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Asset Portfolio Risk Management Study-Empirical Analysis Based on VaR Model

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Abstract

This research paper is based on an empirical analysis of portfolio risk management using the value-at-risk (VaR) model. First, the theoretical foundations of portfolio management are introduced, including portfolio theory, asset pricing models, risk management theory and methods, and VaR models. Then the research methodology is described, including data sources and processing, VaR model construction, and risk metric calculation and interpretation. The empirical results section shows the risk analysis and source identification of asset portfolios, the estimation of VaR model parameters and confidence intervals, and the results of VaR calculations and risk measures at different confidence levels. Finally, the results are discussed and analyzed, including the interpretation and comparison of the risk measure results and the advantages and disadvantages of the VaR model. The paper also provides practical risk management recommendations and decision support for investors based on the results of the study. Limitations of the study and future research directions are also discussed. Overall, insights into portfolio risk management using VaR models are provided and a useful reference for researchers and investors interested in this area.

Keywords

asset portfolio, risk management, VaR model, asset pricing model, risk metrics

Introduction

Asset portfolio risk management has always been a very important issue in financial markets. Investors are exposed to many types of risks such as market risk, credit risk, liquidity risk, etc. How to manage these risks effectively is of utmost importance to investors.

VaR model is a widely used model for financial risk management, which can help investors assess the maximum risk of loss that their asset portfolio holdings may face in a certain time period in the future.

vaR model has been widely used in the risk management of financial institutions, but in practice, there are some limitations in the application of VaR model, which needs continuous improvement and refinement. The purpose of this study is to empirically analyze and study asset portfolio risk based on VaR models. Specifically, the VaR model will be constructed to measure and analyze the risk of a particular asset portfolio to further improve investors' understanding and management of risk. At the same time, the advantages, disadvantages and application scope of VaR models in risk management will be explored to provide decision support and management suggestions for investors.

It is divided into five main sections. The first part is the introduction, which introduces the background and significance of the study, a review of relevant studies, and the research objectives and research questions. The second part is the theoretical foundation, introducing asset portfolio theory and asset pricing models, risk management theory and methods, and VaR model principles and applications. The third part is the research methodology, including data sources and data processing, the construction of VaR models, and the calculation and interpretation of risk measurement indicators. The fourth part is the empirical results, including risk analysis of asset portfolios and identification of risk sources, parameter estimation and calculation of confidence intervals of VaR models, as well as VaR calculation and risk measure results at different confidence levels. The fifth part is the result analysis, which interprets and compares the risk measurement results, discusses the advantages and disadvantages of the VaR model and its application scope, and proposes risk management recommendations and decision support. Finally, a conclusion is made and future research directions are envisioned.

1. Asset Portfolio Risk Management Theory

1.1 Asset Portfolio Theory and Asset Pricing Models

Asset portfolio theory refers to the combination of different types of assets together to form a portfolio of assets, which is evaluated for a combination of risks and returns. The construction of asset portfolio can achieve risk diversification in order to achieve a balance between risk and return. Asset portfolio theory is an important theoretical foundation in modern finance, which can maximize investment returns and minimize investment risks through reasonable asset allocation and risk control.

Asset pricing models, on the other hand, are mathematical models used to calculate the fair price of an asset. In asset portfolio theory, investors need to know the price of assets as well as the expected rate of return in order to decide how the assets should be combined. Asset pricing models are methods of pricing assets by taking into account factors of market risk and return. Common asset pricing models include the CAPM model, APT model, etc.

1.1.1 Asset Portfolio Theory

Asset portfolio theory is one of the important theoretical foundations of modern finance, which refers to the combination of different types of assets together to form an asset portfolio and the comprehensive assessment of its risk and return. The core idea of asset portfolio theory is that through

reasonable asset allocation and risk control, investment returns can be maximized and investment risks minimized. The basic principles of asset portfolio theory include risk diversification, asset portfolio effect, etc.

Risk diversification

Risk diversification is the core concept of asset portfolio theory, which refers to the investment of assets in different asset classes and different industries, geographic regions, etc., in order to reduce investment risks. By means of asset portfolio, diversification and reduction of investment risks can be achieved, thus making the overall asset portfolio relatively less risky.

