LEVERAGE CONTROL AND QUANTITATIVE MANAGEMENT: THE ANALYSIS OF AMPLIFICATION EFFECT ON FINANCIAL SYSTEM

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ABSTRACT
Maintaining the stability of financial leverage is a task in macro-economic management and also a challenge to be faced. Financial amplification characteristics dominate financial leverage system with low risk of capabilities, and the efficiency of this ability has two-sides results and proposes a lot of risks, however, most researchers have not found the best ways to solve this problem. Therefore, taking positive measures to strengthen the management of the financial system leverage feature becomes very important. In this paper, authors use comparative study and data analysis to illustrate the main problems of financial system leverage, the effect of leverage amplification characteristics, bi-amplified comparative analysis of profit and loss, and bi-amplification characteristics of the risk analysis. Meanwhile, based on five classified management methods, authors put forward countermeasures to the management of leverage properties in financial system.
KEYWORDS: *Financial System, Leverage Characteristic, Leverage Category Management.*

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Introduction

Contemporary evolution of the financial system in the outstanding performance, that first developed rapidly, is mixed. This situation is largely due to its real economic leverage amplification characteristics. It is the leverage performance of the financial system, so it has a small risk of capacity, particularly under the effect of high leverage efforts that people often anticipate. Two financial derivatives, for example, under ordinary circumstances investors only need to pay a small deposit that can carry a huge amount of the transactions. Primarily, it can make the money work more efficiently and avoid risks to achieve hedge of gaining huge profit. Furthermore, the financial derivative transactions or probability also contain a huge risk of losing occurs when the amount of loss is correspondingly expanded several times, and its ripple effect will be spread like butterfly effect, and it will be difficult to control it. One of the reasons of the global financial crisis is that five largest investment banks of U.S bankrupted at the same time.

In the current years, financial leverage plays an important role in the financial system. Also financial leverage must be used appropriately to get far away from the crisis. Both macroeconomic regulators and

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financial regulators feel it is difficult to keep the stability of the financial system. Maintaining stable level of financial leverage is also macroeconomic management task and challenge to be faced. Amplification characteristics dominate financial leverage system with low risk of capabilities. Efficiency of this ability is two-sides results and proposes a lot of risks, and most researchers have failed to provide effective solution for this problem. Therefore taking positive measures to strengthen the management of the financial system leverage feature becomes very important.

Paper goal is through the analysis of financial leverage amplification and identification of the weakness of financial leverage systems, put forward countermeasures about the management of leverage properties of financial system from five classified management methods.

In order to achieve paper`s goal, authors defined following tasks for paper: 1) Assess Financial Leverage types and their quantitative indicators; 2) Identify main weaknesses of financial leverage system; 3) Perform analysis of the financial leverage characteristics; 4) Make conclusions about key findings and draw suggestions about better practice;

Regarding to research methods, authors use comparative study and data analysis for illustrating the effect of financial system leverage to the main problems and the leverage amplification characteristics, and bi-amplified comparative analysis of profit and loss and bi-amplification characteristics of the risk analysis.

1. Financial Leverage Types & Quantitative Indicators

1.1. Capital Adequacy Ratio

In financial system, the real economy leverage amplification characteristics show a variety of different forms. In the coordination with the role of different fields, it can be classified as the capital in nature and the nature of the transaction leverage (Beder, Marshall, Bernard, 2012). Meanwhile, corresponded quantitative indicators can be divided into capital-leverage and transactional leverage. The main capital gearing types are: Risk-sensitive Leverage Ratio – Capital Adequacy, and Risk-insensitive Leverage Ratio – (Financial) Leverage. Generally, capital adequacy ratio is defined as total capital divided by total risk-weighted assets ratio. Also, associated with the capital adequacy ratio and basic capital adequacy ratio, namely, the core capital is divided by total risk-weighted assets ratio. According to the China Banking Regulatory Commission requirements (financial), leverage ratio refers to commercial banks to be held, in line with the relevant provisions of a capital with assets ratio's adjusted balance sheets of commercial banks. By comparison with it, we can see that the main difference between these two gearing types lies in the denominator, and the former is based on the risk-weighted assets, while the latter is based on the total assets.

Trading with the main types of leverage margin (ratio) and premiums (rates) plays the main role in the credit guarantee transaction process and it is widely used in the spot trade as well as futures trading and options trading. The latter point in a variety of transaction process will be the decision-making right in the future, which will give an opportunity to choose the right ways to determine the point in the delayed time, as well as the beneficial or contingent event, instead of pointing to the subject matter of the transaction itself.

