Innovation in the Quality of Returns and Alpha Strategies of China's A-shares under the Background of Digital Finance

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Abstract: The rapid development of digital finance has profoundly transformed the ecosystem of China's A-share market, providing a new path for enhancing the quality of returns and optimizing Alpha strategies. This article, through theoretical analysis, explores how digital financial technology can enhance the quality of A-share returns by improving information efficiency, optimizing resource allocation, and strengthening risk control mechanisms. It further proposes an innovative direction of Alpha strategy based on alternative data mining, AI technology integration, quantitative model iteration, and regulatory technology empowerment. Research shows that digital finance is driving the A-share market towards a more efficient, transparent and sustainable direction by reconfiguring the information interaction patterns and decision-making logic of market participants.

Keywords: Digital Finance; The Quality of A-share Earnings; Alpha Strategy Innovation; Alternative Data; AI Technology

1. Introduction

1.1 Research Background and Significance

The rise of digital finance is one of the most remarkable changes in the financial field in the 21st century. The technology cluster centered on big data, artificial intelligence, blockchain and cloud computing is reshaping the information transmission mechanism, risk pricing logic and resource allocation efficiency of the financial market [1]. As the world's second-largest stock market, the quality of returns in China's A-share market not only concerns investors' returns but also directly affects the ability of the capital market to serve the real economy. The traditional Alpha strategy relies on historical data and linear models. Against the backdrop of intensified nonlinear market characteristics, information overload and enhanced noise interference, the effectiveness of the strategy is facing challenges [2]. For instance, during the period from 2020 to 2025, the average daily turnover rate of the A-share market rose from 0.8% to 1.5%, while the annualized excess return of the traditional multi-factor model dropped from 8% to 3% [3].

Digital financial technology offers the possibility of breaking through the limitations of traditional Alpha strategies by providing richer, more real-time, and less correlated data sources, as well as smarter decision support tools. Big data technology can capture heterogeneous data from multiple sources such as government websites, financial media, and social media in real time, covering behavioral characteristics of enterprises that traditional financial data cannot capture (such as ESG performance and supply chain stability). AI algorithms (such as natural language processing and deep learning) can automatically parse unstructured data, extract key information and build predictive models. The decentralized feature of blockchain technology can build a transparent and immutable information ledger, reducing the risks of insider trading and market manipulation [4]. Studying the impact mechanism of digital finance on the quality of A-share returns and the innovative path of Alpha strategies not only helps to enhance investors' returns but also holds significant theoretical value and practical significance for promoting the high-quality development of the capital market.

1.2 Literature Review

Existing research has explored the impact of digital finance on the capital market from multiple dimensions. Du Siqiao [5] found based on the data of China's A-share market that the digitalization level of a region is positively correlated with the investment efficiency of enterprises. Digitalization enhances the efficiency of capital allocation by alleviating financing constraints. Li Youshu [6] further

pointed out that digital inclusive finance can reduce information asymmetry and agency costs, thereby curbing the problems of insufficient and excessive investment by enterprises. In the field of Alpha strategy, the returns of traditional multi-factor models have declined due to the improvement of market efficiency, which has prompted scholars to pay attention to the integrated application of alternative data (such as news public opinion, patent information, and consumer data) and AI technology.

In foreign research, Buchak et al. [1] found through their study of the US securities market that the application of fintech has significantly enhanced market liquidity and reduced transaction costs. Yadava [7] achieved an average daily return rate of approximately 1.3% to 1.4% in the volatile cryptocurrency market through quantitative models, demonstrating the risk control advantages of AI-driven strategies in extreme markets.

However, most of the existing research focuses on the impact of a single technology or data type, lacking a systematic analysis of the relationship between digital financial technology clusters and Alpha strategy innovation. For instance, most studies only explore the individual impact of big data or AI on strategies, without analyzing the strategy optimization paths under the combined effect of the two [8]. This paper attempts to fill this gap and construct a theoretical framework for the impact of digital finance on the quality of A-share returns and the innovation of Alpha strategies.

2. The Impact Mechanism of Digital Finance on the Quality of A-share Returns

2.1 Information Efficiency Enhancement and Revenue Quality Optimization

The core value of digital finance lies in reducing information asymmetry and enhancing market transparency through technological means. In the traditional A-share market, there is hierarchical attenuation and noise interference in information transmission, which limits the efficiency of price discovery.

