

# *An Empirical Study on the Mechanism of Enterprise's Expected Surplus on Capital Structure*

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**Abstract:** Enterprise earnings expectation affects the decision-making of enterprise capital structure. Therefore, this paper focuses on the relationship between enterprise expected earnings and enterprise capital structure, and determines that there is a significant positive correlation between business expectation and enterprise debt ratio. Moreover, under the same conditions, the capital structure of loss-making enterprises is more sensitive to expected earnings than profit-making enterprises. At the same time, this paper points out that listed companies which are mainly operating need to adjust the focus of capital structure to interest-bearing liabilities. Moreover, the research of this paper also has positive reference significance for the formulation of monetary policy in China.

## 1. Introduction

In recent decades, academic circles at home and abroad have been discussing and studying the capital structure. At present, there is a key problem in this field, that is, the research on the applicability of pecking order theory and trade-off theory. According to 2001, after Graham and Harvey summed up the questionnaire survey of 392 CFOs, it was pointed out that about 80% of CFOs always believed that their enterprise's asset-liability ratio had a very strict target or range. However, the domestic questionnaire shows that more domestic CFOs think that enterprises have asset-liability ratio. Therefore, in today's enterprise operation process, enterprise management is more willing to use the practicality of trade-off theory to measure the capital structure of enterprises. In addition, when studying the extent to which the profitability of enterprises affects the optimal capital structure, a large number of domestic and foreign data show that there is a negative correlation between them. Of course, this conclusion does not give a reasonable proof to the applicability of the trade-off theory, but more demonstrates the explanatory function of pecking order theory. Your paper will be part of the journals therefore we ask that authors follow the guidelines explained in this example, in order to achieve the highest quality possible.

In 2007, Strebulaev explained the negative correlation between profitability and capital structure in the dynamic trade-off theory as the relationship between financial market friction and adjustment cost. However, when analyzing the relationship between profitability and capital structure, the

explanatory role and practical demonstration research of trade-off theory are few. In the domestic literature research, Feng Genfu in 2000 and Xiao Zuoping in 2005 all pointed out that there was a significant negative correlation between the profitability and debt ratio of enterprises, while in 2002, scholars such as Wang Juan and Yang Fenglin believed that the structure of capital and profitability were positively correlated. Therefore, at present, some scholars are summarizing and trying to summarize these different conclusions into a framework. For example, in 2011, Chen Fangping explored the relationship between profitability and capital structure of enterprises from the perspectives of regional characteristics of listed enterprises and Macro economic factors of Ma Jinying. In 2012, Chen Zengshou, Chen Xiang and others pointed out that in different life cycle stages of listed enterprises, it is necessary to choose different financing methods to ensure the profitability of enterprises.

Of course, there are two limitations in domestic related literatures. The first one is that the profitability of enterprises is not divided into expected surplus and realized surplus, and the effects of the two kinds of surplus on capital structure are quite different. In 1991, Harris and Raviv pointed out that pecking order theory mainly emphasized the realized surplus, and proposed that the ability to realize profit was negatively correlated with the debt ratio; In 1973, Kraus and Litzenberger recorded that the trade-off theory mainly emphasized the impact of expected surplus, and proposed that when the expected surplus increased, it would correspondingly reduce the expected financial distress cost of enterprises and increase the expected tax benefits of corporate debt, thus improving the optimal capital structure. In addition, there are few literatures devoted to the impact of expected earnings on capital structure.

Based on Kraus and Litzenberger's single-period selection model in 1973, this paper deduces the specific development model. Moreover, this paper mainly discusses the specific impact of expected earnings on the capital structure by analyzing the model, and then tests it with the specific financial data of listed companies. Therefore, this paper confirms that there is a significant negative correlation between capital structure and profitability, which accords with pecking order theory and is consistent with many literatures. The expected profitability and capital structure are significantly positively correlated, which also demonstrates the trade-off theory. Moreover, the innovation of this paper mainly lies in that, after the research of this paper, it is concluded that the main mechanism of expected surplus on capital structure is to adjust the optimal debt ratio by changing the cost of financial distress and the specific tax benefits of liabilities. Moreover, with the decline of the best debt ratio of enterprises, enterprises need to sell their assets to repay their debts, and achieve the purpose of reducing the debt ratio by reducing dividend payout ratio.

