hardware devices and software packages. Inspired by the Linux system CPU task scheduling, the task-level time-sharing scheduling method shifts the graphics card computing power resources from the traditional hardware-exclusive way to the centralized scheduling of training tasks. The graphics card resources are gathered together, segmented on the timeline, and reasonably allocated to each training task in the cluster. Users can submit tasks on the Fire-Flyer on demand, and the cluster can continuously maintain a utilization rate of more than 90% for model training.

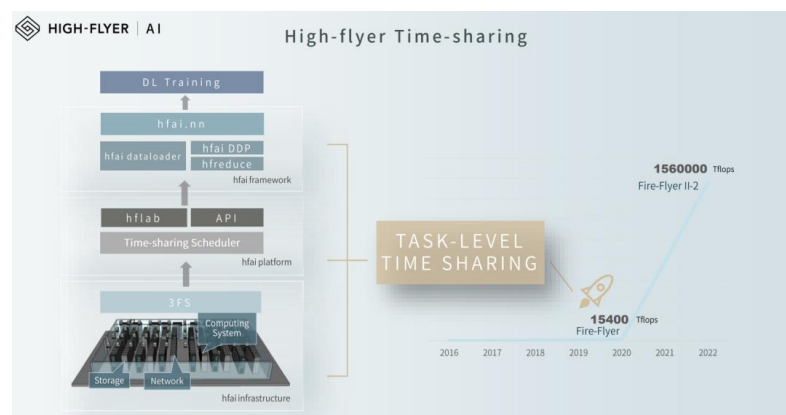


Figure: Deep learning training platform- Fire-Flyer (source: High-Flyer Quant official public account)

To supplement the content of portfolio construction, High-Flyer Quant previously presented its quantitative strategy model employing a Deep Neural Network (DNN) featuring 1 input layer and 3 fully connected layers. Within this model, High-Flyer utilizes 98 factors in alpha101 and Guotai Junan 191. In the construction process, eigenvalues undergo preprocessing steps like normalization, standardization, and clipping to maintain control within the range of -1 to 1. To supplement the content of trading, High-Flyer Quant delves into fully automated quantitative trading, progressing from machine learning to current AI-driven quantitative trading across diverse market conditions, accumulating substantial practical expertise. Consequently, its trading operations can be executed automatically through AI. Furthermore, Chinese market is not a very efficient market, so investor behavior and decision-making

patterns are worth studying. In the market information, this will eventually be reflected in the changes in stock price, trading volume and technical level in the volume and price system, and behind this are people's preferences and behavioral characteristics. High-Flyer Quant finds the internal connection and anticipates price changes by combining and modeling a large amount of historical data. High-Flyer Quant corrects the price shift in the market and trades based on that shift, earning a profit.

Furthermore, High-Flyer uses artificial intelligence technology to select domestic stocks in big data, design trading algorithms and hedge investment risks to do risk management.

## **2. Potential Benefits of AI or ML-powered Strategy Compared to the Traditional Investing Approach**

AI and ML-powered investment strategies offer the potential for more data-driven, adaptive, and efficient decision-making compared to traditional approaches. The ability to process vast amounts of data in real-time, identify complex patterns, and adapt to changing market conditions gives AI and ML a significant advantage in the dynamic and fast-paced world of finance.

### **2.1 Data-driven Decision Making**

**Granular Pattern Recognition:** AI/ML processes vast datasets in real-time, identifying patterns and trends that may be missed by traditional methods.

**Sentiment Analysis:** The ability to analyze real-time sentiment from news articles, social media, and other sources helps in gauging market sentiment promptly.

**High-speed Data Processing:** AI/ML processes large datasets at high speeds, providing timely insights into market changes and opportunities. Traditional approaches, relying on

manual analysis and periodic reports, may struggle to keep up with the volume and speed of data processing required for timely insights.

## **2.2 Adaptive Strategies**

**Dynamic Portfolio Optimization:** AI/ML dynamically adjusts investment strategies based on changing market conditions, optimizing portfolios and managing risk more effectively. Machine learning algorithms excel at quantitative analysis, learning from new data and adapting strategies to evolving trends. In contrast, traditional approaches often employ static models and strategies, making them less responsive to rapidly changing market dynamics.

