Financial Risk Prevention and Legal System Improvement based on Var

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Abstract

There is a close relationship between financial risks and financial laws. In theoretical research, scholars concerned about the relationship between the two, credit awareness, and the direction of formulating laws and regulations. This paper analyzes the characteristics of the current financial market risk, and comprehensively depicts the market risk faced by the portfolio by calculating the VaR (Value at Risk) of the yield under conditional heteroscedasticity and various peak and tail distributions, the components and marginal VaR of the portfolio, and the VaR under extreme market conditions. Finally, combining with the actual situation, this paper makes a detailed inquiry into the problems of financial risk prevention and the strategies of perfecting the legal system. It is hoped that this theoretical study will promote the healthy development of the financial industry.

Keywords

Var; Financial Risks; Legal System.

1. Introduction

With the rapid development of economic globalization, the relationship between financial risks and related legal systems is getting closer and closer. Many scholars have done in-depth research on the relationship between them and the direction of legal system formulation. With the further deepening of China's market economy reform, more attention has been paid to the scientific and systematic formulation of risk prevention measures in the financial industry [1]. We can effectively promote the healthy development of China's financial industry by strengthening the theoretical research on preventing financial risks and perfecting the legal system.

The VaR (Value at Risk) method can simply and clearly express the size of market risk, and is supported by rigorous probability and statistics theory. more importantly, it solves various problems that traditional risk measurement methods cannot solve, so this method has been widely supported and recognized by the international financial community [2-3]. Financial risks are far from being clearly recognized by non-quantitative subjective judgments. How to measure and control financial risks with quantitative methods is becoming more and more important for financial institutions, regulatory authorities and investors themselves.

2. Overview of Financial Risks

Financial risk refers to the possibility that changes in financial market factors will have a negative impact on the cash flow of an enterprise, resulting in the loss of financial assets or earnings of an enterprise, which will eventually lead to the decline of enterprise value. Generally, financial risks involve speculative risks, which can be divided into systematic risks and non-systematic risks according to the scope of risks, and the other is that financial risks can

be divided into credit, market risks, liquidity risks, settlement risks, operational risks and legal risks according to the specific causes of risks [4].

(1) Credit risk

Credit risk is one of the most important risks faced by commercial banks, which is manifested in the risk that borrowers cannot repay their principal and interest on schedule. Credit risk is traditionally defined as the risk of loss caused by the counterparty's failure to perform the contract normally, so it is also called default risk.

(2) Market risk

Market risk is one of the most common risks in the financial system, which usually refers to the risk caused by the change of market variables, or is defined as the sensitivity of the value of financial instruments and their combinations to the change of market variables. According to the differences of these market variables, market risks can be divided into interest rate risks, exchange rate risks, equity price risks, commodity prices and variable volatility risks, etc.

(3) Liquidity risk

Liquidity refers to the ability and convenience of realizing products at normal market prices. For financial institutions, liquidity risk often refers to the loss or bankruptcy caused by the liquidity of assets held by them and the exhaustion of external financing capacity.

(4) Settlement risk

Settlement risk refers to the possibility of losses caused by failure to receive cash or other financial instruments paid by counterparties on schedule.

(5) Operating risk

Operational risk refers to the risk of financial institutions' loss due to the failure of information systems or internal control mechanisms.

(6) Legal risk

Legal risk refers to the risk that a transaction contract signed by a financial institution cannot be performed because it does not comply with the law or the provisions of the financial hose department, thus causing losses to the financial institution.

From the above-mentioned risks, any enterprise is faced with financial risks. No matter what kind of reasons, or in order to avoid or control risks, the enterprise only wants to obtain the time value of assets, but obtains the risk premium of assets by taking risks. Financial risk management is essential.

3. VaR and Financial Risk Measurement

3.1. Dynamic VaR

With the rapid development of world economic internationalization, financial innovation and financial liberalization, banks, securities companies and other financial institutions are facing increasingly diverse and increasing risks. Among these risks, the most important ones are credit risk and market risk.

The definition of VaR is that under normal market conditions and a given confidence level (usually 95% or 99%), in a given holding period, a certain portfolio is expected to lose the most. In other words, under normal market conditions and within a given time period, the probability that the portfolio will lose more than VaR value is only a given probability level, which can be expressed as [5]:

$$Prob(\Delta P > VaR) = 1 - c \tag{1}$$

In which, ΔP is the loss of the portfolio in the holding period Δt, and VaR is the value at risk under the confidence level c.

