

Financial Market Analysis for Duration and Modified Duration

Jiankun Wu^{1,*}

¹Wharton International School, 110013, ShenYang, LiaoNing Province, China

*Corresponding author. Email: guanghua.ren@gecademy.cn

ABSTRACT

Under the wave of financial liberalization and interest rate marketing, the interest rate risk prevention problems faced by commercial banks are becoming increasingly prominent. Interest rate risk management has become an extremely important link in the management of commercial banks. Macaulay's retention gap management is one of the main risk management tools of modern western commercial banks. Reasonably constructing a retention period gap can make the net value of commercial banks not affected by market interest rates, and the adjustment of flow ratio can overcome the gap in duration due to interest rate changes. Insufficient, comprehensive utilization of the gap management in the duration plays an important role in establishing a risk management mechanism for our commercial banks.

Keywords: Duration, Modified Duration, Management, Financial Liberalization

1. INTRODUCTION

Most contemporary bond embedded options and are facing the possibility of default [1-3]. These two characteristics introduce risks (pre-market risk and credit risk) by changing the amount and time of promised cash flow. Macaulay's duration, although tools of epidemic risk, are increasingly unable to meet this complex financial environment [4-5]. Before Macaulay underwent a continuous-time modification, a new theoretical framework is now introduced, adding its functions while retaining its docile. The method-although it still cannot be isolated and affects two characteristics-to produce consistent results is better to match the experiment [6].

Under the wave of financial liberalization and interest rate marketing, the interest rate risk prevention problems faced by commercial banks are becoming increasingly prominent. Interest rate risk management has become an extremely important link in the management of commercial banks [7-8]. Macaulay's surviving gap management is the main style of modern Western commercial banks. One of the insurance management methods, a reasonable construction of a continuation gap can make the net value of commercial banks not affected by market interest rates, and the adjustment of flow ratio can be overcome The gap in the duration is constrained by the lack of changes in interest rates. Comprehensive use of the gap management in the

duration of the gap plays a role in establishing a risk management mechanism for our commercial bank's Important role [9].

With the wave and release of financial liberalization in the 1980s Open interest rate control trends, floating interest rate products in financial products The proportion has risen sharply, and interest rate risk issues have suddenly become prominent, Western businesses The method of bank fund management then shifted from single management to negative assets Comprehensive debt management, technically adjust the matching of assets and liabilities Constructed to avoid risks, its common means are mainly favorable rate gap management And gap management in the duration. Adjusting the gap management during the duration is more beneficial Rate gap management is more accurate and can reduce the net value of changes in market interest rates [10]. The impact of its gap structure is no longer limited to simple asset-liability differences And pay more attention to the maturity matching of assets and liabilities. According to my country, National conditions make reasonable use of the gap management in the duration to treat our commercial bank Quantitative analysis of line risk loss, get rid of asset and liability management The principle of hedging without flexibility establishes a medium- and long-term interest rate fluctuation pre- both measurement and response mechanisms are very important.

This article discusses the definition, management methods, advantages, and disadvantages of Macaulay's duration and modified duration. And expectations for the future of our country's finance.

The second part describes the definition of Macaulay's duration and modified duration, the third part describes its advantages and disadvantages, the fourth part describes the advantages and disadvantages of the management method, and the fifth part describes the expectations and changes for our country's future method

2. DEFINITION

2.1. Existence period

The duration of existence generally refers to the weighted level of cash flow in finance Average time. There are many definition methods during the duration, and this article discusses the most applications A broad one, Frederick Macaulay's righteousness. Refers to an asset or liability that is relatively cash flow in the future Weighted average time of value. It is different from maturity (maturity), later The actual existence time of assets or liabilities depends only on the most The time when the latter cash flow occurs, and the former exists effectively Time, changes with changes in cash flow in future periods. Remember P=present value, D=period, Ct=cash flow in each period (t=1,2,...,T), R=market interest rate, is defined as follows.

$$P = \sum_{t=1}^T \frac{C}{(1+R)^t}; D = \sum_{t=1}^T \frac{Ct \times t}{(1+R)^t \times P} \tag{1}$$

According to the above definition, the size of the gap in the duration is the same as the interest rate Relevant, so how to adjust the duration according to changes in interest rates Size will be the focus of gap management during the duration.

2.2. The gap in the duration

The gap in the duration refers to the duration of the assets and liabilities of commercial banks The difference after adjustment in their respective proportions is equal to the net of commercial banks. The value duration is adjusted according to its proportion in total assets. Remember (A,L,N)= (Commercial bank assets, liabilities, net worth), (A,DL,DN)=(asset duration, debt duration, net value Survival period), the duration gap GAP is defined as:

$$GAP = \frac{A-L}{A} \times DN = DA - DL \tag{2}$$

2.3. Flow adjustment

Simply put, the gap management of the fund

duration is a kind of adoption that Dynamically adjusts the duration of commercial bank risk assets and risk liabilities A joint management method for assets and liabilities with the structure to avoid risks. Flow Quantitative adjustment is a possible asset and by adjusting future issues Liabilities cash flow to meet the adjustment of the gap construction needs of the duration.