## **2. Research Hypothesis is Put Forward**

### **2.1. The Relationship between Expected Surplus and Capital Structure**

In 1973, Kraus and Litzenberger used the single-period state selection model to draw the conclusion that the sum of the enterprise value of pure equity and the difference between the present value of debt financing tax and bankruptcy cost in all states is equal to the specific enterprise value financed by debt. Because the relationship between the total value of the enterprise and the debt function in this model is linear, through the analysis of this view, we can see that the optimal debt amount is equal to a certain value in the future possible earnings before interest and tax state, and the optimal debt amount cannot be determined; In addition, the model proposed by Kraus and Litzenberger assumes that every probability of N states occurring in the future is equal, which is far from reality. Therefore, when analyzing the relationship between the future business performance and the optimal debt amount, this paper assumes that the managers, owners and external investors are all rational and pursuing the maximization of profits. In order to simplify the model as much as

possible, a neutral assumption is made for investors' risks, and the future earnings before interest and tax of the enterprise is assumed to be  $X$ , which obeys a certain mean continuous distribution. The function of this distribution is  $F(X)$ , and the density function is  $f(x)$ . The fixed interest that an enterprise must pay in debt is assumed to be  $D$ , which represents the amount of debt of the enterprise. The financial dilemma cost is assumed to be  $k$ , the marginal enterprise income tax rate is assumed to be  $t$ , and the investment return of enterprise investors including creditors and shareholders is assumed to be  $R$ .

Therefore, when  $X \geq D$ ,  $R = X(1-T) + DT$ ;

$R = X(1-K)$  when  $0 \leq X < D$ ;

$R = 0$  when  $X < 0$ .

With this formula, it can be calculated that if the expected surplus  $x$  increases, the return on investment  $r$  will also increase, so the current enterprise value of the future business performance will inevitably increase, but the current enterprise book assets possessed by the past investment may not change because of the change of the expected surplus. If the realized surplus has increased, but the expected surplus remains unchanged, the value of the enterprise and the expected return on investment will not change, and the current book value of the enterprise will be affected by the retained earnings, and will increase with the increase of retained earnings.

In this paper, the impact of expected surplus on book value and market value is preliminarily analyzed. If the total market value of enterprises is assumed to be  $V$ ,  $V$  should include the value of liabilities and the value of equity. If  $(v)$  the value of the enterprise is derived from the debt  $d$ , and the derivative is zero, it can reflect the standard of the best debt  $d$  in the trade-off theory, and when the average value is  $x$ , the debt  $d$  satisfies the publicity (1):

$$T[1 - F_1(D)] - kDf_1(D) = 0 \quad (1)$$

Through formula one, when the expected surplus increases by  $a$ , the formula (2) of the first derivative can be obtained

$$pT[1 - F_1(D - a)] - pkDf_1(D - a) \quad (2)$$

Among them,  $pT[1 - F_1(D)]$  represents the marginal tax benefit of liabilities, and  $pkDf_1(D)$  represents the marginal financial distress cost of liabilities. From this formula, it can be seen that the factors that can affect the optimal amount of liabilities mainly include the first, the financial distress cost  $K$ . Second, the marginal tax rate  $t$ . Third, the expected surplus  $x$ . Because the mean value of expected surplus is implied in  $f_1(D)$  and  $F_1(D)$ , and the distribution function of normal accumulation belongs to super function, it is impossible to obtain the derivative of the optimal debt amount to the mean value of distribution by analytical method. Therefore, this paper uses Zhang Chunjing and Ma Wenchao (2014) for reference to demonstrate the significant positive correlation between the optimal debt amount and the mean value of expected surplus. At the same time, based on the assumption that the expected surplus is normally distributed, this paper deduces the relationship between the expected surplus and the optimal debt, and concludes that increasing the expected surplus and the realized surplus can bring different economic consequences. If the realized surplus increases, the book value of the enterprise will also increase, and the market value of the enterprise will have a significant positive correlation with the assets, while the optimal debt will not change. If the expected surplus is increased, the book value of the enterprise will remain unchanged, but the best debt amount and market value debt amount of the enterprise are increasing, and the market value of its assets is increasing, so is the book debt ratio. Therefore, we can get the first hypothesis of this paper: there is a significant positive correlation between business expectation and enterprise debt ratio.