1.2. Quantitative Indicators in Bank System

By the U.S. sub-priming mortgage, financial crisis triggered by the global financial crisis has exposed a variety of financial institutions and financial derivatives excessive in the accumulation of leverage after the negative effects, which is promoting people to take the leverage of the financial system (characteristics) of the regulation for the response. On December, 2010 by Basel III, it has raised previous Basel capital adequacy requirements ratio; on June 2011 it has proposed a series of systemically important bank's supplementary capital ratio requirements. And in 2012 in China, some cities began to implement the "Commercial Bank's Capital Management Approach". As for as it concerns, it is more effective than a series of Basel III capital requirements in the financial market in China (see Table 1)

Table 1. Minimum Capital Requirements Ratio in Banks

Domestic and International Regulations	Minimum Capital Adequacy Requirements		
	Core Basic Capital	First Level Capital	Total Capital
Basel III	4.5 %	6 %	8 %
China Banking 2014	5 %	6 %	8 %

Source: BCBS (December, 2015); China Banking collate relevant information

Thus, in order to regulate the leverage effect (characteristics) to become excessive accumulation of the banking sector to avoid future when the deleveraging on the total financial system and the real economy will result in a greater effect, Basel three also explicitly provides the leverage lower limit requirements (not less than 3 %), while China is also higher than the corresponding provisions of this rigorous (not less than 4 %). Basel required the calculation of the leverage ratio, and the bank›s risk exposure estimates include both of the ratios (such as derivatives trading, etc.), but also include off-balance sheet items (such as loan commitments, direct credit substitute, etc.). In the New Basel capital framework agreements it established under the capital adequacy ratio and leveraged the synergy of modern banking regulation that became an effective control characteristics of the main types of leverages.

2. The Main Weakness of Financial Leverage System

Disadvantages of "Bilateral Amplification" Leverage Characteristics. In the trading profit, one of the main reasons is that there is a high leverage that derived type is commonly used while trading (Laux, Loranth, Morrison, 2014). In recent years foundation type deal is also widely used. Ability to leverage amplification (features) of the financial system is one of its characteristics and is also one of the "advantages". The problem is that this kind of amplification ability (features) is a two-way effect, which can not only enlarge profit, but also can magnify the loss, even if very large financial institutions will continue to change the operating results because of business's local loss, which will be caused by this integrity. Such financial department as Lehman brothers, which grew up in the first quarter in 2009 at 31.7 times, and made sub-prime securities losses small changes later led to a net worth of losses, eventually became "the last straw breaks the big camel".

Strengthening the Financial System to the Real Economy Reaction Ability. Leverage over these years is based on the rapid development of the real economy of the financial system. Moreover, it develops faster than the speed of the development of the financial management itself. It makes the range between the two top-heavy "Layers" and "Inverted Pyramid", which is one of the final consequences. These consequences lead to the frequent growing and falling. The financial system in a bull market has all kinds of asset value, causing liquidity; once the financial system is in a bear market, all kinds of assets are impairment, causing liquidity crunch.

The Super Position of Multiple Combinations of Making the Nature of Leverage. The financial system of the trading tools combined with derivatives greatly changes the lever of original features and make it even harder to identify and measure the risk of future. ARM and contain the subprime MBS, for example, the original form is relatively simple and it will help us to safe mortgages and mortgage-backed securities. But the commercial banks, in order to revitalize the capital investment bank, will expand business scale. The institutional investors, which are seeking for higher returns, will contribute to the CDOs (collateralized debt obligations (CDO), and a series of multiple packaging of derivatives for expanding the influence of subprime mortgages, which is spreading over. It can effectively reduce the risk of financial products and, as a result, can spread into specific risk and magnify systemic products risks.

The Main Disadvantages of the System

The modern financial system is independent on the real economy running trend, which is becoming more and more obvious. Pursuing of tools leverage efficiently and industry scale make the trading operations different from general enterprises, organizations, and makes some retail investors give priorities to institutional investors. In addition to hedge funds, mutual funds and pension funds, the issue of MBS policy is based on financial institutions such as Fannie Mae and Freddie MAC, CDOs, an investment banks, management of the CDS (credit default swaps) insurance company (AIG), even the original mortgage selling assets to commercial banks has become a kind of financial instrument, especially the huge derivative security holder. It shows a more and more independence of entire economy of the modern financial system, also a more and more large-scaled financial business, mainly in the various financial institutions that are between inside trading and transferring process, rather than the risk of foreign dispersion process.

