

Countermeasure analysis of inventory financing and its risk management in perfect price fluctuation

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Abstract

This text is a hypothesis in different economic status, in different cases of price fluctuations, in two or more than two cases of inventory combinations, applies Markowitz portfolio management theory to inventory financing and study on borrower how to obtain optimum inventory mix in the configuration of the stock portfolio by analyzing factors of risk. On the basis of theoretical derivation, we take borrower and bank as the main research object, to analyze the case of inventory combination pledge loan. Study results indicate that for price fluctuation, inventory rationality can effectively reduce the risk of the borrower and the bank.

Key words: *price fluctuation; inventory financing; markowitz model; risk evading*

1 Introduction

Inventory pledge loan means that borrowing enterprises use two or more inventories that they owed as a guarantee to the money provider bank, and transfer the two or more than two kinds of the pledged property to the third party logistics enterprise (intermediary parties) who are legally responsible for the custody of movable property to carry out the loan business activities. It belongs to a kind of chattel mortgage business under the participation of the logistics enterprises, but also a further expansion of the logistics and financial business. Inventory pledge loan expands to the combination of pledge for the following reasons: combination pledge can bring more profit to the borrowing enterprises, third-party logistics enterprises and banks. It's not a simple "tripartite win-win", but put the "win" to a higher level of the "tripartite integration" optimization. For the fund provider (Bank), the new profit point can be extended by the inventory portfolio, and the combination method can be fully used to reduce the risk of price fluctuation. For the third-party logistics companies (3PL), they can improve their management ability from the portfolio and risk of price fluctuations they faced, also can expand the business scope, and improve the level of profit. For borrowers, they want to combine the various stocks they owed to raise the quality of their mortgages and get a higher loan amount. Price fluctuation increases the uncertainty of operation and management of borrowing enterprises. It doesn't necessarily bring benefits, and sometimes leads to losses.

The borrowing enterprises should effectively cope with the price fluctuation, reduce loan costs, get more capital, and improve operating flexibility.

Inventory pledge is an effective way for SME to raise funds. Scholars researched the inventory impawn from perfect inventory pledge loan conditions, loan-to-value ratio and the default rate. Merton (1974) put forward a structure method¹, after that Stulz and Johnson(1985) analyzed the relationship between the pledge and the pledged property collateral loan pricing², Jokivuolle and Peura(2003) was in a structured way to study the pledge loan loan-to-value ratio³, Cossin and Hricko (2003)used the same method to calculate the loan discount rate and got a similar result. This method is endogenous based on the default probability⁴,Cossin and Huang(2003) proposed a situation that loan companies default probability is exogenous⁵, they used the simplifying results of Jarrow and Turnbull(1995)、Jarrow、Lando and Turnbull (1997) solve a given exogenous default probability of the pledged property loan discount rate^{6,7}. Klapper(2004)analyzed the promote effect and negative impact of the small and medium-sized enterprises in the supply chain finance through the logistics financial model. He thought this mode is favorable to the development of small and medium-sized enterprise⁸. Guillen(2006)analyzed and thought that the inventory impawn financing can reduce the operating costs of the enterprise, make enterprise get expand liquidity, which is beneficial to the development of enterprise⁹. Sun Xuchua etc. (2014) thought that because of the asymmetry between Banks and logistics enterprises can lead to bank loan risk, and Banks to adopt a simple incentive measures are not sufficient to avoid credit risk, it is recommended that combines the incentive mechanism and supervision mechanism¹⁰.

But these studies above didn't apply this famous investment portfolio theory to inventory pledge. Based on under the precondition of price fluctuations, this paper use the markowitz portfolio analysis framework to research the way bank avoid risk. In this paper, we expend the traditional single quality to the combination pledge, and based on the evaluation of stock market prices, compare the loan amount and the inventory cost price in the different cases, and got the path of borrowers avoid risk by combination.

2 Research on decision-making mechanism

Borrowers are the applicants of pledge of stock portfolios, it is important for them to avoid risk and get the optimal loan revenues from the pledge. Bank is the capital provider of pledge of stock portfolios, it is urgent for him to evaluate and avoid the stock portfolio risk. Third-party logistics enterprises in the stock portfolio pledge authorized by the bank, responsible for the management of the pledge, play an important role in cohesion and adjust between the two parties. In this paper, we apply the markowitz portfolio theory to the inventory pledge loan, and define the cost price of deposits and the loans price of bank. Each borrowing enterprise can choose a stock combination plan according to their wishes, the money lender will analyze the expected yield E_p and standard deviation of returns σ_p of stock portfolio. Thereinto, E_p the bigger the better, σ_p as small as possible. The loan companies deliver inventory to the logistics warehousing enterprises who have corresponding qualifications, and apply to the bank for a loan. w_i is the percentage of the i th stock assets, r_i is the expected yield of the i th

stock assets, $E(r_p)$ is the expected return of the portfolio, σ_p^2 is the standard deviation of the portfolio, $E(r_i)$ is the expected return rate of each item. $Cov(i, j)$ is the yield variance of stock i and j .

