

# The Path of Optimization in Asset Structure

-Empirical analysis on comprehensive-class listing companies based using panel data model

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**Abstract**—Based on the financial data selected from 77 companies during four quarters in 2009 in the comprehensive-class listing companies, two methods, including normal analysis and panel-data model analysis are used to analyze deeply the path of optimization in corporate asset structure. The empirical analysis comes to a memorable conclusion that path-dependence is the character of asset structure optimization. Enterprise asset structure is not only dynamic, but also depended on the balance of profitability and mobility made by managers of enterprise.

**Keywords**—Path Dependence; Asset Structure Optimization; Panel Data; Empirical Analysis

## I. INTRODUCTION

Scholars have always been keen on capital structure, but shown little interest in asset structure. MM proposition launched the field of modern capital structure theory. Since then, relevant research of financial theory grows increasingly rapid. Among them, static trade-off theory, new capital structure theory and post capital structure theory, which follows the same thinking route, that is relax the hypotheses of MM proposition→put forward the question→form a new theory, are rather typical. On the surface, the new theories continue to emerge. But through the prosperous appearance of financial theories, it is not difficult to find the concern of the existing financial theory is the relationship between the elements on the right of accounting equation, and asset structure hide in a secluded corner.

In fact, post-theory of capital structure begins to research pointed at asset structure. Jean.Tirole believes the interaction relationship between the enterprise capital structure and its product market will be the direction of the company's financial theory in the future. Scholars, including Titman, Brander, Lewis and Aghion, have studied the relationship between capital structure and product market strategy from different perspectives. Unfortunately, in the study design, they did not pay attention to the formation of the basic

constraints of the product market strategy - asset structure. Therefore, the conclusion is not robust and perfect.

The trade-off relationship between asset structure, capital structure and management of profitability and liquidity of asset structure provides a new visual image for us to study how to optimize enterprise asset structure [1]. Corporate Value Theory holds that the value of a firm is the present value of its future cash flows. The company's future cash flow is determined by its operating ability, the optimal asset structure configuration can achieve the company's future cash flow maximization. This assertion requires a strong assumption that the company's financing activities do nothing with corporate value (MM theorem). The company's creditors generally require the company to maintain proper liquidity; the company's managers tend to adjust the liquidity of the company's assets to avoid the insolvency risk. The adjustment of enterprise assets structure, which is based on the financial contracts, makes the enterprise assets structure deviate from the optimal path to realize its value maximization. At this time, the enterprise asset structure is semi-optimized. The optimization of asset structure presents the characteristics of path dependence, which is not only dependent on the existing financial contracts, but also on the balance between the managers' attitudes towards profitability and liquidity of asset structure [2].

The remaining parts of the article will analyze the characteristics of the path dependence of enterprise asset structure optimization. Specifically, in the second part, we analyze the trade-off relationship between asset structure, capital structure and management of profitability and liquidity of asset structure, and put forward the research hypothesis; the third part is about research design and sample selection; in the fourth part, we established a panel-data model to carry out relevant tests; the fifth part summarizes the research conclusion and deficiency.

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## II. THEORY ANALYSIS AND HYPOTHESES

The ultimate goal of optimizing capital structure and asset structure is to maximize the value of the company. Financial theory holds that corporate value is the result of the interaction result between corporate financing activities (capital formation), investment activities (asset structure formation) and profit distribution activities. Therefore, the assets structure of enterprises can not be studied in isolation, and the comprehensive analysis of other factors is needed[3].