3. Analysis of the Financial Leverage Characteristics

Financial leverage is a measure of how much firm uses equity and debt to finance its assets. As debt increases, financial leverage increases. In the modern economy, financial leverage has been seen in different studies that financial leverage has the relationship with financial performance, and it plays an important role in the financial system. And financial leverage must be used appropriately to get far away from the crisis. Not only macroeconomic regulators but also financial regulators feel it is difficult to keep the stability of the financial system. The efficiency of this ability is two-ways results and will also pose a lot of risks. Most researchers haven't found the best ways to solve this problem. A high debt equity ratio makes the banks financed by debt more than by equity. Therefore there are fixed interest payments involved. However the inverse of this is also true. Just like financial leverage helps to magnify profits, it also magnifies losses when EBIT fall down. Leverage is very dangerous unless the bank is reasonably certain of its earnings. Investors view the leverage ratio with great detail. This is because it enables a small change in the minimum capital adequacy requirements to completely wipe out the bank's capital and make it insolvent almost overnight. In this study the sample size consists of all the commercial banks in China. The listed bank is included in the study from the data collection of Bank of China in 2014. Analysts strive to quantify exactly how much variability does debt funding create in the operations of a particular bank and have created a measure called "Degree of Financial Leverage" which authors will study in detail. Financial leverage is the independent variable which is measured by using debt to equity ratio. Descriptive and correlation analysis are used for the data analysis. Based on the questions above, authors put forward countermeasures about the management of leverage properties of financial system from five classified aspects.

3.1. Financial System Ability of Leveraging of the Amplification

Financial leveraging "characteristics of the financial system (nature)" is mainly done through the financial tools, which are between the "copy" and the substitute for each other. Also this is enhancing the efficiency of the financial system, which is one of the main ways to decrease the transaction cost (Chatterjee, Rupak, 2014). As we talked before, financial instruments and their replications are intermediate tools as well as alternative tools while you can do it with the same cash flow, but their implicit yields and risk characteristics are not always the same. For instance, you can buy a unit stock call option and put option to sell a unit stock to copy the stock of cash flow, then the call option and put option with the same S, maturity T. As is shown in figure 1, the asset price is X. We always think that call option and put option C and P is for short time, and the price of the tectonic replicate stock cost is $C - P$. In the options of maturity T, the value of the replica VT is value of call option and put option price, the difference is the gap between the namely:

$$VT = max\ (0,\ ST-X) - max\ (0,\ X-ST).$$

If due date *ST* stock price is higher than the strike price *X*, and call option value is *ST – X*, put option value is zero; If the *ST* is less than *X*, the call option value is zero, and the put option value is *X – ST*. Therefore, no matter how the future stock price changes, the copy of this stock in this combination in the value of the option maturity date is always *ST – X*. If only considering replicate stock structure cost without the consideration on the time value of money, then the replication tool at the end of profit and loss is:

$$Max\ (0, ST - X) - Max\ (0, X - ST) - (c - p) = ST - X - C + P.$$

Table 2. The Characteristic of Financial Leverage Amplification by Risen Price

The Type of Transaction	Capital	Leveraged Nature	The Price Rise in Net Profit or Loss	Yield Rate
Spot Transactions	100	1 : 1	90 – 100 = –10	–10 %
Future Transactions	100	Cash Deposit 10 %	(90 – 100) × 10 = –100	–100 %
The Option Combinations	100	The Total Cost 1 %	(90 – 100 – 1) × 100 = –1100	–1100 %

Source: Authors construction based on Financial Engineering (2nd Edition) (ISBN 978-7-302-38597-4)

The principal amount difference of the same circumstances, the financial system in spot trading, futures trading, and options trading yield is consisted now by three ways. As is shown in the table 2 and table 3, the perspective of the nature of the leveraged financial system is to do the corresponding comparison. Thus, it is obvious that when using different financial instruments trading, owing to their leverage performance difference, net profit or loss brought by the difference is huge, and its risk can be completely different. When the price rise 10 %, the financial system of leveraging features is as below (See Table 2).

When the prices have felt by 10 %, financial system leverage amplification characteristics shows below (See Table 3).