We calculate the weighted average of each inventory's expected return rate and get the expected return rate of stock portfolio, and the weight is the percentage of each stock in the portfolio.

$$E(r_p) = \sum_{i=1}^n p_i r_i \quad (1)$$

The stock portfolio variance or standard deviation is not just simply weighted average by the inventory variance or standard deviation, but need more scientific measures. At the beginning, we assume that the bank can predict the probability distribution of stock returns in a certain period of time, stock returns are random variables in there. The expected return rate of stock pledge was obtained through the weighted average, the weights are probability P_i of each income. The expected return rate is the sum of the product of the yield and the corresponding probability.

$$\sigma_p^2 = E \left[\left(\sum_{i=1}^n w_i r_i - \sum_{i=1}^n w_i E[r_i] \right)^2 \right] = \sum_{i,j=1}^n w_i w_j E[(r_i - E[r_i])(r_j - E[r_j])] = \sum_{i=1}^n \sum_{j=1}^n Cov(i, j) w_i w_j \quad (2)$$

We apply the portfolio thought of Markowitz to the stock portfolio risk framework. The risks and benefits of combination pledge are respectively measured with variance and expectations, in this way we can express the problem of stock pledge of fluctuant price as the following quadratic programming problem. We can calculate the minimum value of quadratic function under the condition of two linear equality constraint. The objective function is corresponding income $\bar{\mu}$ to the minimum risk portfolio. The constraint is that the combination of stock proportion in the total assets is equal to 1. And the expected return rate of stock portfolio is the weighted average of the expected return rate of each stock.

$$\begin{aligned} \min \sigma_p^2 &= \sum_{i=1}^n \sum_{j=1}^n cov(i, j) w_i w_j \\ s.t. \quad &w_1 + w_2 + w_3 + \dots + w_n = 1 \end{aligned} \quad (3)$$

$$\mu_p = \sum_{i=1}^n w_i r_i = \bar{\mu}$$

We adopt the Lagrange's method to solve this decision model. Under the limit condition, we solve the optimal investment ratio w_i to make the portfolio risk σ_p^2 be minimum. Firstly, the borrower determines an expected return, and then they make sure the weight of each inventory stock portfolio according to $E(r_p) = \sum_{i=1}^n w_i r_i$, make the overall inventory risk be minimum. So, on the different level of the expected return, we get corresponding solutions which minimize the variance. These solutions form a portfolio of minimum variance, also is what we usually call effective combination. The expected yield of effective combination and

the corresponding minimum variance form a curve, this is the efficient portfolio frontier. Investors according to their own earnings targets and risk appetite to select the optimal combination plan of stock on the efficient portfolio frontier.

3 Business implementation strategies

The paper establishes the correlation model of stock portfolio risk management and analyzes the problem of inventory combination in theory to effectively avoid risk and raise revenue. The model method is helpful to reduce risk of borrowers, Banks, the third-party logistics, and increase their profits.

3.1 Improve the risk measurement capability

According to the above model, the third-party logistics enterprises can effectively calculate the non-system risk and system risk of each inventory in a combination, the correlation coefficient between the inventory and the covariance, and judge the risk coefficient by comprehensive comparison. Through the risk data obtained, they can take effective measures to control it within a certain range. In the process of value assessment, the third-party logistics enterprises consider this series of factors, which can eliminate the unfavorable factors, is conducive to inventory portfolio hedge, and improve the evaluation ability of the method.

3.2 Improve portfolio yields

The borrower can use the above analysis method to make a valid combination of the pledged inventory. It is very important to choose quality and improve the combination efficiency. For example, whether the pledge value reflect the market conditions, the influence degree of the market price fluctuations on the pledge, the difficult degree of the pledge of goods' storage and the future market sales forecast of the pledge of goods and so on. It is prudent to enter the pledge portfolio of goods which is unstable physical and chemical properties, volatile, or with volatility market price, and no recurrent market demand. In addition, it is important to examine the legality of the source of the pledged stock, and the items obtained illegally, which cannot be used as collateral. In the above calculation, only three types of inventory are selected. In the future, Banks and loans can increase the variety of alternative inventories according to the actual situation to increase the applicability of the method.

3.3 Avoid nonsystematic risk

System risk has a wide range of impacts, and the enterprise cannot control. Nonsystematic is because some changes of certain factors in a particular industry or certain enterprises that affect individual industries or individual companies, so they are manageable and dispersible. Therefore, avoid the loss of inventory risk should start from the nonsystematic risk and to reduce it to the lowest level. In order to avoid nonsystematic, it need to know the proportion of the nonsystematic risk, the bigger proportion is deserve to invest. The order of choice for this case is: inventory A > inventory B > inventory C, through this way and the associated risk aversion measures can reduce the system risk to a minimum.

3.4 To assess the market environment

Systematic risk is often coming from the entire market environment. National policies have a significant impact on future trends. The government's tangible hands will have an impact on inventory pledges. So, we need to study the policy implementation and backgrounds, analysis of regulatory environment, regional requirements, local costs, local permits and local tax policy changes. In the inventory combination pledge decision, it is very important to observe and judge the change factors of the whole market. Therefore, it is necessary to establish the information collection and feedback system of the pledge inventory combination, analyze the change factors, track and evaluate the value and sales of the pledged goods in real time; establish the early warning system, when the market price deviates from the normal value or the inventory combination quantity changes, then use the corresponding measures to avoid losses. In the control of operational risk, the responsibilities and obligations stipulated in the pledge management should be strictly implemented.

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