Big data technology can capture heterogeneous data from multiple sources such as government websites, financial media, and social media in real time, covering behavioral characteristics of enterprises that traditional financial data cannot capture (such as ESG performance and supply chain stability). For instance, news public opinion data, analyzed through AI language models, can quantify the short-term impact of market sentiment on stock prices and provide investors with advanced signals.

AI algorithms (such as natural language processing and deep learning) can automatically parse unstructured data, extract key information and build predictive models. The "Xindi Ting AI Smart Data Platform" launched by CITIC Securities (2025) converts investors' strategic ideas into quantitative codes through natural language interaction and conducts backtesting, significantly reducing the technological gap between ordinary investors and institutions and promoting "trading equality". The universalization of this information processing capability enables market participants to make decisions more quickly and accurately based on comprehensive information, reducing irrational trading caused by information lag, thereby stabilizing stock price fluctuations and improving the quality of returns.

The decentralized feature of blockchain technology can build a transparent and immutable information ledger, reducing the risks of insider trading and market manipulation. For instance, the application of blockchain in the securities trading settlement process can enable real-time sharing and verification of transaction information, enhancing market credibility. The improvement of information fairness helps to form a more reasonable price system, allowing the true value of enterprises to be more fully reflected in stock prices, and thereby enhancing the stability of long-term returns.

2.2 Optimization of Resource Allocation and Improvement of Revenue Quality

Digital finance directly enhances the quality of A-share returns by precisely matching the supply and demand of funds and optimizing the efficiency of resource allocation. Under the traditional financing model, small and medium-sized enterprises face financing constraints due to opaque information and insufficient collateral, leading to capital misallocation.

Big data and AI technologies can integrate non-financial data of enterprises (such as e-commerce transaction records, logistics data, and intellectual property rights) to build multi-dimensional credit scoring models. For instance, Ant Group's "310 model" (3-minute application, 1-second disbursement, and zero

human intervention) provides rapid financing for small and micro enterprises by analyzing their business operation data, reducing financing costs and enhancing the efficiency of fund utilization. In the A-share market, similar technologies can be applied to the credit rating of listed companies, helping investors identify undervalued high-quality enterprises and obtain excess returns.

Digital financial platforms extend financial services to long-tail customers that are difficult for traditional financial institutions to cover through a low marginal cost service model. For instance, an intelligent investment advisory system can provide personalized asset allocation suggestions based on investors' risk preferences and return targets, thereby lowering the investment threshold. This kind of service universalization has expanded the market participants, increased the diversity of capital supply, helped to form a more stable market demand, reduced abnormal fluctuations in stock prices, and improved the quality of returns.

Digital financial technology can connect the data of the upstream and downstream of the industrial chain, achieving precise drip irrigation of supply chain finance. For instance, by using Internet of Things (IoT) technology to monitor the production data of enterprises in real time, financial institutions can dynamically adjust the credit limit to ensure that funds flow into efficient areas. In the A-share market, the application of industrial chain data can help investors identify industry prosperity trends, make early arrangements for beneficiary links, and obtain Alpha returns brought by industry rotation.

2.3 Enhanced Risk Control and Quality Assurance of Returns

Digital finance reduces the impact of systemic and non-systemic risks on the returns of A-shares through intelligent risk monitoring and management tools. Traditional risk control relies on historical data and static models, making it difficult to cope with rapid market changes.

AI algorithms can conduct real-time analysis of market data, enterprise data, and macro data to identify potential risk signals. For instance, by monitoring negative events in the news and public opinion (such as management changes and product recalls), and combining stock price fluctuations and trading volume changes, a risk early warning model is constructed to alert investors in advance to avoid risks. This real-time performance is significantly superior to traditional regular report disclosure, which helps to reduce losses caused by information lag and ensure the stability of earnings.

Big data technology can simulate various market scenarios (such as interest rate changes, exchange rate fluctuations, and policy adjustments), and evaluate the performance of investment portfolios in different environments. For instance, AlphaAI (2025) achieved an average daily return rate of approximately 1.3% to 1.4% in the volatile cryptocurrency market through quantitative models, demonstrating the risk control advantages of AI-driven strategies in extreme markets. Similar technologies can be applied to the A-share market to help investors build more resilient investment portfolios and reduce the erosion of returns by tail risks.