Table 3. The Characteristic of Financial Leverage Amplification by Decreased Price

The Type of Transaction	Capital	Leveraged Nature	The Price Rise in Net Profit or Loss	Yield Rate
Spot Transactions	100	1 : 1	110 – 100 = 10	10 %
Future Transactions	100	Cash Deposit 10 %	(110 – 100) × 10 = 100	100 %
The Option Combinations	100	The Total Cost 1 %	(110 – 100-1) × 100 = 900	900 %

Source: Authors construction based on Financial Engineering (2nd Edition) (ISBN 978-7-302-38597-4)

Based on the calculation, we can carry out the bidirectional amplification analysis next.

3.2. Financial System and Contrast Analysis of the Bidirectional Amplification

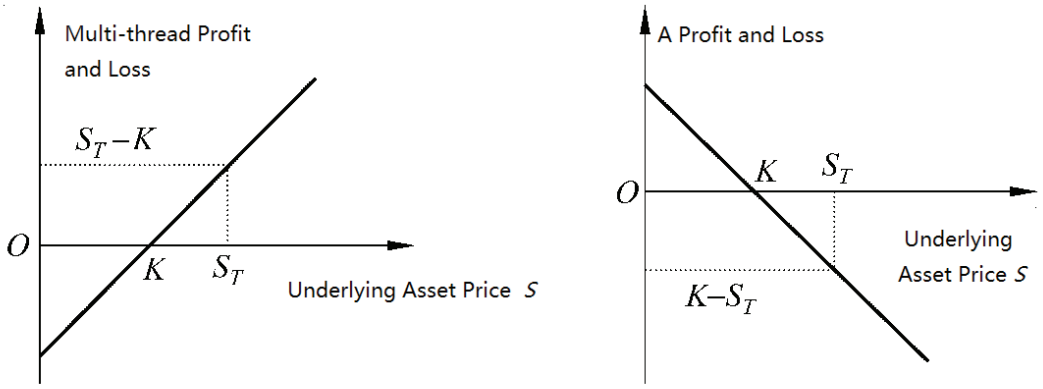
Financial system of contract type can be divided into two major categories, symmetric and asymmetric agreements: contract revenue – the risk of distribution is also varied with the type of different one. Basic financial products and forward derivatives (including forwards, futures, swaps) contracts are symmetric. If *T* is for the session (maturity date), the asset of mark *ST* (Maturity date) to the market price is for the trading time, *K* for the agreed price, delivery, and long profit or loss. The buyer gains and losses, short of symmetric contracts and losses of the seller's profit and loss as shown in figure 2 (a), (b), and the lists of their profit are upper limit and lower limit losses.

When $ST > K$, Symmetric long contract value: $V = ST - K > 0$, Symmetric contracts bulls and losses of the profit limit: $V_{max} \rightarrow +\infty$.

When $K > ST$, Symmetric long contract value: $V = K - ST > 0$, Symmetrical short contracts and losses of the maximum profit: $V_{max} = K$.

When $S < K$, Symmetric long contract value: $V = ST - K < 0$, Symmetric contract bull losses and losses of the lower limit: $V_{min} = -K$.

When $K < ST$, Symmetric long contract value: $V = K - ST < 0$, Symmetrical short contracts and losses of the loss limit: $V_{min} \rightarrow -\infty$.



(a) Symmetric Long Profit and Loss of Contracts (b) Symmetry Short Profit and Loss of Contracts

Fig. 1. Symmetric Contracts of the Long and Short of Comparative Analysis

Source: Authors construction based on Financial Engineering (2nd Edition) (ISBN 978-7-302-38597-4)

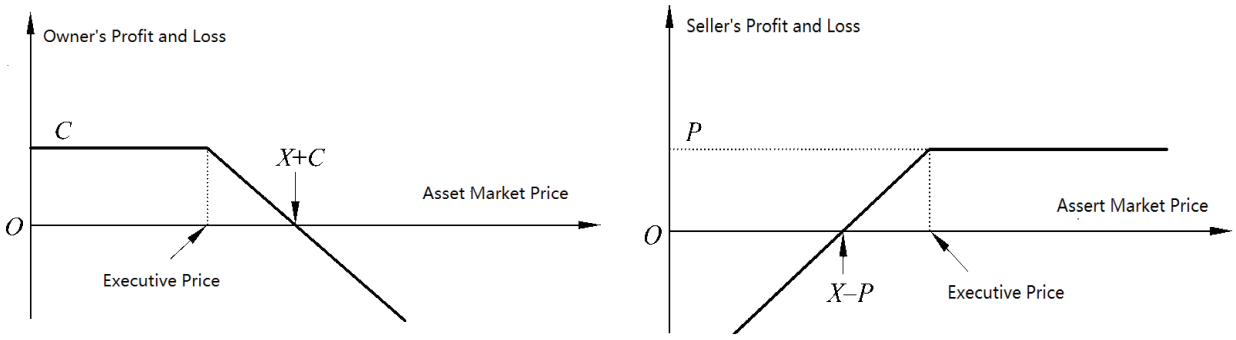
For asymmetric contract, short of options contracts short call option and put option value, respectively is shown in figure 4 (a), (b), and lists the respective profit are upper limit and lower limit losses.