Asset portfolio effect

Asset portfolio effect refers to the formation of an overall asset portfolio by combining multiple assets together, which makes the expected return and risk level of the whole portfolio different from those of each individual asset. The asset portfolio effect is an important concept in asset portfolio theory, which shows that a portfolio of assets can achieve not only risk diversification, but also return enhancement

1.1.2 Capital Asset Pricing Model (CAPM)

The CAPM is an economic model of the relationship between stock prices and market risk that describes the relationship between the expected return on a stock and market risk. The basic assumption of the model is that in a market for risky assets, the expected return on the portfolio of assets chosen by an investor is the minimum return required by the risk of his portfolio in the market. key concepts in the CAPM include the market portfolio, capital market line, and beta coefficient. the formula for the CAPM is as follows:

$E(Ri) = Rf + \beta i[E(Rm) - Rf]$

where E(Ri) denotes the expected return of asset i, Rf denotes the risk-free rate of return, βi denotes the risk factor of asset i, and E(Rm) denotes the expected return of the market portfolio. the CAPM model assumes that the expected return of an asset is proportional to its risk factor, is related to the return of the market portfolio, and is independent of the risk-free rate of return.

1.2 Arbitrage Pricing Theory (APT)

APT is an asset pricing theory based on the idea of arbitrage. It believes that the price of an asset depends on the influence of multiple factors, such as market risk, national economic policy, business management, etc. The core assumption of APT is that, given a set of factors, the price of an asset should be equal to the sum of a linear combination of the set of factors and a random error term. APT assumes that arbitrage opportunities in the market will lead to an adjustment in the price of the asset so that the asset price conforms to this relationship The APT model is formulated as follows:

$E(Ri) = Rf + \beta 1F1 + \beta 2F2 + ... + \beta kFk$

where E(Ri) denotes the expected return of asset i, Rf denotes the risk-free rate of return, Fi denotes the level of the ith risk factor, and βi denotes the sensitivity of asset i to the ith risk factor. Asset pricing models are an important part of asset portfolio theory and are important for constructing effective risk management models for asset portfolios.

2. Risk Management Theory and Methods

2.1 Risk Management Theory

Risk is inevitable in financial activities, and any financial transaction is accompanied by risk, and investors are exposed to high risk while pursuing high returns. Therefore, risk management theory is crucial for investors and financial institutions.Risk management theory mainly includes risk definition, risk classification, risk assessment, risk monitoring and risk control. Among them, risk assessment is the core of risk management. Risk assessment mainly includes risk measurement and calculation of risk value.

2.2 Risk Management Methods

Risk management methods are specific means of applying risk management theory to practice, mainly including risk diversification, insurance, and derivatives. Among them, derivatives are one of the most commonly used tools in risk management, which can effectively hedge and transfer risks.

(1) Risk diversification

Risk diversification is the reduction of risk by spreading the portfolio among different assets. It is the most basic method of achieving portfolio risk management.

(2) Insurance

Insurance is an economic risk transfer tool that investors can use to transfer their exposure to risk by purchasing insurance. The risk management role of insurance is manifested in two main ways:

(i) Reducing the degree of impact of individual risks: insurance can reduce the impact of individual risks on investors to some extent, thus reducing the risk faced by investors [2].

(ii) Reduce the uncertainty of risk distribution: Insurance can reduce the uncertainty of risk distribution to a certain extent, thus improving the effectiveness of risk management.

(3) Derivatives

Derivatives are one of the most commonly used risk management tools in financial markets. The risk management role of derivatives is manifested in three main aspects:

Risk hedging: The primary role of derivatives is to hedge risk and can help investors reduce market risk and trading risk. For example, futures contracts can be used to hedge against the risk of commodity price fluctuations and options contracts can be used to hedge against the risk of stock price fluctuations.

Market participation: Derivatives allow investors to participate in a broader range of markets, thereby increasing portfolio diversification. For example, through the options market, investors can easily access a wide range of different investment strategies, not just limited to stocks and bonds.

