Research on the Investment Decision in Financial Market Based on Optimal Portfolio

Ruixiao Zhao[✉]

School of Economics and Management, China University of Petroleum, Qingdao, Shandong, China
netnews@upc.edu.cn

Abstract. The theory of investment decision is one of the key topics in current research. Researchers have found that each group of standard deviations and risks in the portfolio are marked in the chart, which can form an efficient investment boundary. This paper analyzes risk aversion based on the risk characteristics of financial markets and analyzes the impact of financial market liberalization on the internationalization of the RMB, and conducts an in-depth study in the context of domestic RMB equity and bond assets held by offshore foreign institutions. The results show that the industry attributes of investment products, individual age, and financial knowledge reserves are related to the management of market risk, enhancing diversity of financial asset allocation is an important way to effectively control risk. The research in this paper has important practical implications for financial market participants to hedge market risks.

Keywords: Investment decision · Efficient boundary · Optimal portfolio · Standard deviation

1 Introduction

1.1 Research Background and Motivation

In such a complex financial market, there are very rich financial products. How investors choose different assets to form a diversified portfolio, so as to control risks and maximize investment returns is still a hot issue in the field of modern finance. As an important part of national strategy, finance is an important core competitiveness of the country, financial security is an important part of national security, and financial system is an important fundamental system in economic and social development. Financial stability, economic stability and accurate judgment of risks and hidden dangers are the premise of financial security. A stable and open financial market will contribute to the globalization of capital market and the internationalization of RMB. It is of great significance to the goal of building an international financial center and is an important force for promoting economic and social development.

In the past 70 years, China has basically established a modern financial market system that is compatible with socialism with Chinese characteristics. In the past 40 years

of reform and opening up, the financial industry has ushered in a period of great development and prosperity, and gradually formed a financial system with full competition covering banking, securities, insurance, funds, futures and other fields. Has been in our financial always follow the rules of financial development, closely around service entity economy, the financial risk prevention and control of three tasks, deepen financial reform, innovation and improvement of financial regulation, improve the modern financial enterprise system, perfecting the financial market system, advancing the construction of modern financial regulatory framework, to speed up the transformation of the mode of financial development, improve the financial law, safeguard national financial security, To promote a virtuous cycle and healthy development of economy and finance, the development of financial market has evolved from a correct understanding of the initial financial market to a correct understanding of the nature of financial market, from learning advanced experience overseas to enhancing the ability to participate in international financial governance.

At present, China has eight exchanges approved by The State Council: Shanghai Stock Exchange, Shenzhen Stock Exchange, China Financial Futures Exchange, Shanghai Futures Exchange, Zhengzhou Commodity Exchange, Dalian Commodity Exchange, National Sme Share Transfer System, and Shanghai Gold Exchange. Trading varieties involve a series of targets such as securities, funds, bonds, stock index futures, options, commodity futures, precious metals spot, etc., while the trading of securities of listed companies also includes a series of multi-level capital markets such as new Third Board, Growth Enterprise Board, small and medium board, Science and Technology Innovation Board and main board. With 2020 gem launched pilot registration system, the formation of Kechuang board, the gem, the new three board selected layer, small and medium-sized board and mainboard architecture basic perfect multi-level capital market in China, Kechuang board, the gem, select layer are shouldering accommodate new economy firms and the task of structure transformation, multi-level market system, form the dislocation development, It is the relationship of complementary promotion rather than competitive substitution. Compared with the "eight old shares" era in the 20th century, China's financial market is now a hundred flowers blooming, hierarchical. At present, the main investment targets situation is as follows: the Shanghai and Shenzhen two cities stocks for a total of more than 3900 cigarettes (is expected to more than 4000, 2020), international capital, and the previous period, Zhengzhou, Dalian listed futures varieties of 64 species, a total of 15 kinds of options sort, Shanghai and Shenzhen two cities also supports a large number of open mode fund transactions, parts of private equity funds shall redeem, The amount of money involved is huge. The overall investment target covers: individual stocks, agricultural futures, energy futures, precious metals futures, futures options, individual stock options, exchange-traded funds and many other financial products. Financial market of our country not only made great achievements on the breadth of the diverse, at the same time in the construction of multi-level capital market, the depth of the financial market in China also has a great progress, in view of the different types of investments and the market demand, many financial market trading system in our country also has a big difference, in view of the applications have audit system and registration system; There are full trading, margin trading and margin trading for the efficiency of capital utilization; In view of the direction of the transaction