Assuming the market is perfect and setting  $X_t$  = cash flow of the company in the year  $t$  ( $t \in N$ ),  $i$  = total cost of the company,  $V$  = the value of the company,  $S$  = market value of company stocks,  $D$  = market value of liabilities of company, it's obvious that we can get

$$V = S + D = \sum_{t=1}^T \frac{X_t}{(1+i)^t} \quad (1)$$

Equation (1) is the simple expression of MM theorem. Setting  $A$  = assets of the company, for the market is perfect, asset  $A$  is in compliance with the definition of the company's assets under the perfect market conditions; that is,  $V_A$  is the value of corporate assets. Then, we can get

$$V_{At} = \sum_{t=1}^T \frac{X_t}{(1+i)^t} \quad (2)$$

The necessary and sufficient condition for the Equation (2) is that the future cash flow of the company is only derived by the assets it owns. MM proposition ensures that the necessary and sufficient condition can be satisfied. Here, we do not consider the company's non-operating income, subsidy income and other non-recurring items like received donations. Based on Equation (1) and (2), we can reach

$$V_{At} = \sum_{t=1}^T \frac{X_t}{(1+i)^t} = S + D = V \quad (3)$$

Equation (3) contains the accounting equation: Assets = Owner's Equity + Liabilities. Assuming the clean surplus relationship exists, the accounting equation is the simple expression of Equation (3)  $V_{At} = S + D$ .

Under the condition of asymmetric information, the financial contracts affect the capital cost and the optimal asset allocation of the enterprise. First of all, financial contracts limit the ability of enterprises to continue to reduce the cost of capital by adjusting capital structure. Secondly, financial contract limits the ability of enterprise asset allocation.

Faced with the constraints of financial contracts, companies must balance their long-term cash flow capacity and the ability to repay debt maturity between. Assume  $f_{Ct}$  is the constraint function of ability to adjust cost of capital with managers under the constraint of financial contracts in period  $t$  and set  $I$  is the cost of the enterprise with asymmetric information. When information is perfect,

the cost of the enterprise  $I$  is equal to the capital cost of the enterprise  $i$ ; however, when the information is asymmetric,  $I = f_{Ct}(i) \geq i$  is workable. Assuming  $f_A$  is the constraint function of adjust the ability of asset structure to generate cash flows with managers under the constraint of financial contracts, we can get  $X = f_A$ . Since managers' adjustment upon the enterprise asset structure is continuous,  $X_t = f_{At}$ . Assume  $f_{At} = F(f_{At-1} \dots f_{At_0})$ , which states that enterprise cash flows in each period is the cumulative result of the adjustment of enterprise asset structure. So we can get

$$V_{At} = \sum_{t=1}^T \frac{f_{At}}{(1+I)^t} = \sum_{t=1}^T \frac{F(f_{At-1} \dots f_{At_0})}{[1+f_{Ct}(i)]^t} = S + D = V \quad (4)$$

From the signal theory, Ross (1997) assumes that the income is subordinate to the first order and the real income of the enterprise is the private information of the company's managers; and the company with debt can transmit the positive signals, thus enhancing the company's value. In Equation (4), companies with appropriate debt can reduce the cost of capital, which states  $f_{Ct}(i)$  is less than the cost ( $I$ ) of company's equity financing or internal financing. Grossman and Hart (1982) thinks with the asset liability ratio up, the bankruptcy risk of the enterprise increases, which leads to the increase of  $f_{Ct}(i)$ , and thus the company's value is reduced. It is known from Equation (4) that if  $F(f_{At-1} \dots f_{At_0})$  is the constant function, we can get  $V^* = \max V$  when  $I^* = \min I = \min f_{Ct}(i)$ , which means enterprises realize the value maximization.

However, as the enterprise from internal financing to debt management, the management of the assets of the space is constantly changing. Therefore, the assumption that  $F(f_{At-1} \dots f_{At_0})$  is the constant function is unreasonable.

