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A Study Analysing the Impact of Artificial Intelligence on Investment Risk Aversion

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Abstract. This paper focuses on the impact of artificial intelligence on investment risk avoidance to carry out research. Based on IT Orange data, Tortoise Intelligence report, IDC data and Sohu Securities data, this study uses linear regression models to quantitatively analyse investment returns and AI investment amounts. The study found that there is a significant linear positive correlation between the amount of AI investment and the amount of Kingsoft Securities stock returns, and that an increase in AI investment may theoretically improve investment returns. However, the study faces challenges such as the difficulty of data acquisition, the existence of model limitations and the complexity of the market environment. In the future, researchers can promote the in-depth research and application of AI in the field of investment and enhance the efficiency of resource allocation in the financial market by improving the data sharing mechanism, innovating the model, and expanding the application scenarios.

Keywords: Artificial intelligence, investment risk avoidance, linear regression model, risk-return analysis

1. Introduction

Artificial intelligence is a strategic technology leading a new round of scientific and technological revolution and industrial change, with a strong overflow driven by the "head goose' effect. At present, AI technology continues to upgrade, leading the overall optimisation of the industrial system, promoting the overall leap in the mode of production, and becoming the focus of the game of big countries and regional competition. The relevant report pointed out that the market scale of financial technology in China is huge, and presents diversified characteristics [1]. In the context of the current industry competition pattern, technology continues to break through innovation, all kinds of technology applications continue to increase, and the emergence of artificial intelligence technology has achieved the peak of technology for all kinds of enterprise crowds in risk assessment and stock market prediction. It is becoming a key tool for investors to avoid risks and improve the efficiency of decision-making by its powerful arithmetic power, as well as its ability to process and analyse data.

Currently, XIU-LI TANG et al. proposed risk assessment via the Law of Big Data (LLN) and clarified that the average results of a large number of stochastic phenomena have a stability law, and

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then estimate the risk state of the target risk carrier based on the principle of analogy [2]. This study provides a theoretical cornerstone for big data-driven risk assessment, but its application in data quality, model transparency and complex systems still needs to be further explored. Meanwhile, XIU-QI ZHANG introduces the theoretical foundations of fintech's influence on securities investment behaviour, including the theory of asymmetric information, the theory of behavioural finance, the theory of financial intermediation, etc., and explores the specific impact of fintech on securities investment behaviour, and analyses in-depth how fintech can provide support for the post-investment management of securities, to enhance the efficiency of management and the quality of decision-making [3].

For investors, credit risk, market liquidity and operational risk are even more important issues in the financial markets. Traditional investment strategies often rely on investor experience and limited information to make decisions, which can lead to underestimation or misjudgment of risk. Investment risk is affected by a multitude of reasons, and the impact of this cannot be ignored in the modern world, which is highly dependent on artificial intelligence. Meanwhile, data security is also a pain point for fintech, and financial data governance still needs to focus on privacy and security, with 42 per cent of firms citing it as their first option, up five percentage points from 2022.

The purpose of this paper is to analyse investment risk aversion based on a linear regression model. Specifically, the explanatory variable (investment return) and the core variable (amount of investment in AI) will be quantified based on the latest report of Tortoise Intelligence, IDC data, and relevant data from Sohu Securities (stock.sohu.com). In this way, the impact of AI on investment risk aversion is explored in depth.

2. Research design

2.1. Set variable

The explanatory variable selected for this paper is Investment Income. Through risk-adjusted returns, rather than purely financial returns. The connotations include: i. Whether AI investment reduces the volatility (variance) of returns, the risk of extreme loss or systemic risk exposure. ii. whether the AI investment leads to higher returns at the same level of risk or reduces risk at the same level of return. According to the financial returns (net profit, ROI) or market returns (share price returns) of the firm or portfolio, as well as historical returns, maximum retracements, and market risk factors. This variable has some limitations. I. Future risks that may not be predicted by historical volatility and need to be combined with implied volatility (options market data). ii. non-financial risks (e.g. ethical risks, data breaches, etc.) are difficult to quantify. Improvement options include: constructing a comprehensive risk index that integrates financial risk (volatility), operational risk (failure rate), strategic risk (competitive position), etc.; and using machine learning models to capture the non-linear relationship between AI investment and risk aversion. The multi-dimensional risk-return analysis can provide firms, investors and policymakers with evidence of the risk management value of AI investments.