Modified duration, the revised duration is the proportion of a given small change in the yield at maturity, the relative change of bond prices to the Macaulay maturity, and the correction of Macaulay duration on the basis of considering the yield is a more precise measure of the sensitivity of bond prices to interest rate changes.

The formula: Macaulay Duration=

$$\frac{\text{Macaulay Duration}}{(1 + \frac{YTM}{n})^n} \tag{3}$$

The difference between Macaulay duration and modified duration: The Macaulay duration calculates the weighted average time before a bondholder would receive the bond's cash flows. Conversely, the modified duration measures the price sensitivity of a bond when there is a change in the yield to maturity.

3. CONTINUOUS GAP MANAGEMENT METHOD AND ITS ADVANTAGES AND DISADVANTAGES

The principle of gap management during the duration is based on future interest rates The maturity structure of assets and liabilities can be adjusted by change, and their operational steps Suddenly can be divided into two steps: First, based on historical data, business experience, and engineering technology to reasonably estimate the time series of future cash flows Construct to determine the current gap level of the time. Second, based on the prediction of future interest rate changes and with the help of financial product portfolios and new financial instruments, changing deadline gaps to avoid risks or even profit.

3.1. Management method

According to the definition of present value P, you can get:

$$\frac{dP}{P} = -D \times \frac{d(R+1)}{(R+1)} \tag{4}$$

Therefore, the net value is also established as above:

$$\frac{dN}{N} = -DN \times \frac{d(R+1)}{(R+1)} \tag{5}$$

According to the definition of the gap in the duration:

$$dN = -GAP \times A \times (R+1)^{-1} \times dR \quad (6)$$

Indicate: Net value if other conditions remain unchanged Change dN The degree of influence and continuation of market interest rate changes dR The gap is related to the following three situations:

(1) If the gap in the duration is small to close to zero, consider to A and $(R+1)^{-1}$ is bounded, and the net value change dN is also close to Zero, changes in market interest rates have little or no effect on changes in net worth It is negligible that commercial banks are expected to have difficulty changing interest rates in the future Such a conservative gap can be set up to avoid risks.

(2) If there is a gap in the duration of $GAP > 0$, then due to A and $(R+1)^{-1}$ More than is non-negative (when hyperinflation is serious, $R+1$ It can present a negative value, and there is no discussion on this particular situation), net value DN changes and market interest rate changes dR on the contrary, interest rates rise Net value declines, while net value rises when interest rates fall. So be a business When the bank expects that the market interest rate will fall, it can be properly constructed and lacking a mouth.

(3) If there is a gap in the duration of $GAP < 0$, it is the same as the second scenario The situation is completely opposite. Changes in net worth and changes in interest rates are the same, so Commercial banks can construct a negative gap in the face of rising interest rates The mouth increases the net worth as interest rates rise.

4. THE MAIN ADVANTAGES AND DISADVANTAGES OF GAP MANAGEMENT DURING THE DURATION

4.1. Advantage

Incidental gap management is a combination of assets and liabilities Joint management, therefore has the general advantage of integrated asset and liability management Point: You can achieve greater flexibility and comprehensiveness than single management It does not have to be limited to the size of assets or liabilities. Other than that In addition, there are unique features in gap management during the duration, mainly as follows:

4.1.1. Has the effect of short-term interest rate change immunization

Analyzed by the above It can be seen that the gap in the duration is zero, and the theoretical net value is to the market interest rate The changes are not sensitive. Therefore, it is impossible to accurately estimate in commercial banks When interest rate trends or interest

rate fluctuations are too frequent, they can be reduced The absolute value of the gap in the duration makes it tend to be zero, at which time the net value is good The elasticity of the rate is very small, and commercial banks can not only avoid short-term interest rate waves The damage caused by the movement to the net value, and can avoid continuous observation benefits rate and the cost of frequently correcting the gap. Due to the wave of financial liberalization Innovation with financial instruments, relying on financial engineering technology and statistics, The operability of the gap and the near-zero gap is greatly enhanced compared to before commercial banks can design a certain amount in their balance of assets and liabilities Zero-gap structure to reduce the asset-liability portfolio to be accurate against the predicted interest rate Sexual dependence.

4.1.2. Have better flexibility

In the traditional interest rate gap tube In theory, because the interest rate sensitivity limit is determined, the gap is equal to the interest rate sensitivity. The difference between perceived assets and interest rate sensitive liabilities, so adjustments are limited to The absolute number of assets and liabilities is relatively single. In the management of renewal gaps, not only the quantity is manageable, but also the duration control, due to the use of the time scale, the asset-liability structure need not be limited to The quantity matches, and long-term assets and liabilities can also be discounted qualifications for obtaining uniform calculations with short-term assets, therefore, with the aid of gold Melting projects and various financial products, commercial banks have gaps in the duration Management has greater flexibility.