When $ST > X$, Short call option value $V = X - ST + c$, $X > ST$, Short put option value $V = ST - X + p$.

If Short call options and losses of the loss limit $V_{min} \rightarrow -\infty$, Short put option increase and decrease loss limit $V_{min} = -X + p$.

When $ST < X$, Short call option value $V = c$, Short call options and losses of the maximum profit $V_{max} = c$, when $X < ST$, Short put option value $V = p$, Short put option and losses of the maximum profit $V_{max} = p$.

The analysis can be shown in the chart below:



(a) Short of Profit and Loss of the Call (b) Short Put Option of the Profits and Losses

Fig. 2. Options Contract's Short Comparative Analysis

Source: Authors construction based on Financial Engineering (2nd Edition) (ISBN 978-7-302-38597-4)

3.3. Financial Systems of the Bidirectional Amplification Characteristics of Risk Analysis

Through the above comparison and analysis of profit and loss of the financial system we can see that the different contracts can be found here, under the condition of transaction costs to be ignored, the financial system of all kinds of trades is a zero-sum game. If it is included in the transaction costs, many financial systems can even become a negative game. When the direction of the transaction itself changes the "empty" replacement, it is not only benefit or risk reversal, and its profit or risk limit will be completely reversed. The properties of the resulting sudden risk would be very great, and in the previous financial crisis it had such an instance.

For the long-short contracts, both sides of the financial system faced the risk by the nature of the differences that can be controlled by the loss of limit comparison to contrast (for example, in derivative contracts). Between them, the standardization of futures trading can be regard as the forward transactions. For swaps, according to the habit of swap market, it will be paid by a fixed interest rate, and the party in a floating interest rate is a "buy" interchangeably for a long time; for long time, it will pay a floating interest rate, the party in a fixed rate is a "sell" trading interchangeably. Agreed the delivery price for K fixed interest rate, maturity date to the market price of ST is for a floating interest rate. The tables below will show the long and short profit (loss) maximum of limit (see Table 4 and Table 5).

Table 4. Long and Short Profit Maximum of Limit

Contract Type	Long Profit Upper Limit	Short Profit Upper Limit
Forward contracts	$V_{max} \rightarrow +\infty$	$V_{max} = K$
Futures contract	$V_{max} \rightarrow +\infty$	$V_{max} = K$
Swap contract	$V_{max} \rightarrow +\infty$	$V_{max} = K$
Call option	$V_{max} \rightarrow +\infty$	$V_{max} = c$
Put options	$V_{max} = X - p$	$V_{max} = p$

Source: Authors Construction based on Asset Pricing (John Cochrane)

Table 5 Long and Short Loss Maximum of Limit

Contract type	Long loss maximum	Short loss maximum
Forward contracts	$V_{min} = -K$	$V_{min} \rightarrow -\infty$
futures contract	$V_{min} = -K$	$V_{min} \rightarrow -\infty$
swap contract	$V_{min} = -K$	$V_{min} \rightarrow -\infty$
call option	$V_{min} = -c$	$V_{min} \rightarrow -\infty$
Put options	$V_{min} = -p$	$V_{min} = -X + p$

Source: Authors Construction based on Asset Pricing (John Cochrane)

In the table we can see that the limit of the profit and loss formula for many derivative transactions as well as the profit is mostly on the "Cap" (+ up), and the losses are always in a bottom level (K, $C - P$). But for the short time, it is profitable, always limited (K, C, P), that the losses are mostly not guaranteed. Thus the risk of the "short" is higher than the "long". If it is a cross trade, the risk will be higher.