can only do more also support multi - short trading; Hedging, arbitrage and speculation seats are provided for different trading purposes; For trading frequency, there are T + 1 day trading and T + 0 day trading. In the multi-level and in-depth development of the financial market, China's financial market can see almost all the mainstream trading systems, it is these trading systems play an important role in the development of China's financial market to prevent risks and protect investors.

At present, the development of China's financial market is facing many challenges, among which financial risk is a kind of impact, to economic main body and harmonious main body produce great damage. But the financial markets There are relatively few researches on risk characteristics and management. Based on the current situation of the problem, effective research is required the scope of this paper mainly includes the actual connotation of financial market, financial market risk characteristics and countermeasures and control measures. The prevention and treatment of financial market risk Starting from the risk characteristics, the specific prevention and management measures are analyzed. This study It is of great theoretical significance to analyze the risk characteristics and management of financial market.

1.2 Literature Review

Shuanghui Yang and Zhikai Zheng constructed CAPM model to conduct empirical test of its applicability in a-share market, calculate stock return rate and market return rate, and conduct empirical analysis [2]. Yiwen Liu, Nan Deng and Pan Ding study the validity of Shanghai stock market based on The Bayesian CAPM model, and find that market returns have a significant impact on the stock returns of all industries, which is consistent with the capital asset pricing model. In examining the relationship between return and risk, it is found that systemic risk is not the only measure of expected return of stock portfolio. Internal factors of enterprises play a certain role in stock pricing, which does not conform to capital asset pricing model [2]. Yang Yang tested the A-share market based on the CAPM model and the Fama-French three-factor model. The research results found that the practical experience of the stock market has driven the continuous enrichment and improvement of the theoretical system of capital asset pricing [3].

Benchmark-based investment decision is active portfolio management and is also a widely used evaluation investment method in the financial field. To measure the investment performance of a fund manager, we should not only pay attention to the absolute returns he brings to clients, but also pay more attention to his ranking in the whole fund industry. For example, many mutual funds target the S&P500 index, with mutual fund investment returns exceeding the S&P500 index's growth rate. In the portfolio management of pension funds, the benchmark is the liability for pension payments. However, it is not just professional investors who have goals; many ordinary investors also follow a target benchmark. The average investor also wants to beat inflation, fund growth, or some other index.

Based on CAPM model and WACC analysis, Shengyuan Lin discussed the relationship between corporate capital structure and corporate value and judged that the value of a company (assuming that the company is in continuous operation) should be discounted according to an appropriate cost of capital. To maximizing the value of a company, it is necessary to find the most suitable capital structure for the company, which is difficult

to be quantified by a formula. Therefore, the management of the company should constantly try to reduce the cost of capital in daily operations to achieve the optimal capital structure of the company [4].