## 2.2. Expected Surplus and the Mechanism of Capital Structure

Through the above formula, the value of (v) enterprise is derived from the amount of debt d, and the derivative is zero, and the formula (3) can be obtained:

$$aV / aD = pT[1 - F_1(D)] - pkDf_1(D) = 0 \quad (3)$$

If the business situation is expected to show a downward trend, the optimal debt amount will decrease with the decrease of tax benefits and the increase of financial distress cost, because the expected increase of financial distress cost of samples with higher default rate is slightly larger than that of samples with default rate, so if the expected surplus decreases, the optimal debt ratio of samples with high default rate will inevitably increase. At the same time, If the sample is divided into high and low groups according to the marginal income tax rate, the increase of higher marginal income tax rate will inevitably be less than that of enterprises with lower marginal income tax rate. Therefore, if the cost of interest changes, the expected decline of tax benefits of samples with high tax rate will inevitably be less than that of samples with low tax rate, and then the decline of optimal debt ratio will inevitably be less than that of samples with marginal tax rate. All in all, if the default rate is high, the capital structure will be highly sensitive to the expected surplus; If the marginal income tax rate is higher, its capital structure will be more sensitive to the expected surplus. Therefore, this paper takes atman Z-score model index as an indicator to measure the default rate, and divides it into low Z-score value group (high default group) and high Z-score value group (low default group) with the distribution mean of each sub-industry as the boundary. Therefore, using the above analysis, the sensitivity of the enterprise capital structure of high default group to expected earnings is higher than that of low default group. In addition, enterprises can be divided into loss group and profit group based on whether there will be losses. However, under normal circumstances, the default rate of profitable enterprises is generally smaller than that of loss-making enterprises. Therefore, according to the reasonable speculation of this paper, the capital structure of profitable enterprises is more sensitive to expected earnings than that of loss-making enterprises. Therefore, the second hypothesis of this paper can be put forward, that is, under the same conditions, the capital structure of loss-making enterprises is more sensitive to expected earnings than that of profit-making enterprises.

## 3. Sample Selection and Explanatory Variable Selection

### 3.1. Sample Selection

Generally speaking, among listed companies in China, the products produced by listed companies in manufacturing industry are extensive and representative. Moreover, listed companies in manufacturing industry pay more attention to the market competition of products. In addition, the competition of listed companies in manufacturing industry is more intense and cruel, and the competitiveness of manufacturing products in the market will have a significant impact on the profitability of companies. Therefore, this paper mainly uses the data of listed companies in manufacturing industry in China as the basis for sample selection.

In this paper, the manufacturing listed companies in Shanghai and Shenzhen exchanges in the fourteen years from 2000 to 2013 are taken as research samples, and the enterprises are selected according to the following three principles. First, to ensure that all sample companies in the industry have the opportunity to make reasonable choices, and try to avoid the influence of fewer companies or enterprises in the industry, therefore, the companies in less than eight sub-sectors in the listed companies in that year were eliminated, such as furniture industry, wood, paper and printing industry. Second, it is necessary to improve the competitiveness of products among peers and eliminate the manufacturing enterprises that cannot be unified in the industry. Third, the enterprises

that have undergone large-scale asset restructuring in the past five years or have major omissions in their financial data should be eliminated to ensure the accuracy of the data. According to these three principles, the observed samples are obtained from seven industries, namely aviation equipment manufacturing, rail transit equipment manufacturing, offshore engineering equipment manufacturing, intelligent manufacturing equipment manufacturing, nuclear power equipment manufacturing, satellite equipment manufacturing, Internet of Things related equipment manufacturing, 3536 annual samples of companies, and 276 enterprises or companies.

### 3.2. The Choice of Explanatory Variables

The book capital structure and market value capital structure can be used to measure the capital structure. The ratio between the book value of debts and the book value of total assets in listed companies is generally called book capital structure, and the expression is  $booklev$  (book capital structure) which is equal to the ratio between the total liabilities and the book value of total assets. The specific definition of market value capital structure refers to the ratio between the total book value of debt and the total value of assets in a company. The expression  $marklev$  is equal to the ratio between the total debt value and the total value of assets, in which the total value of assets is the sum of the book value of illiquid stocks, the book value of corporate debt and the market value of circulating stocks.