4.1.3. It can better solve the matching problem and has long-term advantages potential

In short-term interest rate risk management, interest rate gap management, and survival period gap management has better results, in the medium and long term, due to heavy depending on the duration of the match, the gap management during the duration is in liquidity management and increase. The added net value is better than interest rate gap management. First, in the interest rate gap under management, in order to solve the problem of liquidity, the maturity match depends on tradition The hedging principle, assets of different maturities and liabilities of corresponding maturities Strict matching, although it can guarantee safety and liquidity, business The efficiency of the bank's capital utilization has decreased, and the profitability has been lost; The renewal gap fully considers the duration structure, and the issue of maturity matching is lacking It can be solved in the mouth setting, without relying on the hedging principle, it can be more well achieve the balance of "three points".Second, although interest rate

gap management Risks can be avoided in the short term, but cannot be guaranteed in the long run The net value of commercial banks increased. If due to excessive reliance on interest rate sensitive capital production and liabilities, increasing the number of sensitive assets when interest rates rise The assets will be reduced later, and the net value may decline. Continuous gap tube Start with the deadline structure and adjust future cash flows Management gaps are not limited to interest rate sensitivity adjustments, so they can be reduced assets shrunk from rising long-term interest rates.

4.2. Disadvantages

As with most interest rate risk management methods, deposit Renewal gap management also has defects, mainly the following two points:

First, under active management, whether it is for future cash flows estimates are still more complicated and accurate in predicting interest rate movements It is estimated that a large number of models and calculation tools are required to be stored in practice In difficulty. Second, set up conservative management with zero gaps or near zero gaps. Although reasoning can avoid the effect of interest rate changes on net worth, it does not The law avoids the impact of changes in interest rates on the gap in the duration, which is in benefit In the case of rate fluctuations, the gap in the duration will not remain zero. This one The conclusion can simply be calculated by calculating GAP's guidance to R.

For easy writing, remember the line vector

$$X = (A, (1+R)^{-1}); Y = (L(1+R)^{-1}) \quad (7)$$

Column vector

$$T1 = \{t\}, T2 = (t^2), I = (1, 1, A, 1, 1), \quad (8)$$

There are:

$$\frac{dGAP}{dR} = \frac{(1+R)^{-1} (X - Y)(T1XT1 - T2XI)}{(XI)^2} \quad (9)$$

Obviously, GAP is affected by R and its role is uncertain Consider $(1+R)^{-1}$ and $(XI)^2$ are greater than zero if $(X-Y)(T1XT1 - T2XI) > 0$, the rise in interest rates will lead to a duration. The gap becomes larger, otherwise $(X-Y)(T1XT1 - T2XI) < 0$, then Rising interest rates will lead to a narrowing of the gap in the duration. This means no matter what the business Industrial banks adopt conservative or active gap management measures for retention periods when interest rates change, the original gap in duration may occur Change or even reverse, For example, even if commercial banks correctly predict interest rates Raise and set a negative gap, but changes in interest rates will lead to deficiencies oral changes, if $(X-Y)(T1XT1 - T2XI) > 0$, the gap will follow The rise in interest rates

has risen, even from a negative turn, resulting in a lack of duration Mouth setting error; otherwise $(X-Y)(T1XT1 - T2XI) < 0$, Then the gap in the negative renewal period is further expanded, and the risk is also increased.

5. CONCLUSION

For our country, compared with a large number of non-performing loans and capital adequacy ratio is too low, our country commercial bank interest rate risk faced by also small. But in under the tide of world economic integration and financial liberalization, the internationalization of China's financial markets has become an inevitable trend and is common at present in our country each big commercial bank loan ratio, a higher percentage of loans, the characteristics of the flow concentration and the quality are not high, the interest rate once completely let go, will inevitably bring a huge risk to commercial Banks.

First, today's financial institution's competition is intense, spreads the space have been compressed, if not prudent management, precise metering, innovation efforts, and is difficult to gain a foothold in the international market. Therefore, our country commercial bank to learn the concept of western commercial bank assets and liabilities management and quantitative approach to preventing risk identification, reform the traditional qualitative analysis and hedging operations, strengthen the assets and liabilities of the term structure of interest rates and control, set up long-term interest rates observation and feedback mechanism.

Second, in the international market, frequent fluctuations of interest rates are difficult to predict, although theoretically reasonable duration gap management can hedge the interest rate risk, in fact, because of information asymmetry, the cash flow of assets and liabilities are difficult to estimate the problems, such as duration gap and difficult to accurate measurement. Thus, our country commercial bank must realize the mathematical model can not completely replace the actual operation experience when financial products must fully estimate and measure the benefits and risks.

Third, the net value of the long-term goals cannot completely depend on the duration gap management, therefore, our country's commercial banks must learn a variety of management methods, comprehensive applications in order to best effect.

This article only describes the advantages and disadvantages, but its invention process and the reasons for advantages and disadvantages have not been described. Later, I hope to improve the Macaulay duration and modified duration.

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