Yuan Jing et al. remeasured the returns of Chinese funds based on the sharpe ratio of jump risk and drew a conclusion: First, the operation of Fund market in China has A great decline risk and is vulnerable to extreme value events. Second, China's 117 funds and Shanghai A-share return Sharpe ratio are significantly affected by the jump risk of uncertainty shock, with the maximum difference reaching 19%, much smaller than the Us fund market. The main reason is that the Chinese government directly intervened in the crisis in the face of uncertainty shock. This is very necessary to stabilize the development of China's capital market and protect investors' benefits. Third, both standard sharpe ratio ranking and sharpe ratio with uncertain impact modified ranking, the Shanghai a-share ranking trend is more and more in our country, especially after 2017, after more than ten years of development, China's capital market has gradually into the weak efficiency market effectiveness from the market, the strong efficient market will be the future development direction [5, 6]. Hongmei Lin, Jinyan Du and Shaodong Zhang sharpe ratio estimation method, applicability and empirical analysis, summarized the existing methods to estimate the sharpe ratio function, including parameters method, the nonparametric method, time series analysis method, four methods, the wavelet analysis according to the above with the introduction of the model and method summarized the advantages and disadvantages of four kinds of methods when use [7–10]. Xia Zhao, Yu Shi and Jiaqi Wang studied the portfolio strategy based on Sharpe ratio from the perspective of network. The results show that the model based on maximum Sharpe ratio criterion will produce more active strategies compared with the global risk minimization criterion, which may be more suitable for investors with risk preference; the network method proposed by Clemente needs to perform better in a specific market environment and window width, indicating that this method has certain limitations; The optimal portfolio based on network method can better avoid investing in network-centric assets under the maximized Sharpe ratio criterion[11].

Zongrun Wang and Guoxi Tan studied the equal-weight adjustment of portfolio investment strategy based on deterministic equivalence, and the results show that combined investment strategy based on the equal-weight reweighting of deterministic equalization can be effective Control the risk of wind, reduce the risk of small tail wind, help investors to avoid pole end loss, at the same time raise the investment group after adjusting the risk of wind Profit [12–14].

Gueli Zhang studied the relationship between gold and stock price index and found that the property of gold's value appreciation and preservation was negatively correlated with stock price [15]. Zhuo Huang, Chen Tong and Fang Liang found that financial market is affected by external economic uncertainty. Economic uncertainty is an aggregate variable, which includes not only the financial market but also the external economic environment of financial activities. Uncertainty affects economic activity and financial markets in a variety of ways [16].

Longzhen Fan and Chu Zhang analyzed the macro influencing factors of bond risk premium in China's bond market. The higher the short-term interest rate, the higher the excess return rate of bonds. The higher the inflation rate, the greater the excess return on

bonds; The higher the growth rate of real consumption is, the smaller the excess return rate of bonds is. The excess return of bonds is negatively correlated with the growth rate of money supply [17–19]. Yue Wang, Zhong Wang and Nan Tang conducted a comparative study on the efficiency of China's carbon trading pilot market based on Sharpe ratio, and the results showed that the efficiency of China's carbon trading market was far lower than that of EU-ETS on the whole[20]. Jiajia Lou and Ling Zhang studied how to diversify the bitcoin portfolio and practice the optimal trading mode, and basically reached the following conclusions: First, the dynamic correlation between Bitcoin and the traditional asset return series has significant persistent characteristics. Second, the correlation between bitcoin and traditional financial assets is weak, and the correlation intensity is different. The low correlation between bitcoin and traditional markets and the difference between them in dynamic correlation are conducive to investors' diversification in financial investment and risk reduction through diversification in bitcoin market. Third, of the seven traditional asset classes under consideration, shorting money market assets is the most effective strategy for hedging bitcoin exposure when short selling of bitcoin is not allowed; Fourth, joining bitcoin creates higher returns and greater risk in your portfolio [21].

1.3   Research Framework

The first chapter is an introduction. First, the research background and motivation of this paper are introduced. Next, an extensive literature review is conducted. Sect. 2 is the methodology. This paper uses empirical analysis to explore the optimal portfolio in financial markets. Sect. 3 is the results and discussion. The results of the study are presented, discussed, and suggestions and recommendations for improvement are made. Sect. 4 is the conclusion. This paper composes and summarizes the whole paper, and draws relevant conclusions and research results.