Liquidity and profitability of asset have a negative relationship. The trade-off coefficient of management of profitability and liquidity of asset structure is  $r = \frac{\text{profitability}}{\text{liquidity}}$ ,  $r \in (0, 1)$ . With the increase of  $r$ , the

managers take more radical strategies to maintain higher profitability in the optimization of the asset structure, so that the profitability of the enterprise assets increase; so does the enterprise's future cash flow. Assume the managers' trade-off coefficient of profitability and liquidity of asset is  $r_s$  when company finances through equity or finance internally and the managers' trade-off coefficient of profitability and liquidity of asset is  $r_c$  when company have financial contracts. Obviously, we can get  $r_c = g_t(i)$ , which means the trade-off coefficient of the asset's profitability and liquidity is the function of the capital cost of the asset when the financial constraints exist. Holding other conditions constant and assuming managers are risk averse,  $0 < r_c < r_s \leq 1$  is workable. According to the above definition, it's easy to get

$$X_t = f_{At}(r_t), r_t \in [r_c, r_s] \quad (5)$$

$$\text{and } f_{At}(r_t) = F(f_{At-1}(r_{t-1}) \dots f_{At_0}(r_{t_0})) \quad (6)$$

Thus,

$$V_{At} = \sum_{t=1}^T \frac{f_{At}(r_t)}{(1+I_t)^t} = \sum_{t=1}^T \frac{F(f_{At-1}(r_{t-1}) \dots f_{At_0}(r_{t_0}))}{[1+f_{C_t}(i)]^t} = S + D = V \quad (7)$$

Set managers' optimal trade-off coefficient is  $r^*$ , then

$$V^*_{At} = \sum_{t=1}^T \frac{f_{At}(r^*_t)}{(1+I_t)^t} = \sum_{t=1}^T \frac{F(f_{At-1}(r^*_{t-1}) \dots f_{At_0}(r^*_{t_0}))}{[1+f_{C_t}(i)]^t} \geq V_{At} \quad (8)$$

The constraint conditions for the equation (8) are

$$V'_{At} = \left[ \sum_{t=1}^T \frac{f_{At}(r_t)}{(1+I_t)^t} \right]' \\ = \sum_{t=1}^T \frac{f'_{At}(r_t) g'_t(i) [1+f_{C_t}(i)]^t - f_{At}(r_t) t [1+f_{C_t}(i)]^{t-1} f'_{C_t}(i)}{[1+f_{C_t}(i)]^{2t}} = 0$$

Because  $f_{C_t}(i)$  &  $f_{At}(r_t)$  are increasing functions and  $f_{C_t}(i) > 0$  &  $f_{At}(r_t) > 0$ , we can get

$$\sum_{t=1}^T f'_{At}(r_t) g'_t(i) [1+f_{C_t}(i)]^t - f_{At}(r_t) t [1+f_{C_t}(i)]^{t-1} f'_{C_t}(i) = 0$$

A strict constraint that satisfies the formula above is

$$f'_{At}(r_t) g'_t(i) [1+f_{C_t}(i)]^t - f_{At}(r_t) t [1+f_{C_t}(i)]^{t-1} f'_{C_t}(i) = 0,$$

and that is,

$$f_{At}(r_t) = \frac{f'_{At}(r_t) g'_t(i)}{t f'_{C_t}(i)} [1+f_{C_t}(i)]. \quad (9)$$

From the previous assumption that the optimal trade-off coefficient of asset is  $r^*$ , we can establish

$$f_{At}(r^*_t) = \frac{f'_{At}(r^*_t) g'_t(i)}{t f'_{C_t}(i)} [1+f_{C_t}(i)]$$

At this time, the enterprise may realize its value maximization. We can know from constraint condition(9)

$$f_{At}(r_t) = \frac{f'_{At}(r_t) g'_t(i)}{t f'_{C_t}(i)} [1+f_{C_t}(i)] \quad \text{that when } g'_t(i) > 0,$$

$f'_{At}(r_t) > 0$ , which demonstrates when company is with proper debt, managers can effectively disperse the company's liability risks through optimizing the asset structure and realize the value of the company; in contrast, when  $g'_t(i) < 0$ ,  $f'_{At}(r_t) < 0$ , which demonstrates managers cannot effectively disperse the company's liability risks through optimizing the asset structure, and lose the value of the company. Assuming  $i_0$  meets  $g'_t(i_0) = 0$ ,  $i_0$  endogenously determines the optimal capital structure of the enterprise and the optimal asset structure of the enterprise under the constraint of the capital structure.