Blockchain and AI technologies can achieve real-time monitoring and compliance review of transaction behaviors. For instance, regulatory rules can be automatically enforced through smart contracts to ensure that transactions comply with requirements such as information disclosure and insider trading prevention. This technological empowerment not only reduces regulatory costs but also maintains market order by minimizing violations, creating a fairer earnings environment for investors.

3. Innovative Directions of Alpha Strategy in the Context of Digital Finance

3.1 Alternative Data Mining and Low-Correlation Alpha Returns

Traditional Alpha strategies rely on structured information such as financial data and market data. As market efficiency improves, the returns of such strategies gradually decline. Alternative data, due to its diverse sources, heterogeneous forms and frequent updates, has become a new source for mining low-correlation Alpha returns.

The research report texts and profit forecast data released by analysts every day can be entered into the database on the same day, and the timeliness of data updates is strong. When the growth style is strong, analysts' strategies are more effective because they can quickly capture changes in the fundamentals of enterprises. Mid-level industry data (such as capacity utilization rate, inventory level, and price index) are widely used to construct fundamental quantitative strategies. By comparing industry

prosperity trend indicators horizontally to screen out high-prosperity industry combinations, or by timing industries based on historical time series changes, the Alpha returns brought by industry rotation can be obtained. The coverage rate of behavioral data such as news public opinion and stock forum comments is high, and the application of AI language models has accelerated the exploration of their value. For instance, by analyzing the policy dynamics on government websites, financial media reports, and articles on WeChat official accounts, and constructing sentiment indicators and stock selection factors, opportunities brought about by irrational market fluctuations can be captured. Patent data and financial note information are the key objects to be mined. The patent coverage rate in the A-share market exceeds 60%. The quantity and quality of patents can reflect the technological content of enterprises, and they have a strong ability to select stocks among large-cap growth stocks. The improvement in the structuring efficiency of financial notes information enables investors to assess the true financial status of enterprises more accurately and reduces misjudgments caused by information opacity. Online sales data can frequently track changes in a company's revenue. At the industry level, it can reflect changes in overall sales volume and average price, and is an effective indicator for judging the industry's prosperity. Although the current coverage rate is relatively low, With the development of e-commerce and Internet of Things technologies, its application potential is huge.

The low correlation of alternative data stems from its capture of dimensions of enterprise behavior and market sentiment that traditional data cannot cover. For instance, changes in investor sentiment in news public opinion may precede financial data to reflect a company's future performance, and technological innovation information in patent data may indicate changes in the industry landscape. By integrating alternative data with traditional data, a more comprehensive Alpha factor system can be constructed, enhancing the adaptability of strategies in different market environments.

3.2 AI Technology Integration and Intelligent Strategy Upgrade

The rapid development of AI technology has provided Alpha strategy with more powerful decision support tools. Traditional quantitative strategies rely on linear models and historical data backtesting, making it difficult to cope with the nonlinear characteristics and dynamic changes of the market.

NLP technology can automatically parse unstructured data such as research report texts, news headlines, and social media comments, extract key information and convert it into structured indicators. For instance, market sentiment can be quantified through sentiment analysis, or enterprise-related information can be extracted through entity recognition, providing a basis for stock selection and timing. Deep learning models (such as convolutional neural networks and recurrent neural networks) can handle high-dimensional data and capture complex market patterns. For instance, by training deep learning models to predict short-term fluctuations in stock prices or identify trading signals in chart patterns. Reinforcement learning can optimize strategy parameters and execution timing by simulating trading environments. Generative AI (such as the GPT series) can generate simulated market scenarios, write summaries of research reports, and even offer investment strategy suggestions. Although the current application is still in its early stages, its potential lies in enhancing the efficiency of investment decisions through automated content generation. For instance, generative AI can quickly analyze a large amount of enterprise data and propose potential investment opportunities for investors to further verify.

The integration of AI technology not only enhances the information processing capacity of strategies but also reduces the deviations caused by human intervention through automation and intelligence. For instance, in traditional strategies, investors' emotional fluctuations may lead to irrational decisions, while AI-driven strategies can strictly follow model signals and maintain decision consistency. This intelligent upgrade helps enhance the robustness of the strategy and the sustainability of its returns.

3.3 Quantitative Model Iteration and Dynamic Adaptability Enhancement

The dynamic changes in the market environment require Alpha strategies to have stronger adaptability and iterative capabilities. Traditional quantitative models are prone to failure in market style transitions or extreme events due to their assumption of static market characteristics.