2   Methodology

2.1   The Opening of the Financial Market Promote the In-Depth Development of RMB Internationalization

In recent years, China's financial market has been steadily opening up. The 2020 negative list for foreign investment has removed restrictions on foreign ownership in securities, funds, futures and life insurance, further expanding the business scope of foreign financial institutions. The bond market, stock market open also significantly speed up the pace of foreign investors can pass directly into the market (QFII, RQFII, foreign investors) directly into the inter-bank bond market, the domestic and overseas market, interconnection mechanism (Shanghai port, the bond, Shenzhen and Hong Kong, Shanghai Aaron through institutional arrangements, mutual confirmation of funds, etc.) and multiple channels to participate in the investment RMB assets. Chinese stocks and bonds have gradually been included in international mainstream indexes, with bonds successively included in Bloomberg Barclays Global Composite Index and JPMORGAN Flagship Global Emerging Market government bond Index, and A-shares successively included in MSCI, FTSE Russell and S&P Dow Jones global mainstream indexes.
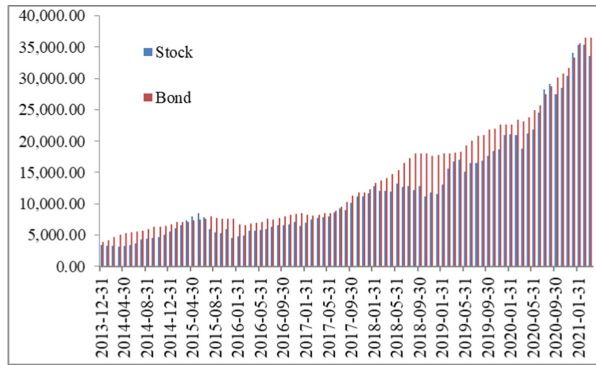
Fig. 1. Stock and bond assets

As can be seen from the data, with the acceleration of the opening up of the financial market, the attraction of domestic RMB assets to foreign investors has been increasing, greatly improving the internationalization level of RMB. Data from the People's Bank of China show that by the end of March 2021, the market value of domestic RMB stocks held by foreign entities was 3.36 trillion yuan, up 78% year on year. The balance of domestic RMB bonds held by foreign entities is 3.65 trillion yuan, up 57% year on year (see Fig. 1). Moreover, according to the latest official international reserve currency data from the International Monetary Fund, the renminbi's share of known international reserves reached 2.25 per cent at the end of 2020, its highest level to date.

While seeing the achievements, it should also be noted that the opening of China's financial market is still characterized by "fragmentation" and "pipeline". This helps to prevent cross-border capital flow risks in a certain stage, but with the deepening of the openness of the financial market, the transaction rules of various channels are not unified, which objectively increases the transaction costs of foreign investors. From the market feedback, market subjects have a strong demand for the current pipeline and market opening to uniform institutional opening. At the same time, after the lifting of restrictions on institutional access and business exhibition, foreign investment still faces some operational problems, and there are still many demands for the opening of the financial sector. The implementation of the negative list management model in the financial sector needs to be further promoted in practice.

2.2 Further Promoting the Opening of the Financial Market Deserves Attention

First, the integration of the existing opening channels, reduce the institutional cost of foreign investors to enter the domestic financial market. Relevant academic studies and the internationalization process of major currencies show that in order to give full play to the supporting role of financial market system for currency internationalization, it is necessary to avoid increasing transaction costs of investors due to various formal or informal barriers to entry. In order to further facilitate the participation of foreign investors in the domestic financial market, it is necessary to pay attention to the interconnection of various opening measures in the short term, promote the overall coordination of transaction

links and exchange links, ensure the stability and continuity of policies, and guide market subjects to form stable policy expectations. In the long run, efforts should be made to promote the transformation of partial tunnel opening to comprehensive institutional opening, build a systematic framework for financial market opening, and adhere to the simultaneous implementation of macro-level top-level design and micro-level operation process optimization to ensure the implementation of policies.