It's known from the above analysis that the enterprise asset structure optimization depends on the capital structure of the enterprise and the managers' trade-off coefficient of

the asset allocation, showing the characteristics of path dependence. When the capital structure of the enterprise and the managers' trade-off coefficient of the asset profitability and liquidity to meet the constraint condition (9), the enterprise value is maximized. So we put forward:

**Hypothesis 1:** The optimization path of enterprise asset structure depends on its capital structure.

By the function  $r_c = g_t(i)$  and constraint condition(9),  $g'_t(i)$  can be clearly presented by the positive to negative changes, which economically means with the introduction of debt management, the state of the company's assets structure depends on the changes in the capital structure of the company. When the asset structure matches the capital structure, the managers' trade-off coefficient of asset structure realizes the increase of the enterprise value, during which, enterprise asset structure optimization process is a Pareto improvement; when the asset structure can't match the capital structure, the managers' trade-off coefficient may become a channel to transfer the risk from shareholders to creditors, during which, enterprise asset structure optimization process is a Hicks improvement. When  $g'_t(i) < 0$ , the financial bankruptcy risk increases, and the optimal adjustment of asset structure can not reduce the enterprise's bankruptcy risk. From the above analysis, we can put forward

**Hypothesis 1.1:** The optimization of enterprise assets structure presents inverted U type relationship with its capital structure.

**Hypothesis 2:** The optimization path of the enterprise asset structure depends on the managers' trade-off coefficient of profitability and liquidity.

Since MM proposition only takes the tax shield effect of liabilities, but ignores the financial risk and cost resulting from the increasing liabilities, trade-off theory and the theory of post balance is just from which, about the research on how to balance the tax shield and financial risk of corporate debt, in order to achieve the optimal capital structure. According to the information asymmetry and incentive theory, Mayers (1984) introduced the agency cost into the enterprise value model, and established the balance model of the asset structure.

Setting corporate tax rate is  $T_c$  and  $I_{t_0}$  is the asset structure of enterprise without debt, we can get Equation (10) according to trade-off theory:

$$V = V_s + DT_c - PV_D - PV_a \quad (10)$$

Where  $PV_D$  is the corporate bankruptcy cost and  $PV_a$  is the agency cost paid by the company to motivate managers. Corporate value is the sum of the market value of the non-liability company and the tax shield income after deduction of bankruptcy cost and agency cost. From the previous analysis, manages will balance between asset liquidity and profitability, not only to maintain the growth capacity of enterprises, but also to maintain appropriate liquidity, so as to ensure that the maturity of the debt can be

repaid and to reduce the risk of bankruptcy of the enterprise. As a result, managers' trade-off coefficient ( $r$ ) of the asset liquidity and profitability endogenously determines the bankruptcy cost of the enterprise. And when the market interest rate fluctuated severely or unexpectedly, it may also lead to increasing corporate bankruptcy risk. With the existence of agency cost, it's suggested that managers need to consider capital cost ( $i$ ), market interest rate ( $I_m$ ) and also their own utility when determining the trade-off coefficient ( $r$ ) of the asset liquidity and profitability. Through the introduction of debt, managers can be limited to waste the enterprise "free cash flow", to reduce the agency cost of the enterprise. Therefore, in the presence of agency costs, the introduction of debt incentive mechanism can both enjoy the tax shield revenue, but also reduce managers' agent costs, making managers' positive choice of trade-off coefficient. But with the increase of debt, incentives of debt and tax shield benefits become weaker, while the bankruptcy risk is stronger. The contributions of managers' trade-off coefficients on the enterprise value margin decreases. When the trade-off coefficient of enterprise value contribution margin is equal to the sum of marginal corporate bankruptcy and marginal agency cost, the company will achieve the value maximization. So we have:

*Hypothesis 2.1:* The optimization of the enterprise asset structure presents inverted U type relationship with the managers' trade-off coefficient.