## **2.3 Efficiency and Automation**

**Efficiency Enhancement:** AI/ML automates routine tasks, allowing human analysts to focus on higher-level decision-making and strategy development. The ability to automate repetitive tasks enables a more streamlined and scalable investment process, enhancing overall operational efficiency.

**Risk Management:** Automation not only increases efficiency but also reduces the likelihood of errors associated with manual data entry and analysis in traditional approaches.

## **3.1 Performance Analysis on High-Flyer Quant**

As of December 5, 2023, High-Flyer Quant achieved a nearly one-year income of 2.85%, with cumulative income at 169.66% and annual income at 15.42%. The firm has sustained positive earnings for five consecutive years since 2019. High-Flyer Quant manages 507 products, and the latest weekly report provided operational data for 274 portfolios, classified into four main categories: Index Increase (65), Quantitative Hedge (12), Exclusive Custom (about 190), and Others (7). Analysis of the weekly report revealed that, as of December 5,

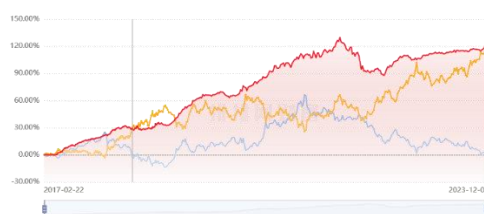
2023, Index Increase products, specifically 1000 IC, and a portion of Exclusive Custom products performed well in 2023. However, the performances of Quantitative Hedge portfolios and Index Increase products tied to CSI300 and SSI50 were average or subpar.

### 3.1.1 Index Increase Portfolio

According to the latest weekly report from High-Flyer Quant, the overall performance of the Index Increase Portfolio was relatively moderate this year. Among the 44 portfolios linked to the IC500 index, the average annualized return is approximately 11.8%, with an average annualized extra return of 14.8%. However, the individual portfolio returns for this year ranged from -4.9% to 5.8%. Despite this, all Index Increase Portfolios showed positive extra returns compared to the corresponding index in 2023. Notably, 12 out of the 14 portfolios tied to the IC1000 achieved an average return of over 10% in 2023.

### 3.1.2 Quantitative Hedge Portfolio

According to High-Flyer Quant's latest weekly report, their Quantitative Hedge products demonstrated a relatively average performance this year. The returns of the 12 Quantitative Hedge Portfolios ranged from 3.7% to 6.4% (with an average annualized return of 8.1%). However, all 12 portfolios experienced a maximum retracement of over 18%. Notably, the historically impressive "九章幻方量化对冲 1 号" portfolio, which typically has an average annual return of about 12.5%, only achieved 4.9% this year, as indicated by the return curve.



Data Source: 私募排排网

### 3.1.3 Exclusive Custom Portfolio

The performance of Exclusive Custom portfolios has maintained a stable level. With a total of 190 portfolios, the returns for 2023 vary modestly from -2.6% to 12.6%. Most of these portfolios recorded positive annual returns, with over 87% of them having returns below 10%.

### 3.2 Comparison with Other Non-AI-Based Competitors in China

There's a saying that "scale can hinder achievements." When operations become too large, flexibility decreases, allocation becomes more challenging, and returns tend to be lower. With High-Flyer managing assets exceeding 60 billion, comparing its performance directly with smaller funds would be unfair. This report, therefore, aims to assess High-Flyer's performance against three other domestic non-AI-based Quantitative Fund companies with similar asset scales as of June 2023. Notably, High-Flyer Quant is the only one among them entirely driven by artificial intelligence.

基金公司	产品数	夏 普 比 率	累 计 收 益	最 近 一 年	最 近 半 年	投资策略
幻方量化	507	1.02	161.77%	5.97%	-3.75%	股票策略
九坤投资	763	1.15	144.66%	9.12%	-1.71%	股票策略
灵均投资	490	0.93	166.08%	7.02	-4.19%	股票策略
明汨投资	159	/	586.32%	6.21%	2.49%	股票策略

The table indicates that High-Flyer had an average performance in 2023 and notably poor results in the recent six months, with a typical Sharpe Ratio. Its most recent annual return is the lowest among the four, including two years of negative returns (-4.63), suggesting a subpar performance for AI-driven Quant strategies in recent times.