Second, further enrich the product sequence of the financial market, improve the infrastructure of the financial market, and continuously enhance the attractiveness of the domestic financial market to foreign investors. In the process of promoting RMB internationalization, the satisfaction of overseas investors' demand for investment appreciation and hedging depends on the in-depth development of domestic financial market. This requires both the domestic financial market can provide rich financial products, to meet different types of foreign investors demand for yield, safety and liquidity, also need to constantly improve the domestic financial market infrastructure and supporting system construction, through in line with international standards, reduce the transaction costs overseas investors, thus further promote local currency financial assets more attractive. In this regard, on the one hand, we should focus on enriching the RMB investment products and derivatives in the domestic market, and construct and improve the RMB yield curve; On the other hand, we should actively promote the registration and custody, investment transactions, clearing and settlement of infrastructure and accounting, auditing, taxation, evaluation and other supporting systems closer to international standards, to facilitate overseas entities to hold RMB assets. Among them, particular attention should be paid to the improvement of the Cross border Interbank Payment System (CIPS), and the Payment efficiency of cross-border business should be continuously improved by extending the operation time of CIPS and expanding the scope of CIPS participating in banks. In addition, the second generation of RCPMIS (RMB Cross-border Payment Management Information System) should be actively promoted to bridge the gap between RCPMIS and foreign exchange cross-border Payment Management System and international payment System. Improve the comparability of data information and facilitate the input of information by banks and enterprises.

Third, we will closely monitor changes in the external environment and continue to improve macro-prudential management of cross-border capital flows. At present, China's interest rate is significantly higher than that of major developed economies, which objectively helps to increase the willingness of foreign investors to hold RMB assets. Take the interest rate difference between China and the US as an example. Although the yield of THE US Treasury bond has risen sharply since 2021, there is still a certain gap with that of China. For example, the yield of China's 10-year Treasury bond is still 1.5 percentage points higher than that of the US (see Fig. 2). In addition, strong export momentum and solid economic fundamentals also form a strong support for RMB asset yield. At the same time, however, it should also be noted that the situation of cross-border capital flows should still be closely watched against the backdrop that the COVID-19 epidemic has not been effectively controlled worldwide and the global economic recovery is accelerating but clearly divided. Especially at present, the advancement of vaccination, and inflationary pressures push up the market's expectations of the fed to raise interest rates, monetary policy needs to pay close attention to the developed economies dynamic
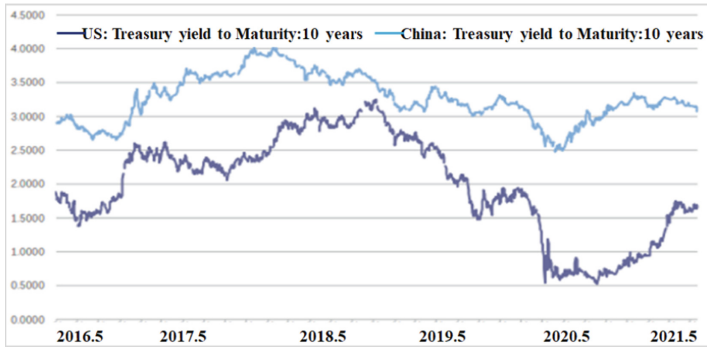
Fig. 2. Yield trend of treasury bonds

potential impact of cross-border capital flow situation, constantly enrich and perfect the macro-prudential toolbox of cross-border capital flow management, improve the monitoring and early warning and response mechanism of cross-border capital flows, We will adjust the pro-cyclical behavior of market entities and actively respond to the risks of abnormal cross-border capital flows.

3   Results and Discussion

Through research, this paper found that. Finally, whether the industry attribute of the invested product will affect the relationship between its standard deviation and return, and whether the individual age of investors will affect their preference for products with high or low standard deviation. Financial knowledge is not necessarily a preparation for participating in the risk financial market. In daily life, related financial fraud, personal rights and interests protection, fixed asset purchase, even expenditure and other aspects more or less also need relevant knowledge to identify and judge. Therefore, enriching the channels of financial knowledge accumulation and enhancing the level of wealth allocation planning have become one of the basic qualities for the survival of the current society. Therefore, when you encounter financial related information, videos and community activities, you should not stay away from them. Instead, you should actively learn about them and verify them with the relevant affairs and news that you actually contact, so as to comprehensively improve your financial knowledge level.