Traditional multi-factor models (such as the

Fama-French three-factor model) assume that factor returns are stable, but in the current market, factor effectiveness changes over time. By introducing machine learning algorithms (such as random forests and gradient boosting trees), effective factors can be dynamically screened and their weights adjusted. For instance, switching factor combinations based on market cycles (such as bull markets, bear markets, and volatile markets), or rebalancing when factors are overly exposed, can enhance the performance of strategies in different environments.

Traditional risk models (such as VaR and CVaR) rely on historical data to estimate risk parameters and are difficult to capture real-time changes in the market. By introducing high-frequency data and AI algorithms, a real-time risk monitoring system can be constructed. For instance, by analyzing minute-level transaction data and public opinion, dynamically adjusting the risk exposure of the investment portfolio, or reducing the leverage level when market volatility rises, the impact of extreme risks on returns can be mitigated.

Traditional strategy backtesting relies on manual code writing and parameter adjustment, which is inefficient and prone to errors. Digital financial platforms can quickly verify strategic ideas by providing automated backtesting tools (such as Alpha Lab). For instance, investors describe the strategy logic through natural language, and the system automatically generates code and conducts backtesting, outputting performance reports and improvement suggestions. This automation not only enhances the efficiency of strategy development but also optimizes strategy parameters through a large number of backtesting experiments, thereby increasing their adaptability.

The iteration of quantitative models is also reflected in the capture of the nonlinear characteristics of the market. For instance, traditional linear models struggle to handle "black swan" events in the market. However, by introducing nonlinear algorithms such as neural networks and support vector machines, more complex predictive models can be constructed. In addition, by integrating alternative data with AI technology, a more comprehensive market scenario simulation can be constructed, enhancing the survival ability of strategies in extreme markets.

3.4 Regulatory Technology Empowerment and Strategic Compliance Assurance

The rapid development of digital finance has put forward higher requirements for regulation. Traditional regulation relies on post-event review and regular reporting, making it difficult to cope with the real-time nature and complexity of the digital finance era.

Through big data and AI technologies, regulatory authorities can monitor market trading behaviors in real time and identify violations such as insider trading and market manipulation. For instance, by analyzing information such as trading patterns, capital flows, and associated accounts, an abnormal trading early warning model can be constructed to promptly prevent violations and maintain market order. This real-time performance not only reduces regulatory lag but also creates a fairer income environment for investors by minimizing the interference of violations on the market.

Blockchain technology can build an immutable transaction ledger, automatically record transaction information and generate compliance reports. For instance, smart contracts can automatically enforce regulatory rules (such as information disclosure requirements and position limits) to ensure that transactions comply with laws and regulations. This automation not only reduces compliance costs but also enhances compliance accuracy by minimizing human operational errors.

The regulatory sandbox provides a safe testing environment for digital financial innovation. By testing new strategies and technologies within a limited scope, regulatory authorities can assess their risks and benefits and formulate adaptive regulatory policies. For instance, for Alpha strategies based on alternative data, regulatory sandboxes can allow them to explore applications while controlling risks, promoting a balance between innovation and compliance.

The empowerment of regulatory technology not only ensures the compliance of strategies but also enhances investor confidence by improving market transparency and credibility. For instance, markets with strong compliance are more likely to attract long-term funds, reduce short-term speculative behavior, thereby stabilizing market fluctuations and enhancing the quality of returns.

4. Conclusion

The rapid development of digital finance is

profoundly changing the ecosystem of China's A-share market. By enhancing information efficiency, optimizing resource allocation and strengthening risk control, digital financial technology has significantly improved the quality of A-share returns, creating more stable and sustainable returns for investors. Meanwhile, digital finance offers a new path for Alpha strategy innovation. Alternative data mining, the integration of AI technology, the iteration of quantitative models, and the empowerment of regulatory technology have become the core directions for strategy upgrades. Future research can further explore the standardization and quality assessment of alternative data, the interpretability and ethical risks of AI technology, and the deep integration of digital finance and the real economy.

Against the backdrop of digital finance, China's A-share market is now presented with dual opportunities of improved earnings quality and innovative Alpha strategies. Through continuous technological innovation and institutional improvement, the capital market will better play its role in resource allocation and provide strong support for high-quality economic development.

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