The core explanatory variable of this study is the amount of investment in artificial intelligence (AI Investment). In this paper, due to the limitation of data, the amount of investment in AI by enterprises in recent years will be extracted to indicate the development of AI. Firstly, the study collects the "R&D Expenditure' or "Technology Investment' in the annual reports of high-tech enterprises in the website of "Kingsoft Office' as the preliminary data. Secondly, the AI investment trend reports released by Gartner, IDC and other consulting organisations are used as auxiliary indicators for calibration. Then, indirect indicators such as the number of patents, the number of AI

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job openings, and the usage of cloud services (e.g., AWS/GCP billing) are used as proxy indicators. Enterprises' investment in AI reflects their recognition of AI technology and willingness to apply it, and the amount of investment is positively correlated with technological innovation ability, plus engaging in investment may signal to the market that an enterprise is technologically leading. Its advantage lies in the fact that it can quantify the development of AI and directly reflect resource allocation decisions, avoiding the bias of subjective evaluation. However, the limitations are, firstly, the accessibility of data is limited, it is difficult to obtain the data of non-listed companies, and the disclosure of segmented subjects is not uniform; secondly, there are quality differences among enterprises, and although the investment amount of large and small enterprises is not used, it is possible that the amount of small enterprises accounts for a larger percentage of large enterprises, and the value of the value is not equal; thirdly, the return on investment is long, and the short-term effect may be unremarkable. The direction of improvement lies in: first, composite indicator construction. Weight the investment amount with the number of patents and product penetration rate to synthesise the AI development index. Second, dynamic adjustment. Introduce the discount rate to react to the long-term investment value. Third, heterogeneity analysis. Distinguish the investment difference between exploratory innovation and developmental innovation.

Following the data, this paper incorporates relevant control variables. Specifically: net profit, main business income, total profit, net profit growth rate, main business income growth rate, enterprise AI investment ratio and other variables.

2.2. Model specification

In order to empirically analyse the correlation and causality between the core variables, the paper is tested in accordance with linear regression analysis.

$$\hat{y} = \hat{b}x + \hat{a} \tag{1}$$

$\hat{b}$ in the above equation is extrapolated using the following equation:

$$\hat{b} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \tag{2}$$

2.3. Data selection

Using IT Orange data, Tortoise Intelligence's latest report, IDC data, and one of Sohu Securities' (stock.sohu.com) stocks, Jinshan Securities (68111), closing data can be seen in Table 1.

Table 1. Kingsway Securities (68111) stock market earnings 2020-2024

Year	Main operating revenue/billion yuan	Increase	Net profit/billion yuan	Increase
2020	22.61	43.14%	8.79	119.56%
2021	32.8	45.07%	10.42	18.68%
2022	38.85	18.44%	11.18	7.40%
2023	45.56	17.27%	13.18	18.03%
2024	51.2	12.40%	16.45	24.84%

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Table 1 demonstrates that the stock, Kingsway Securities (68111), has a large but consistently slowing growth in both main operating income and net income from 2020-2024.

The experimental data can be seen in Table 2:

Table 2. Global artificial intelligence project investment amounts vs. Jinshan Securities (68111) share earnings amount data

year	Amount invested in AI projects globally (in US$ billion): X	Jinshan Securities (68111) Share Earnings Amount (in billions of yuan): Y
2020	253	8.79
2021	775	10.42
2022	1324.9	11.18
2023	1557.4	13.18
2024	2523	16.45

Table 2 demonstrates the significant increase in the amount of investment in global AI projects over the last five years, and the significant increase in net profit of Kingsway Securities (68111), which is heavily influenced by AI proposition decisions.

3. Results and analysis

3.1. Linear regression analysis

The resultant values were obtained by substituting the relevant data and following the above calculations and can be seen in Table 3:

Table 3. Results of regression analysis

	$\overline{x}$	$\overline{y}$	$\widehat{a}$	$\hat{b}$
Results	1286.66	12.004	7.655	0.00338

Finally, the linear regression equation was obtained after meticulous calculations: $\hat{y} = 0.00338x + 7.655$. included among these, $\overline{x} = 1286.66$ representing the average amount of money invested in AI projects globally, $\overline{y} = 12.004$ is the mean value of the amount of earnings of the shares of Jinshan Securities (68111), $\widehat{a} = 7.655$ is the intercept term of the regression equation, $\hat{b} = 0.00338$ is the regression coefficient, implying that the amount of return receives a positive influence from the amount of investment. These data are the key parameters for constructing the linear regression equation, which is finally obtained: $\hat{y} = 0.00338x + 7.655$.

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3.2. Heterogeneity test

The calculation of the p-value is a central aspect in the calculation of the significance test of the regression coefficients $\hat{b}$ to determine the non-randomness of the effect of AI in the one-way linear regression analysis [4]. Firstly, based on the linear regression equation. $\hat{y} = 0.00338x + 7.655$ Calculation of projected values $\hat{y}_i$, and compare it with the actual observations to get the residuals e_i , and then calculate the residual sum of squares $SSE \sum_{i=1}^{n} e_i^2 = 1.092118$ with the residual standard deviation $s_{res} = \sqrt{\frac{SSE}{n-2}} \approx 0.60336$, is the standard error of the regression coefficient $SE\left(\hat{b}\right) = \frac{s_{res}}{\sqrt{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}}$ provides the basis for the calculation of the On this basis, according to Eq $t = \frac{\hat{b}-0}{SE\left(\hat{b}\right)}$ Calculate the t statistic, where $\hat{b} = 0.00338$, The degree of freedom $df = n - 2 = 3$ was determined by combining the sample size $n = 5$, and finally by the two-sided test formula $p = 2P(T \geq |t|)$, and calculated using Python to get the results. The results were obtained $p \approx 0.025$. This rigorous series of calculations shows a strong rejection of the original hypothesis that the regression coefficients are significantly non-zero when the p-value is much less than the significance level of 0.05, thus confirming that the effect of AI on the dependent variable is not random, but rather that there is a significant linear relationship, a result that provides solid statistical evidence for the importance of the factors associated with AI in the regression model.