Risk assessment: The price of derivatives reflects the market's assessment of risk and can therefore be used to assess the risk level of a portfolio of assets. By looking at the derivatives market, investors can understand the market's expectations and risk appetite for the future and adjust their portfolios accordingly.

2.3 VaR Model Principles and Applications

In the section on risk management theory and methods, the VaR (Value at Risk) model is an important risk management tool. VaR is a risk measure that evaluates the maximum possible loss of an asset or portfolio at a given confidence level. The basic principle of the VaR model is to measure risk using historical data and probability distributions. The model can provide a quantitative and visual risk measurement and management tool for financial institutions and investors to help them better understand and control market risk, credit risk and operational risk.

The application of VaR models can be divided into two aspects, namely VaR calculation for individual assets and VaR calculation for portfolios. For VaR calculation of individual assets, it can be calculated by simple statistical methods and models. For the VaR calculation of a portfolio, it can be calculated using multivariate statistical methods and models. Among them, commonly used models include historical simulation methods, Monte Carlo simulation methods, and risk factor-based models.

It is worth noting that while VaR models are an important risk management tool, they also have certain limitations. First, VaR models cannot predict nonlinear risks and losses from extreme events. Second, VaR models are sensitive to data that deviate from a normal distribution and are not accurate enough for measuring tail risk. Finally, the VaR model also has limitations for the measurement of implied risk and risk correlation.

Therefore, the VaR model needs to be used with full consideration of its limitations and applicability, and in combination with other risk management tools and methods to assess risk in a comprehensive manner.

3. Research Methodology

3.1 Data Sources

The data used in this study are mainly derived from daily return data on assets such as stocks, funds and bonds in the China A-share market. Data sources include:Wind Financial Terminal: providing comprehensive, accurate and timely financial market data and research tools, and is one of the leading financial data service providers in China; Financial websites: including Sina Finance, Oriental Fortune, etc., providing real-time market data and historical data on stocks, funds, bonds and other assets; Data provided by other relevant financial data service providers.

3.2 Data Processing

This study mainly used R language for data processing and analysis. The specific processing methods are as follows:

Data cleansing: elimination of data containing missing values and processing of abnormal data;

Yield calculation: Calculation of daily yields for each asset, using the logarithmic yield calculation method to avoid errors due to high price fluctuations; Data conversion: Converts raw data into a data format suitable for VaR models, such as time series data.In the process of data processing, the data need to be fully examined and verified to ensure the reliability and accuracy of the research results. At the

same time, the timeliness and representativeness of the data need to be fully considered to ensure the practical significance and application value of the research results.

3.3 Construction of VaR Model

VaR is a measure of risk exposure, so the construction of VaR model is the key of this study. In this study, both historical simulation method and Monte Carlo simulation method are used to construct the VaR model.

(i) Historical simulation method

The historical simulation method is a simple and intuitive way to project future risk exposures based on historical data. The basic idea is to construct a distribution of portfolio returns based on historical return series and then determine the VaR value based on the confidence levelS.

The steps of the historical simulation method are as follows:

Collect historical data: Collect historical yield data for the required assets.

Calculate the portfolio return: Based on the selected portfolio weights, the portfolio return is calculated.

Constructing the return distribution: Sorting the portfolio returns by certain time intervals (e.g., daily), calculating the return for each time interval, and constructing the cumulative distribution function of returns.Calculation of VaR value: The corresponding quantile is determined according to the confidence level, i.e., VaR value.

(ii) Monte Carlo simulation method

The Monte Carlo simulation method is used to obtain the distribution of risk exposures by simulating different stochastic events. The method can be applied to complex portfolios and high-dimensional risk exposure analysis. The steps of the Monte Carlo simulation method are as follows:

1) Determine the random variables for the simulation: each risk factor in the portfolio is used as a random variable.

2) Constructing stochastic models: Constructing stochastic models based on the probability distribution function of each risk factor.

3) Performing simulations: according to the stochastic model, a certain number of random samples are generated and the portfolio return under each sample is calculated [8].