Furthermore, as of June 2023, among 31 domestic private equity firms with assets exceeding 10 billion yuan, High-Flyer Quant ranks 22nd based on a 2.09% average return this year, reflecting a relatively low standing. Notably, within the subset of 24 companies focusing on



equities, High-Flyer Quant holds the 18th position in terms of average return this year (up to October).

#### **4.1 the commonalities and differences between Bridgewater Associates and High-Flyer Quant**

##### **Bridgewater Associates**

**AI Transition and Strategy:** Bridgewater is currently transitioning towards an AI-based investment strategy, focusing on developing a machine-learning engine to forecast global economic events and guide investment allocation.

**Artificial Investment Associate (AIA) Lab:** The firm's AIA Lab, staffed with seasoned investors and machine-learning experts, plays a pivotal role in transitioning Bridgewater's entire investment methodology to machine learning, from analyzing financial trends to formulating and testing investment theories.

**Human Oversight:** Despite the significant role of AI, human oversight remains integral to Bridgewater's approach, especially in risk management, with measures like a manual 'kill switch' in place.

**Global Economic Forecasting:** The AI strategy at Bridgewater is heavily oriented towards macroeconomic forecasting, blending AI analysis with human judgment for investment decisions.

##### **High-Flyer Quant**

**Longstanding AI Integration:** Since 2008, High-Flyer Quant has been integrating AI and machine learning into its investment strategies, indicating a deep-rooted AI-centric culture within the firm.

**Data-Driven Strategy:** With over 10PB of diverse data collected, the firm's strategy heavily relies on big data analytics for a nuanced analysis of market trends and mispricing opportunities.

**Proactive Market Tactics:** High-Flyer focuses on identifying market mispricing and conducting reverse transactions, suggesting a more aggressive, market-reactive investment strategy. **Technological Innovation:** The proprietary Fire-Flyer series of AI deep learning platforms highlight High-Flyer's commitment to technological innovation, using powerful computing for efficient idea verification.

### **Difference**

**Integration Depth:** High-Flyer Quant has a more profound and longstanding integration of AI, while Bridgewater is still adapting its AI capabilities.

**Focus of AI Strategy:** High-Flyer's approach is data-intensive, leveraging large datasets for market analysis, while Bridgewater focuses on macroeconomic forecasting and investment allocation.

**Risk Management Approach:** High-Flyer's strategy might imply a higher risk profile due to its proactive market tactics, whereas Bridgewater's balanced approach of AI and human insight suggests a more risk-averse stance.

**Technology vs. Theory:** High-Flyer emphasizes technological innovation in its platforms, whereas Bridgewater focuses on developing AI-driven investment theories and methodologies.

### **Commonalities**

While there may not be an official document detailing the precise utilization of AI in their investment processes, common industry practices suggest several ways in which AI is often leveraged.

Firstly, both firms likely harness AI for data analysis and processing. AI's proficiency in analyzing extensive financial data enables the identification of patterns and trends that might

elude human traders. Moreover, AI systems, often powered by advanced computation tools like GPUs, can process and analyze data in real-time.

Secondly, AI is likely employed for predicting market trends based on historical data and diverse indicators. Its ability to assess potential risks and market conditions surpasses the accuracy achievable by human analysis.

Thirdly, algorithmic trading is a probable application of AI, primarily rooted in Reinforcement Learning (RL). This technology automates trade executions based on learned experiences and predefined criteria.

Additionally, AI may find utility in portfolio management, particularly in optimization. Its adaptive algorithms can dynamically adjust portfolio allocations based on varying market conditions.

Furthermore, both High-Flyer Quant and Bridgewater likely leverage AI for sentiment analysis, a valuable tool for analyzing social media and news to identify potential market-moving events. An extensively studied AI topic, anomaly detection, may also be utilized to identify unusual events, aiding in profit-making.

In summary, both Bridgewater Associates and High-Flyer Quant represent the growing influence of AI in finance. AI significantly contributes to the investment performance of both High-Flyer Quant and Bridgewater, mitigating trading risks and enhancing overall portfolio management. However, they differ in their AI integration depth, investment focus, risk management approaches, and the balance between technological innovation and theoretical development in AI-driven strategies.

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