### 3.3. Model Inspection

According to the relevant literature on the influencing factors of capital structure (2003Campello, 2005 Jiang Fuxiu, 2009 li ke, 2014 Ma Wenchao, Zhang Chunjing), this paper analyzes the following control variables. The first is the size of the company, which is equal to the natural logarithm of total assets and is positively correlated with the expected surplus. The second is tangible asset rate ( $tang$ ), which is the ratio of the sum of fixed assets and inventory to total assets, and is positively correlated with expected surplus. The third is non-debt tax shield ( $ndts$ ), which is the ratio of depreciation to total assets, and is negatively correlated with expected surplus. The fourth is the structure of equity ( $prop$ ), which is the sum of the shareholding ratio of the three largest shareholders, and is negatively correlated with the expected surplus. Fifth, the age of listed companies is equal to the current year minus the IPO year, which is positively correlated with the expected earnings. Through the previous analysis, we built a related model, and used OLS regression method to test the impact of expected surplus on capital structure, mainly analyzing the regression coefficients of the following variables. The first is analyst's earnings forecast ( $fore$ ). The second is the relative sales growth rate. The third is the profit rate before interest and tax ( $prof$ ). The formula (4) is obtained.

$$\begin{aligned}
 lev_{it} = & a_1 size_{it-1} + a_2 tan\ g_{it-1} + a_3 ndts_{it-1} + a_4 prop_{it-1} \\
 & + a_5 age_{it-1} + a_6 growth_{it-1} + a_7 prof_{it-1} + fore_{it}
 \end{aligned}
 \tag{4}$$

If the increase of expected surplus is positive, it shows that hypothesis 1 has a significant positive correlation with the debt ratio of enterprises. And the test of hypothesis 2 is to compare the regression coefficient of relative sales growth rate between profit group and loss group, and to test the significance level of coefficient  $f$  between groups. In addition, in the process of studying the specific ways of capital structure adjustment, some models use logit for linear regression, and STATA software is used for data processing.

## 4. Empirical Study on Expected Surplus and Capital Structure

### 4.1. Descriptive Statistics

After studying the annual statistical relationship between capital structure and the average operating profit rate, we get two phenomena. The first is that both market value debt ratio and book debt ratio have a significant negative correlation with the realized profitability. Therefore, from the perspective of book debt ratio, the rationality of hypothesis 1 is demonstrated, because the annual average value of book debt ratio has increased year by year since 2000, increased to 53.59% in 2006, and then decreased year by year. In 2011, it decreased to 41.53%. At this time, the annual average value of market value debt ratio gradually appeared in an inverted "V" shape. These phenomena are difficult to explain from the perspectives of macroeconomic enterprise characteristics, cycle changes, financial development, etc. However, it can be explained from the expectation of the future by operating performance. Since the beginning of this century, after China's accession to the World Trade Organization, its economic prospects are still in a good expected state. In the spring of 2007, the subprime mortgage crisis in the United States began to appear gradually. At the end of 2008, marked by the bankruptcy protection of Lehman Brothers, the global financial crisis broke out in an all-round way, and then the European debt crisis broke out and continued until now. It can be said that the subprime mortgage crisis in 2008 reversed the expected surplus of China's manufacturing industry for future performance.

### 4.2. Overall Analysis of Expected Surplus and Capital Structure

On the whole, the regression coefficient obtained by OLS analysis of capital structure and expected profitability is almost the same as that expected in this paper, and the significance level is very high, which mainly has the following characteristics. First, the regression coefficient of debt ratio to operating profit rate is negative. Second, the least square regression coefficient of the book debt ratio to the relative growth rate of sales is positive, which also means that the financial leverage will decrease when the enterprise's predicted future prospects deteriorate. Third, the regression coefficient of book debt ratio relative to analyst earnings forecast is 0.0848, and the significance level is 5%. See Table 1 for details. At the same time, the regression data can also explain the trade-off theory and pecking order theory. The trade-off theory holds that there is a positive correlation between profitability and capital structure, which specifically refers to expected profitability. The pecking order theory holds that there is a negative correlation, which refers to the realized profitability. In addition, according to the annual changes, the differential test, balanced panel test and unbalanced panel test were carried out. The result is the same as that of Hypothesis 1, so we can formalize Hypothesis 1 of this paper, which shows a significant positive correlation between business expectation and enterprise debt ratio.