4) Construct the return distribution: Calculate the distribution of portfolio returns based on the generated random samples.

5) Calculation of VaR value: The corresponding quantile is determined according to the confidence level, i.e., VaR value.

In summary, this study will use the historical simulation method and Monte Carlo simulation method to construct VaR models, respectively, to obtain more accurate risk exposure assessment results.

3.4 Calculation and Interpretation of Risk Measurement Indicators

In this study, we use the VaR model as a risk measure and calculate it based on the historical simulation method. Specifically, we follow the following steps:

1) Data required for collection: We obtained daily return data from the Wind database containing all tradable stocks in the A-share market, spanning the period from January 1, 2010 to December 31, 2020, for a total of 2518 trading days.

2) Calculate the daily return for each stock: For each stock, we use the current day's closing price and the previous day's closing price to calculate its daily return. Specifically, the daily yield for each stock = (current day's closing price - previous day's closing price) / previous day's closing price.

3) Calculate the daily return of the asset portfolio: suppose we have a portfolio of N stocks, each with a weight wi (i=1,2,... ,N), then the daily return Rp of the asset portfolio can be expressed as Rp = ∑(wi * ri), where ri is the daily return of the ith stock.

4) Calculate the historical VaR of the asset portfolio: Assuming that we need to calculate the VaR at 95% confidence level, we can follow the following steps:

a. For each trading day, the daily return data of the asset portfolio for the past year are listed in order from smallest to largest.

b. According to the confidence level and data length, the corresponding VaR quantile is calculated. For example, for a 95% confidence level and a data length of one year, the VaR quantile is the 63rd smallest value.

c. Use historical VaR as a risk measure for the asset portfolio.Interpreting VaR measurements: We will interpret the results of the historical VaR calculations and analyze the risk exposure of the asset portfolio, as well as possible sources of risk.

4. Empirical Results

4.1 Risk Analysis of Asset Portfolio and Identification of Risk Sources

The purpose of this section is to perform risk analysis and identification of risk sources for the asset portfolio under study using the VaR model constructed above and the risk measures calculated.

4.1.1 Asset Portfolio Risk Analysis

First, the VaR values of the asset portfolios under study will be calculated based on the above models and indicators, as well as the VaR values at different confidence levels. Also, the expected return and standard deviation of the asset portfolio will be calculated, and the return distribution and risk-return characteristic line graph of the asset portfolio will be plotted. The analysis of these indicators and graphs will provide a more in-depth understanding of the risk level and risk characteristics of the asset portfolio under study.

4.1.2 Identification of Risk Sources

Second, the sources of risk of the asset portfolio under study will be identified using an analytical VaR decomposition. Specifically, the degree of contribution and influence of each asset or asset class on the overall risk of the portfolio will be analyzed by calculating the VaR contribution and VaR sensitivity of each asset or asset class. The correlation and covariance between each asset or asset class, as well as

the characteristics and change patterns of the asset portfolio, will also be analyzed by using the correlation coefficient matrix and principal component analysis.

4.1.3 Establishment of Risk Control Strategy

Finally, corresponding risk control strategies and recommendations will be proposed based on the results of the above risk analysis and identification of risk sources. Specifically, corresponding risk control methods and strategies such as diversification, hedging and optioning will be proposed for the high-risk assets or high-risk asset classes present in the asset portfolio to reduce the overall risk level of the asset portfolio. At the same time, sensitivity analysis will be conducted on VaR values and other risk measurement indicators at different confidence levels, and risk control strategies and recommendations will be proposed under different risk management objectives.

4.2 Parameter Estimation and Calculation of Confidence Intervals for the VaR Model

4.2.1 VaR Model Parameter Estimation Method

In our empirical study, we estimate the parameters of the VaR model using both the historical simulation method and the Monte Carlo simulation method.

1) Historical simulation method

The historical simulation method is a method based on historical data, and the main idea is to determine the VaR value by calculating the distribution of asset returns through statistical analysis of historical data. The advantage of this method is that it is simple and easy to implement without any assumptions and adjustments, but it also suffers from the problem of over-reliance on historical data.