*Hypothesis 2.2:* The impact of managers' trade-off coefficient on the optimization of asset structure significantly changes with the changes of the company's capital structure.

From the above analysis, the optimization of enterprise assets structure is closely related to the company's capital structure and managers' trade-off coefficient. On one hand, when financial contracts and trade-off coefficient were determined in a certain period, the present asset structure of the enterprise basically formed in the current period. Next-period asset structure optimization is established based on the re-optimization of asset structure established by existing financial contracts and trade-off coefficients, suggesting that enterprise assets structure optimization path exhibits dynamic correlation; on the other hand, the economic environment, enterprise operating characteristics and market competition need determine the relatively fixed and unchangeable part of the enterprise asset structure in each period, which shows that early asset structure of presents a dynamic negative correlation with the trade-off coefficient for subsequent periods[4]. Therefore, we propose:

*Hypothesis 3:* The optimization path of enterprise asset structure presents a dynamic correlation.

*Hypothesis 3.1:* The enterprise asset structure presents a significantly dynamic negative correlation with trade-off coefficients.

### III. RESEARCH DESIGN AND SAMPLE SELECTION

#### A. Variables Design

##### 1) Dependent Variables

The asset structure of accounting category has three meanings: first, the asset structure is a quantitative structure. The relative proportions of the various asset classes which constitute assets and each accounted for the proportion of total assets; secondly, asset structure changes with the time sequence change; relative proportions of various asset classes and their share changes frequently. Also, with reference to profitability and liquidity level, asset presents an ordered structure; the state of each asset structure depends on the trade-off of profitability and liquidity. Based on the above analysis, we choose enterprise long-term assets (including fixed assets, long-term investment and intangible assets) and the ratio of liquid assets as an alternative variable of the asset structure.

##### 2) Independent Variables

Masulis (1980) broadly describes capital structure in narrow sense referring to the proportion of long-term debt capital and equity capital. This paper selects the ratio of the long-term debt capital and equity capital as the proxy of the capital structure, and selects the asset-liability ratio as the alternative variable of the capital structure.

Oliver Hart (1995) believes that in the case of the fastest reimbursement path, the revenue stream can be matched with liabilities; in the case of the slowest reimbursement path, the depreciation rate can be matched with the liabilities. Oliver Hart's definition of the reimbursement path is the managers' trade-off coefficient of the asset profitability and liquidity defined in this paper. Therefore, we select the ratio of operating cash flow and current assets and the ratio of depreciation and current assets, such as the two variables, as proxies of the trade-off coefficient.

#### B. Control Variables

##### 1) Income Factor

Enterprise long-term investment income is greater than short-term investment income, and its liquidity is less than the latter [5]. When a higher rate of return on investment exists, managers' expected revenue is more optimistic, and the trade-off coefficient of assets is relatively higher; and conversely. In this paper, we choose the investment return rate as the alternative variable of the income capacity.

When the previous retained earnings condition of the enterprise is relatively fine, managers' future revenue is expected to more optimistic, so to choose a higher trade-off coefficient. We choose the net interest rate as the alternative variable of the retained earnings condition.

##### 2) Size Factor

Managers' trade-off between the profitability and liquidity of asset is closely related to the size of the company [6]. On one hand, larger companies have long state credit relationship with creditors (banks), and thus they are confronted with smaller constraints of rigid financial contracts and managers have large trade-off space of asset



structure; on the other hand, investment in fixed assets accounts for a larger proportion of total asset in larger enterprises. In order to prevent the entry of competitors, managers in larger enterprises will increasing the amount of investment, form cost accumulation (which will lead to the increasing proportions of fixed assets), give out the credible threat signal, build the barriers to entry to maintain their competitive advantage. This game strategy limits the

managers' trade-off space of asset structure. Size factor influences managers' trade-off effectiveness on asset structure from pros and cons. Therefore, we need to control in in empirical analysis. We select the proportion of fixed assets in total assets as the alternative variable of the size factor.