Conclusions

Generally, the financial system that has two-way leverage amplification characteristics and is based on the project has a huge backlash. The levers of different natures and leverage amplification characteristics of high and low risk will affect the stability of the financial system and the scale of the risk. The evidences show that the leading automotive corporations make an extensive use of financial instruments derivative to

hedge the cost of optimized currency, commodity contracts and interest payments. In this situation it can be modeled on the effective method of five-classification management of credit assets category, which is the five classification management of financial management, including five classification management's internal operations and the departments in charge of five classification external regulation category. In anticipation, the function is different, but in the field of the nature, the capital property of leverage and trading in respectively leveraged levels, the lower limit and upper limit (the following quantitative indicators) levels are corresponding to the Basel agreement. Due to the limit of length, its specific measurements are published in article already. The developed model estimates that the currency risks on the basis of cash flow model activated the economy that aimed at increasing the company's value. Capital leverage of the quantitative indicators can be selected sensitive to risk ratio. The ratio of capital adequacy ratio is not sensitive to the risk type. Trading leveraged quantitative indicators can be selected for the security deposit (rate) or royalties (rate). In order to solve these problems, we put forward the five classified methods of financial risk management at the end.

The first classified management method is in the "normal" state of the financial system institution or trading process. Institutions of capital adequacy ratio have to reach 10 % or even higher level, the leverage ratio have to reach 4 % or higher level; margin trading process (rate) have to reach 12 % or higher level. For the system of financial institutions in the normal or trading process, regulators through routine statistics and collecting information is controlling the general situation.

The second classified management method is a process of financial trading in a financial system. Institutions of capital adequacy ratio have to reach 8 ~ 10 % or higher level, and the leverage ratio have to reach 3 ~ 4 % or higher level; margin trading process (rate) have to reach 8 ~ 12 % or higher level. For the system of financial institutions in the classified trading process, the regulatory department's statistics summary are related to the tables outside the area, in which the financial institutions should also require market calculating the exposure.

The third classified management method is a high concerning of financial institutions or trading process. Institutions of capital adequacy ratio have to reach 6 ~ 8 % or higher level, the leverage ratio have to reach 2 ~ 3 % or higher level; margin trading process (rate) have to reach 5 ~ 8 % or higher level. For the system of financial institutions in the trading process regulatory authorities have to require financial institutions to the related credit risk, market risk, operation risk of comprehensive management, and to submit the data classification. The different trades for purpose is to set up a different account between "firewall", and the regulatory risk on a regular basis.

The fourth classified management method is in a limit of the financial system institution or trading process. Institutions of capital adequacy ratio have to reach 4 ~ 6 % or higher level, the leverage ratio have to reach 1 ~ 2 % or higher level; margin trading process (rate) have to reach 2 ~ 5 % or higher level. For the "restriction" system of financial institutions or transaction, leverage effect, regulators have to take exception to regulatory way to set up a targeted leverage multiple threshold limit value.

The fifth classified management method is in the non-financial institutions or trading process. When Institutions of Capital Adequacy Ratio is less than 4 %, leverage ratio is less than 1 %, and the margin trading process (rate) is only 2 %. For the "prohibition" of the classified system of financial institutions or transaction process is due to the high leverage such risks as current regulatory ability, once the market reverse move, not only making the individual institutions in trouble also spilling over to other institutions If we will have a better understanding to this problem in the future, we could explore the appropriate methods again, but only after we introduce more effective ways of the regulation.

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SVERTŲ KONTROLĖ IR KIEKYBINIS VALDYMAS: POVEIKIO FINANSŲ SISTEMAI ANALIZĖ

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Finansiniai svertai finansų sistemoje vaidina svarbų vaidmenį. Siekiant išvengti neigiamų ekonominės krizės padarinių jie turi būti tinkamai naudojami. Finansinių svertų sistema leidžia sumažinti riziką, bet

finansinių svertų efektyvumo užtikrinimas gali ją padidinti. Mokslininkai iki šiol nerado būdų, kaip šią problemą spręsti. Todėl veiksmingų priemonių taikymas stiprinant finansinių svertų valdymą tampa svarbiu uždaviniu.

Straipsnio tikslas – atlikus finansinių svertų analizę ir nustačius silpnąsias finansinių svertų sistemos vietas, pateikti būtinas šios sistemos svertų valdymo priemones, taikant penkis sisteminius valdymo metodus.

Taikydami lyginamojo tyrimo ir duomenų analizės metodus autoriai atskleidė dvejopą finansinių svertų taikymo poveikį pelno ir nuostolių bei finansų rizikos analizei. Taikant finansinius svertus autoriai siūlo remtis penkiais jų išskirtais sisteminiais finansų valdymo metodais.

PAGRINDINIAI ŽODŽIAI: *finansų sistema, sverto charakteristika, svertų kategorijų valdymas*.

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