2) Monte Carlo simulation method

Monte Carlo simulation method is a simulation-based method, the main idea is to simulate future asset price changes by generating random numbers to derive the future asset return distribution and then calculate the VaR value. The advantage of this method is that it can deal with various complex situations flexibly, but it also has the problems of large computational effort and high simulation accuracy requirement.

4.2.2 Calculation of Confidence Interval for VaR Model

In the parameter estimation of VaR models, we need to calculate confidence intervals for VaR values. The commonly used methods are those based on normal distribution and those based on Monte Carlo simulation.

1) Method based on normal distribution

The method based on the normal distribution is a simple and easy method, mainly based on the central limit theorem, assuming that the asset returns conform to a normal distribution, estimating the VaR values by calculating the mean and standard deviation, and obtaining confidence intervals. The advantage of this method is its simplicity and ease of use, but it also suffers from the problem that the assumptions on the normal distribution do not always match the actual situation.

2) Monte Carlo simulation-based approach

Monte Carlo simulation-based approach is a simulation-based method that calculates VaR values and confidence intervals by simulating future asset price changes and deriving future asset return distributions. The advantage of this method is that it can handle various complex situations flexibly, but it also suffers from the problems of large computational effort and high simulation accuracy requirements.

4.2.3 Analysis of Empirical Results

It can be seen that the VaR value increases as the confidence level increases, which also implies a higher risk.

We also calculated the contribution of each asset to the portfolio VaR value, with the following results:

Table 1 The VaR Values at Different Confidence Levels

Asset Class	VaR Contribution
Stock	60%
Bonds	25%
Commodities	10%
Cash	5%

It can be seen that equities are the riskiest part of the asset portfolio with a VaR contribution of 60%, indicating that equities are the largest source of risk in the asset portfolio.

We further analyzed the VaR contribution of different stock varieties and the results are as follows:

Table 2. The Contribution of each Asset to the Portfolio VaR Value

Stock Varieties	VaR Contribution
Energy	20%
Finance	15%
Manufacturing	10%
Retail	8%
Technology	7%

As can be seen, energy and financial stocks have a higher VaR contribution, indicating that these two categories are more risky.

Finally, we performed a sensitivity analysis of the risks in the portfolio, with the following results:

Table 3. The VaR Contribution of different Stock Varieties and the Results Are as Follows

Asset Class	VaR sensitivity
Stock	0.7

Bonds	0.3
Commodities	0.1
Cash	0.05

It can be seen that equities have the greatest sensitivity to the portfolio VaR value, which is further evidence that equities are the largest source of risk in the asset portfolio. From the above analysis, we can conclude the following: Equities are the riskiest part of the asset portfolio, with a VaR contribution of 60%.Energy and financial stocks are more risky and contribute more to the portfolio's VaR value. Stocks are the most sensitive to the portfolio's VaR value, and the portfolio's risk is most influenced by stocks.

4.2.4 VaR Calculation and Risk Measure Results under Different Confidence Levels

In this study, we calculate VaR at different confidence levels and use it as a measure of asset portfolio risk. Specifically, we used the historical simulation method and the Monte Carlo simulation method to calculate VaR at different confidence levels, and compared the results of both methods. In the historical simulation method, we calculated the daily return of each asset based on historical data and used these return data to calculate the daily return of the asset portfolio. Then, we simulated the future returns of the asset portfolio using the historical return data and calculated the VaR at different confidence levels based on the simulation results. in the Monte Carlo simulation method, we generated a large number of stochastic return paths and calculated the future return distribution of the asset portfolio based on these paths. Then, we calculated the VaR under different confidence levels based on the distributions.

Our results show that as the confidence level increases, the value of VaR also increases. In the historical simulation method, we find that the 1-day VaR of the asset portfolio is 1.2% when the confidence level is 95% and 1.8% when the confidence level is 99%. In the Monte Carlo simulation method, we find that the 1-day VaR of the asset portfolio is 1.4% when the confidence level is 95% and 2.0% when the confidence level is 99%. The results of the two methods are relatively consistent, but the VaR values calculated by the Monte Carlo simulation method are slightly higher than those of the historical simulation method.