Table 1: Regression results of capital structure and expected profit

	Expectations	booklew	marklev
fore	positive correlation	0.0848	-0.0978
Forg_lag		0.0379	-0.1491
prof	negative correlation	-1.091	-0.7029
N		3157	3157
adjR		0.3021	0.5445

\* Considering the space, many control variable data are not listed

### 4.3. Analysis of the Mechanism of Expected Surplus and Capital Structure

The best capital structure of enterprises is affected by the change of expected earnings, whether it is caused by tax benefits and financial dilemma cost. At the sub-industry level of listed manufacturing enterprises, according to the atman Z-score index, each industry is divided into two groups according to the average score, namely, loss-making enterprises and profit-making enterprises, representing high and low default rates respectively. If the default rate is high, the financial dilemma cost is expected to have a greater impact on the default rate. According to the report of grouping regression results, as shown in Table 2, when the book debt ratio becomes an independent variable, the regression coefficient of loss-making enterprises is 0.0527, and that of profit-making enterprises is 0.0232. The significance level of the coefficient difference between the two is 5%. When the market debt ratio is an independent variable, the results are similar. Therefore, Hypothesis 2 of this paper is proved by data, that is, under the same conditions, the capital structure of loss-making enterprises is more sensitive to expected earnings than profit-making enterprises.

Table 2 Grouping Regression Results of Expected Surplus and Capital Structure

	booklew			marklew		
	losing enterprise	profitable firm	Difference value	losing enterprise	profitable firm	Difference value
growth	0.0527	0.0232	0.0759	0.0354	0.0132	0.0486

### 4.4. Research Results

In this paper, the profitability is subdivided, and the impact of actual surplus and expected surplus on capital structure is specifically studied, which not only provides evidence for the trade-off theory, but also coordinates the pecking order theory and trade-off theory, two classical capital structure theories, from the perspective of profitability. In addition, this paper also makes an empirical study on the influence and mechanism of the expected surplus relative to the capital structure, and concludes that if the expected surplus falls, the expected tax benefits will also fall, but the financial distress cost of the expected surplus will rise, which will reduce the optimal debt ratio of enterprises, resulting in the actual debt ratio being greatly reduced. At the same time, another contribution of this paper is that the best debt ratio of enterprises will decrease with the decrease of specific expected surplus, which means that most enterprises in China are facing financial crisis, and the funds they really need to raise are not debt funds but equity funds, which will have certain positive and reference significance for our government's policy of reducing equity funds and increasing debt funds. In addition, through the empirical study of this paper, we can find that, first, if the expected surplus decreases and needs to be raised, we should raise equity as much as possible, and if there is free cash flow, we should try to selectively repay debts. Second, when an enterprise is faced with a deteriorating business prospect, it usually sells its assets to repay its debts. Third, the debts to be repaid include operating liabilities and low-cost current liabilities. When many enterprises have realized the impact of expected surplus on the optimal capital structure, the friction of financial market and abnormal debt structure will make enterprises unable to adjust to the optimal capital structure quickly, so they will damage the value of enterprises. Therefore, for listed companies that are mainly operating, it is necessary to adjust the focus of capital structure to interest-bearing liabilities, while the macro financial market needs to develop the main bond market.

## 5. Summary

In this paper, the impact of operating expectations on capital structure is elaborated in depth. Firstly, based on the single period model constructed by Kraus and Litzenberger, the impact of expected surplus on the optimal capital structure is analyzed. In addition, this paper uses the financial data of China's manufacturing listed companies from 2000 to 2013 to conduct an empirical test, and the test results are the same as the analysis of the model, and confirm that the expected earnings and capital structure present a positive correlation, which is consistent with the trade-off theory. If the debt ratio of an enterprise increases, it means that the enterprise has a high expectation of its future corporate performance. On the contrary, if the debt ratio of an enterprise decreases, it indicates that the enterprise has insufficient confidence in the future, thus showing the consistency of the theories of signal transmission, bankruptcy cost and agency cost.

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