3.3. Model fit test

In studying the relationship between the amount of investment in global AI projects (X) and the amount of return on Kingsway Securities (68111) shares (Y), model fit is an important indicator of the quality of the constructed univariate linear regression model [5].

This study is based on the regression equation $\hat{y} = 0.00338x + 7.655$, derive first $\sum_{i=1}^{n}\left(y_i - \hat{y}_i\right)^2 = 34.67.$ Combined with the previously derived residual sum of squares 1.092118, then deriving the coefficient of determination $R^2 0.9685$, and further calculating the adjusted $Adjusted\ R^2$. Calculated the $Adjusted\ R^2$ is 0.958 . It is significantly higher than the required 0.6 . This result fully indicates that the independent variables in the model have strong explanatory power for the dependent variable, and the constructed regression model can effectively fit the data, better reflecting the relationship between the amount of investment in the global AI project and the amount of return on Kingsoft securities shares, providing a reliable statistical basis for in-depth analysis of the association between the two and the related decision-making.

Overall, there is a significant linear positive correlation between the amount of investment in AI and the amount of return on Kingswood stock. This significant linear positive correlation has important practical implications, which implies that on a theoretical level, when investors increase their investment in the field of AI, the amount of investment returns is likely to increase as a result. Theoretically, investment returns are likely to increase.

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3.4. Challenges and prospects

Although the study reveals a positive correlation between the amount of AI investment and the amount of Kingsway Securities stock returns, it faces many challenges in practical application. At the data level, the difficulty in obtaining data from unlisted companies and the inconsistent disclosure of segmented subjects affect the universality of the conclusions; the large differences in the quality of enterprises and the unequal value of investment amounts complicate the analysis. On the model level, linear regression models are difficult to capture complex non-linear relationships and do not adequately consider non-financial risks, and their timeliness and accuracy are debatable, and Isaac has also mentioned that little is known about the validity and reliability of infrastructure data collected by the public [6]. In terms of the market environment, the return on investment is long and difficult to see results in the short term, and market volatility, industry competition and macroeconomic changes can also interfere with investment returns. In addition, in the environment of rapid development of the Internet and artificial intelligence, data security has become the most serious issue, and data loss may include disinformation campaigns, behavioural verticals and financial exploitation [7]. Recent incidents such as fitness tracking apps unintentionally leaking secret military bases in 2018 [8].

Looking ahead, the research and application of AI in the field of investment risk avoidance has a vast scope for development. Scholars Maheshwari and Samantaray studied the impact of AI on investment decisions and found that AI can help Gen Z investors identify and manage behavioural biases, which provides a new perspective for subsequent research [9]. Subsequent research can further focus on how to use AI technology to deeply mine investor behavioural data and build more accurate investor behavioural bias identification and correction models, so as to optimize the investment decision-making process and reduce investment risks caused by investors' subjective emotions. At the level of technology application, according to “The Role Of AI In Managing Investment Risks”, AI shows great potential in investment risk assessment and management, such as the use of complex algorithms and machine learning technology to analyse massive data, identify potential risks and provide real-time warnings [10]. In the future, it can be combined with quantum computing, blockchain and other emerging technologies to improve the computing speed and data security of AI models to create a more efficient and reliable investment risk avoidance system.

4. Conclusions

Using a linear regression model, based on multiple sources of data such as IT Orange data and Tortoise Intelligence reports, this study quantitatively analyses the relevant variables and finds that there is a significant linear positive correlation between the amount of AI investment and the amount of return on Jinshan Securities shares, i.e., increasing AI investment theoretically helps to improve investment returns and highlights its key role in investment decision-making. However, the research process also exposed several problems. Data acquisition faces obstacles, it is difficult to obtain data from unlisted companies and the disclosure standards of subdivided subjects are different, which affects the universality of the conclusions; linear regression model is difficult to deal with complex non-linear relationships, insufficient consideration of non-financial risks, and the timeliness and accuracy need to be improved; the market environment is complex, the investment return cycle is long, and it is subject to the interference of market fluctuations, industry competition and macroeconomic changes; the problem of data security is prominent. Data leakage can cause many risks. In the future, artificial intelligence has great potential in the field of investment risk avoidance. It can dig deep into investor behaviour data, optimize investment decisions with the help of AI,

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reduce subjective risks, and also integrate emerging technologies to improve the performance of AI models. However, to achieve these, all parties must collaborate and work together to solve the challenges, to promote the in-depth application of AI in the field of investment and improve the efficiency of resource allocation in the financial market.

Authors contribution

All the authors contributed equally and their names were listed in alphabetical order.

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