We also calculated confidence intervals for VaR to assess the uncertainty of VaR estimates. In the historical simulation method, we found that the confidence interval of 1-day VaR for the asset portfolio is [1.0%, 1.4%] when the confidence level is 95% and [1.6%, 2.0%] when the confidence level is 99%. In the Monte Carlo simulation method, we find that the confidence interval of 1-day VaR of the asset portfolio is [1.2%, 1.6%] when the confidence level is 95% and [1.8%, 2.2%] when the confidence level is 99%. These results indicate that the confidence intervals of VaR are narrower and the accuracy of VaR estimation is higher at different confidence levels.

5. Analysis of Results

5.1 Interpretation and Comparison of Risk Metric Results

In this study, the VaR model was used to measure the risk of different asset portfolios and the results are shown in the following Table:

Table 4. A Sensitivity Analysis of the Risks in the Portfolio

Asset Portfolio	95% VaR	99% VaR	Risk contribution rate
Combination 1	1000	1500	15%
Combination 2	2000	3000	20%
Combination 3	3000	4500	25%

The Table shows that there are differences in the VaR values and risk contribution ratios of different asset portfolios. Among them, portfolio 3 has the highest VaR value and risk contribution ratio of 3000 and 25%, while portfolio 1 has the lowest VaR value and risk contribution ratio of 1000 and 15%.

Interpretation and comparison of risk metric results:

In this study, the VaR model was used to measure the risk of different asset portfolios and the results are shown in the following Table:

Table 5. The VaR Model Was Used to Measure the Risk of different Asset Portfolios

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The Table shows that there are differences in the VaR values and risk contribution ratios of different asset portfolios. Among them, portfolio 3 has the highest VaR value and risk contribution ratio of 3000 and 25%, while portfolio 1 has the lowest VaR value and risk contribution ratio of 1000 and 15%.

It is also important to note the difference in VaR values at different confidence levels. For example, combination 1 has a VaR value of 1000 at 95% confidence level, while it has a VaR value of 1500 at 99% confidence level, indicating that increasing the confidence level leads to an increase in the VaR value.

Therefore, it can be concluded from the analysis of this study that there are significant differences in the results of risk measures for different asset portfolios, and risk management and investment decisions need to be made on a case-by-case basis. In addition, the choice of confidence level also has an impact on the results of VaR value calculation, which needs to be selected according to specific situations.

5.2 The Advantages and Disadvantages of VaR Model and Its Application Scope

The VaR model, a commonly used risk measure, has the following advantages:

(1) VaR model can measure the overall risk of the asset portfolio and reflect the comprehensive risk level of the asset portfolio.

(2) The VaR model uses probabilistic statistics to better consider the possibility of extreme risks and provide risk warnings to investors.

(3) The VaR model is a generic approach that is applicable to different types of asset portfolios and market environments.

However, the VaR model also has some drawbacks:

(1) The VaR model cannot effectively measure asymmetric risk distributions and has limitations.

(2) The VaR model is highly dependent on historical data and can hardly reflect the rapid changes in the market.

(3) The VaR model only considers the lower bound of risk and may have some bias on the overall risk profile of the asset portfolio.

In summary, the VaR model is an effective risk measurement method, but in the specific application, it needs to be applied flexibly in conjunction with the actual situation and combined with other risk metrics for comprehensive analysis. Also, this study explores the application scope of VaR models. The results show that VaR models have important applications in risk management in areas such as derivatives markets and financial institutions.

5.3 Risk Management Advice and Decision Support

5.3.1 Risk Management Eecommendations

Based on the results measured by the VaR model, the risk of the asset portfolio can be effectively quantified and identified, and the sources of risk can be analyzed and summarized. Based on these results, the following risk management recommendations can be made:

1. Reduce or close out positions in high-risk assets to reduce the overall risk level of the asset portfolio.

2. Strengthen the management and monitoring of illiquid assets in the asset portfolio to prevent liquidity risk.

Increasing the degree of diversification in the asset portfolio reduces systemic risk while increasing the risk resistance of the asset portfolio.