From the above definition, we can see that VaR has two important parameters: the holding period of the portfolio and the confidence level. These two parameters play an important role in the calculation and application of VaR.

A very important feature of financial time series is its "volatility agglomeration", which is what we call heteroscedasticity-its volatility is different for different time periods [6]. In recent years, a large number of empirical studies have shown that GARCH (generalized autoregressive conditional heterogeneity) model is particularly suitable for modeling the volatility and correlation of financial time series. Therefore, in this part, we will introduce GARCH model into the calculation of variance of VaR, so that we can predict the short-term dynamic risk of portfolio.

The $GARCH(p,q)$ model describing the average rate of return R_t consists of two parts. The first part is the data generation process (averaging process):

$$R_t = \alpha + \sum_{i=1}^{m}\theta_i R_{t-i} + \varepsilon_t + \sum_{j=1}^{n}\eta_j\varepsilon_{t-j} \tag{2}$$

The above formula indicates that the data generation process of R_t obeys the $ARMA(m,n)$ process. The absolute residual sequence ε_t is not a pure white noise process, but a conditional heteroscedasticity process. Under the condition of known information set $I_{t-1} = \{R_s, \varepsilon_s; s \le t-1\}$, assuming that the conditional probability distribution of absolute residual sequence is normal distribution, it has time-varying conditional variance:

$$\varepsilon_t|I_{t-1} \sim N(0, h_t^2), \qquad t = 1,2,\cdots,T \tag{3}$$

The second part of the $GARCH(p,q)$ model is the formation process of conditional heteroscedasticity (variance equation), and the $GARCH$ model assumes that the conditional heteroscedasticity sequence satisfies:

$$h_t^2 = \beta + \sum_{i=1}^{q}\phi_i\varepsilon_{t-i}^2 + \sum_{j=1}^{p}\varphi_j h_{t-j}^2, \beta > 0, \phi_i > 0, i = 1,2,,\cdots,q; \varphi_j = 1,2,,\cdots,p \tag{4}$$

This shows that the conditional variance depends not only on the past conditional variance, but also on the realization of the past absolute residual of the model. We use conditional VaRiance to measure the volatility of return, and then calculate the dynamic var of portfolio, which can make volatility and risk time-varying and reflect the dynamic impact of new information and new shocks.

3.2. Measurement of Marginal Var, Component VaR and Incremental Var

Asset risk management mainly understands the influence of one or a kind of assets in a portfolio on the overall VaR, which is divided into static and dynamic situations, mainly including the marginal contribution of an asset in the portfolio to the portfolio VaR, the proportion of an asset in the portfolio to the portfolio, and the influence of the addition or withdrawal of a new asset on the existing portfolio.

This risk information is important for risk management, which helps to identify the important sources of risks in all risk exposures, and helps to improve the overall risk situation, evaluate investment opportunities, analyze the impact of portfolio adjustment on risks and set position

limits. The portfolio management of marginal VaR, component VaR and incremental VaR provides such an analysis tool [7].

(1) Marginal VaR

The marginal VaR of portfolio P in an asset i refers to the change of portfolio VaR caused by the position change of asset i, namely:

$$M - VaR_t = \frac{\partial VaR(p)}{\partial w_t} \tag{5}$$

In which w_t represents the weight of asset i in the portfolio.

Under the assumption of normal distribution, the return obeys multiVaRiate normal distribution, i.e., $R \sim N(\mu_p, \sigma_p)$, and the var with a holding period of 9.5% of Δt confidence level is:

$$\sigma_p^2 = \sum_{l=1}^{N} w_l^2 \sigma_i^2 + \sum_{l=1}^{N} \sum_{i=1, j \neq i}^{N} w_l w_i \sigma_{ij} = \sum_{l=1}^{N} w_i^2 \sigma_j^2 + 2 \sum_{i=1}^{N} \sum_{l=1, j<l}^{N} w_i w_j \sigma_{ij} \tag{6}$$

So,

$$\frac{\partial \sigma_p}{\partial w_l} = \frac{Cov(R_i, R_p)}{\sigma_p} = \beta_l \cdot \sigma_p \tag{7}$$

In which $\beta_l = \frac{Cov(R_i, R_p)}{VaR(R_p)}$ and Cov, VaR represent covariance and variance operations respectively.

Assuming that the expected return of the portfolio is 0, the marginal VaR is:

$$M - VaR(p) = \beta_l VaR(p) \tag{8}$$

(2) Composition VaR

There are usually two basic types of VaR of asset portfolio:

One is the VaR considering the diversification of assets.