Based on the above analysis, China's household monetary property dispersion is seriously insufficient. However, enhancing the diversity of financial asset allocation is an important way to effectively control risks. First of all, if families only participate in stock market investment and blindly hold the stocks of one company, the corresponding asset fluctuations will be more severe. By investing in multiple stocks, non-systemic risks can be dispersed to some extent. If constrained by wealth, capital is not enough to achieve diversification allocation, you can hold related equity funds to achieve. Secondly, in addition to stocks, there are also a variety of investment targets to choose from, such as bonds, financial products, commodities, etc., which are suitable for different family situations, income levels and personal risk preferences.

4   Conclusion

There are abundant researches in the field of household finance. However, there are few in-depth researches on the mechanism of financial knowledge and risk attitude on the participation of risk financial market. Based on the analysis of the data from the 2017 Chinese Household Finance survey, this paper analyzes the risks involved in the household financial market, financial knowledge and the current situation of the attitude to risk. And also based on the results of relevant questions in the questionnaire, variable factor analysis was used to synthesize financial knowledge. Empirical analysis was made on the impact of financial knowledge on household financial behavior, CHFS to test the existence of the intermediary mechanism of risk attitude. The following conclusions were drawn:

Through theoretical analysis and empirical test, financial knowledge can positively promote the breadth and depth of household risk financial market, and the results are still stable when endogenous and contingency are considered. The higher the level of financial literacy, the more inclined households are to participate in risky financial markets. When the risk financial market is divided into stock market, fund market, financial management market and bond market, it is found that both the breadth and the depth of participation, financial knowledge is significantly positive. When the three factors of financial knowledge are analyzed separately, it is found that the generalized knowledge factor has the greatest influence on family investment behavior.

Through the heterogeneity analysis, it is found that financial knowledge has the greatest positive effect on the probability and degree of household participation in risk financial market in regions with medium level of digital financial inclusion, indicating that financial knowledge can improve the level of digital financial inclusion to some extent. The marginal effect of household financial literacy was greater in towns. The financial knowledge of households with different educational backgrounds significantly positively promotes the breadth and the depth of qi's participation in risk financial investment.

This paper further analyzes the influence path and mechanism of financial knowledge on household risk financial market participation. Through relevant theoretical deduction and empirical test, financial knowledge can increase the probability and degree of participation in the risk financial market by changing the risk attitude of household residents and increasing their risk tolerance. Through the three-step regression of different financial markets, it is found that when the risk degree of financial markets is relatively high, the mediating effect of risk attitude is more significant and has a higher proportion.

As far as other control variables are concerned, this paper finds that household financial market participation is significantly positively correlated with macro indicators such as per capita GDP and digital financial inclusion index. Residents' gender, marriage, commercial insurance and health status also have a significant impact on the household financial market. Household risk financial market participation is negatively correlated with the age of household head. Age has a significant inverted U-shaped relationship with family stock market participation.

In the aspect of statistical analysis, through the analysis of CHFS data over the years, it is found that the degree of household participation in the risk financial market is not high. The dispersion degree of financial asset allocation is also not so high and the

polarization is a little obvious. In terms of financial knowledge, Chinese residents' risk perception has gradually increased since 2013, but the overall level has both increased significantly and remains at a low level. In terms of risk attitude, most residents are still conservative and unwilling to take any risks.