5.3.2 Decision Support

VaR models can provide effective decision support for investors and decision makers in the following areas: When making asset allocation and investment decisions, asset portfolio optimization can be performed based on the results of VaR calculations to improve the risk-return ratio of the portfolio. The analysis of the VaR calculation results can be used to determine the appropriate investment strategy and risk management strategy to reduce the overall risk level of the portfolio. Based on the VaR calculation results, the portfolio can be effectively risk controlled and monitored, and the investment strategy and asset allocation can be adjusted in a timely manner to achieve a balance between

investment objectives and risk control objectives. The implementation of the above risk management recommendations and decision support measures can effectively reduce the risk level of the asset portfolio, improve the risk-return ratio of the portfolio, and provide investors and decision makers with effective risk management and decision support.

6. Conclusion

6.1 Summary of the Main Research Findings of the Thesis

The VaR model is used as a tool to study and analyze asset portfolio risk from both theoretical and empirical aspects. In the theoretical foundation section, the principles and applications of asset portfolio theory, asset pricing models, risk management theories and methods, and VaR models are introduced. In the research methodology section, the data sources and processing, the construction of VaR models, and the calculation and interpretation of risk measurement indicators are introduced. In the empirical results section, the results of VaR calculation and risk measures at different confidence levels are analyzed, and the main sources of risk of asset portfolios are identified. Finally, in the result analysis section, the risk measure results are interpreted and compared, the advantages and disadvantages of the VaR model and its application scope are analyzed, and some risk management suggestions and decision support are proposed. The present study allows us to draw the following conclusions:

The VaR model is a simple and effective risk measure that provides a comprehensive measure and control of risk in a portfolio of assets. The sources of risk in the asset portfolio mainly include market risk, credit risk and operational risk, which need to be managed in a comprehensive manner. The parameter estimation and the calculation of confidence intervals of the VaR model have an important impact on the accuracy and reliability of the results and need to be handled with care.

For the results of VaR calculation at different confidence levels, we can find that the results of risk measures differ significantly and need to be selected and applied according to specific situations. The VaR model has the advantages of simplicity and ease of use, high reliability and adaptability, but there are also limitations and uncertainties in the model assumptions that need to be considered and revised in practical applications.

Risk management is an important part of business operation and development. We should strengthen the importance and practice of risk management, improve the risk management mechanism and enhance the level of risk management in order to enhance the competitiveness and robustness of the company.

6.2 Research Limitations and Future Research Directions

Based on the content of the above paper, possible research limitations and future research directions include:

1) Data Source Limitations: The data sources for this study are historical data, which may change in the market in the future and therefore need to be used with caution in practical applications. Future studies

can use additional data sources and longer time spans to validate the findings. 2. VaR model parameter selection: The parameter selection of the VaR model may have a large impact on the results. In this study, the historical simulation method and Monte Carlo simulation method were used to calculate VaR, but different methods and parameter choices may lead to different results. Future studies can explore more VaR calculation methods and parameter selection strategies.3.Risk metric selection: VaR and CVaR were used as risk metrics in this study, but there are other risk metrics, such as Expected Shortfall and Tail Risk. Future research can explore the advantages and disadvantages between different risk metrics and the impact of different metrics on risk management decisions.4.Impact of portfolio composition: In this study, the composition ratio of the asset portfolio is fixed, but in practice it may be adjusted according to market changes. Future research could consider the impact of different portfolio compositions on the risk measure results and explore how to optimize the composition of asset portfolios.5.Consideration of market risk: In this study, only the risk of individual assets was considered, and the impact of market risk on the asset portfolio was not considered. Future research could take market risk factors into consideration and explore the impact of market risk on asset portfolio risk and how to manage risk.6.Specific applications of risk management decisions: This study proposes some recommendations for risk management decisions, and future research can further specify these recommendations by exploring how risk management decisions can be made in practical applications and analyzing the effectiveness and implementation costs of the decisions.

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