The other is VaR without considering the diversification of assets.

Due to the diversification effect of assets, the sum of the undistributed VaR of all components in a portfolio is usually not equal to the decentralized VaR of the portfolio. Components can be financial instruments, assets or a transaction.

The undistributed VaR obviously cannot reflect the contribution of each component in the portfolio VaR. Assume that the asset portfolio contains N components. If the above formula holds, $C - VaR_i$ is called the component VaR of the asset portfolio component i:

$$VaR = \sum_{i=1}^{N} C - VaR_i \tag{9}$$

(3) Incremental VaR

The incremental VaR of an asset refers to the change of portfolio VaR when the asset is added to the portfolio. The incremental VaR of asset A is:

$$I - VaR = VaR(\text{Including A}) - VaR(\text{Exclude A}) \tag{10}$$

$I - VaR$ increases the portfolio risk to prove the newly added assets; Is negative, indicating that the newly added assets have hedged the portfolio risk; When it is zero, it means that the newly added assets do not affect the risk of the portfolio.

4. Strategies for Perfecting the Legal System of Financial Risk Prevention

4.1. Scientific and Comprehensive Implementation of Financial Legislation

Under the current background of China's economic system reform and development, only by perfecting the legislative work can it be conducive to the effective prevention of financial risks. From the implementation of specific measures, it is necessary to effectively implement the thinking of overall planning and scientific legislation. On the ideological level of financial risk prevention and supervision, it is necessary to develop in a unified way, and the supervision department of financial risk prevention should carry out its work scientifically, paying attention to the good flow and sharing of information.

It is also necessary to take the protection of depositors' and investors' interests as the important guiding ideology of financial legislation, to strengthen the research work of financial legal relations persistently. Strengthening and perfecting from the legal level can better promote the presentation of the financial risk prevention effect.

4.2. Establish and Improve the Supervision System of Employees' Behavior in Financial Enterprises

In the whole process of China's economic development, financial enterprises play an important role in safeguarding, which requires employees to have a positive value orientation and establish a correct working attitude in their work. For employees who have different degrees of bribery in actual work, they should be strictly dealt with in combination with relevant laws and regulations.

At the same time, relevant criminal laws should be used to reasonably regulate the behaviors of enterprise employees, to reduce financial risks as much as possible. Therefore, enterprises should constantly optimize the relevant supervision system and establish a perfect supervision system, to further standardize the behavior of employees in financial enterprises.

4.3. Do a Good Job in the Research of Financial Legal Relations

The innovation of financial relationship is an important part of financial innovation. In fact, economy and law are being organically combined, and the economic analysis of law is the product of their combination. In the future, we need to introduce the principle that the financial transactions before the bankruptcy of financial institutions continue to be valid into the legal rules of bankruptcy of financial institutions.

Therefore, the study of financial law should not be confined to the circle of discussing law on the basis of law. Instead, it should boldly learn from and absorb the knowledge and concepts of other disciplines, and use the latest research results of economics, psychology and sociology to promote the innovation of financial law, so as to ensure that the financial legal system can not only standardize the financial business behavior, but also promote the healthy development of the financial industry.

4.4. Clear Information Disclosure System

From the perspective of optimizing the financial legal system, clarifying the principles of information disclosure and ensuring the truthfulness, completeness and reliability of information disclosure will be beneficial to the safety of financial institutions' capital circulation. As for the information content disclosed, it should be constantly improved, such as internal related party transactions and internal control system, etc., so as to strengthen measures, control the frequency of information disclosure, accurately handle the protection measures of

information disclosure and trade secrets, further improve the legal liability system of information disclosure, adhere to the principle of double penalty, and strictly treat information disclosure violations, so as to maximize the warning function.

5. Summary

In a word, during the further development of market economy, people pay more attention to the financial industry. Only by strengthening the implementation of good development measures of financial enterprises can the stable development of market economy be fully guaranteed. Based on absorbing the latest research results and implementation experience at home and abroad, this paper studies how to use the most advanced VaR technology to measure and manage the market risk and credit risk comprehensively and deeply. By introducing the concepts of marginal VaR, component VaR, incremental VaR and dynamic VaR, we can understand the impact of each asset constituting the portfolio and its corresponding adjustment and change on the overall risk of the portfolio. This information is very important for risk management, which helps to identify the main sources of risks in all risk exposures, and helps to improve the overall risk situation, evaluate investment opportunities, analyze the impact of asset adjustment on portfolio risks, and set position limits.

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