References

1. S.H., Yang & Z.K. Zheng.(2021). Empirical test of the applicability of CAPM model in A share market. Financial theory and teaching (06), 39-44
2. Y.W., Liu, N., Deng & P., Ding.(2022). Study on the efficiency of Shanghai stock market based on Bayesian CAPM model Financial Economics (04), 15–28, doi:https://doi.org/10.14057/j.cnki.cn43-1156/f.2022.04.004.
3. Z.H., Yang (2022). The test of CAPM model and Fama-French three factor model in China's A-share market Economic Research Guide (08), 117–119.
4. S. Y., Lin(2022). The relationship between corporate capital structure and corporate value: Based on CAPM model and WACC analysis. China Collective Economy (12),108-110
5. J., Yuan, Y.J., Dong, X., Liu, J., Gao & Y., Huo.(2022). Remeasurement of Chinese fund returns based on jump Risk Sharpe ratio. Journal of Shandong Institute of Business and Technology (01),45-54.
6. J., Tang (2019). Sunk costs and investment decision distortion in financial markets. Learning and Exploration (02),131-136.
7. H.M., Lin, J.Y., Du & S.D. Zhang.(2021). Sharpe ratio estimation method, applicability and empirical analysis. Statistical journal (6), 73-88. doi:https://doi.org/10.19820/j.cnki.issn2096-7411.2021.06.006.
8. R., Wang & H. Y., Wei (2021). Digital finance and household asset allocation efficiency based on Sharpe ratio. China merchants (15), 43-46. doi:https://doi.org/10.19699/j.cnki.issn2096-0298.2021.15.043.
9. Y., Wu, X., Li,J., Li & L., Zhou.(2021). The development of digital finance and the effectiveness of household financial portfolio. Doi:https://doi.org/10.19744/j.cnki.11-1235/F.2021.0094.
10. J.X., Wang & M.Y., He.(2022). Optimal portfolio selection under CVaR constraint in variable coefficient model: Based on non-extended statistical theory. Journal of Henan Normal University (Natural Science Edition)(01),59–66. doi:https://doi.org/10.16366/j.cnki.1000-2367.2022.01.006.
11. X., Zhao, Y.,Shi & J.Q., Wang.(2022). Portfolio strategy based on Sharpe ratio from the perspective of network. Journal of Shandong University of Finance and Economics (02),17-26.
12. X.,Lin, Y.P., Qian& Y.B., Shu.(2021). Optimal portfolio selection considering relative return. Applied Probability and Statistics (06),611-626.
13. Z.R., Wang & G.X., Tan.(2022). Research on portfolio investment strategy based on deterministic equivalence. Journal of Systems Science and Engineering (2),287-303.
14. J., Peng, J.Q., Yang, Z.H., Liu & S.Q.,.Zhao(2021). Optimal household consumption and investment portfolio: An analysis based on incomplete market. Theory and practice of finance and economics (6), 75-81. doi:https://doi.org/10.16339/j.cnki.hdxbcjb.2021.06.010.
15. G.L., Zhang.(2020). Research on the relationship between gold and stock price Index. Journal of Management Science and Technology (2005),87-91.
16. Z., Huang, C., Tong & F., Liang, (2017). The Impact of economic Uncertainty on financial markets: A Literature review. Journal of Financial Sciences (02),20-35.
17. L.B., Yao.(2007). Building the optimal portfolio. Forum of Science and Technology Association (2nd half)(07),100–101.

18. W.J.,Guo & Q.Y., Hu. (2005). Multi-stage optimal portfolio with uncertain termination time. Journal of Management Science, 8(2), 8.
19. L.Z., Fan, & C., Zhang, (2009). The Influence of macro Factors on bond risk premium in China's bond market. Journal of Management Science, 12(6), 10.
20. Y., Wang, Z., Wang & N., Tang (2022). A comparative study on the efficiency of China's carbon trading pilot market based on sharp ratio Land and resources science and technology management (01), 9–19.
21. J.J., Lou & L., Zhang. (2021). Research on the optimal trading mode of bitcoin portfolio diversification. Economic Perspective (04),65-71.