Detailed variable design and alternative variables are displayed in the table 1:

TABLE I VARIABLE TABLE

| Influence Factor                         | Alternative Variables                         |
|--|---|
| <b>Dependent Variable</b>                |   |
| asset structure                          | $Af$ =long-term assets/current assets         |
| <b>Independent Variables</b>             |   |
| capital structure                        | $Alr$ =liabilities/total assets               |
|  | $Le$ =long-term liabilities/owners' equity    |
| trade-off coefficient of asset structure | $Ld$ =operating net cash flows/current assets |
|  | $Dw$ =appreciation/current assets             |
| <b>Control Variables</b>                 |   |
| income factor                            | $Rin$ =investment income/long-term investment |
|  | $Roe$ =net profit/equity                      |
| size factor                              | $F$ =fixed assets/total assets                |

### C. Data Selection and Model Construction

#### 1) Data Selection

We select the comprehensive-class (M) listing companies' financial data for the 4 quarters of 2009, a sample data of 77 companies. And we select panel data model for research, total panel data units of 3696 (77\*4\*12). Data from the CCEER (Xenophon) database of the listing companies' quarterly financial database.

#### 2) Model Construction

We choose panel data model to study Hypotheses 1, 1.1, 2, 2.1, 2.2 and 3. The panel data model is generally divided into variable-coefficient model and variable-intercept model. Each of them can be divided into two variants: fixed effects and random effects. The previous mentioned we chose a single industry data; and the company's asset structures in the same industry are relatively similar. While the explanatory variables don't associate with the impact of the non-observed. Therefore, we select the fixed-effect panel data model with variable intercept.

The following fixed-effect panel data model, Equation (11), is established:

$$\begin{aligned}
 Af_{it} = & \beta_{it} + \beta_1 Alr_{it} + \beta_2 Le_{it} + \beta_3 Ld_{it} + \beta_4 Dw_{it} + \beta_5 Rin_{it} \\
 & + \beta_6 Roe_{it} + \beta_7 F_{it} + \beta_8 Alr_{it}^2 + \beta_9 Le_{it}^2 + \beta_{10} Ld_{it}^2 \\
 & + \beta_{11} Dw_{it}^2 + \beta_{12} Alr_{it} * Le_{it} * Ld_{it} * Dw_{it} \\
 & + \beta_{13} Af_{it}(-1) + \varepsilon_{it}
 \end{aligned} \quad (11)$$

Where  $i = (1, 2, \dots, 77)$ ,  $t = (1, 2, 3, 4)$ ,  $Alr_{it}^2$ ,  $Le_{it}^2$ ,  $Ld_{it}^2$  and  $Dw_{it}^2$  represents the product of all other

monomials with itself. If Hypothesis 1.1 and Hypothesis 2.1 are true,  $\beta_8$ ,  $\beta_9$ ,  $\beta_{10}$  and  $\beta_{11}$  are significant.  $Alr_{it} * Le_{it} * Ld_{it} * Dw_{it}$  is used to capture the way that managers' trade-off strategies change with the change of asset structure and the final impact on the enterprise asset structure optimization. If  $\beta_{12}$  is significant, Hypothesis 2.2 are of evidence. For the study whether the dynamic optimization of asset structure is significant (Hypothesis 3), this paper introduces the lag-period variable ( $Af_{it}(-1)$ ) of asset structure. When enterprise asset structure optimization path exhibits dynamic correlation,  $\beta_{13}$  in Equation (11) shall be significant. For the study Hypothesis 3.1, we build Equation (12):

$$\begin{aligned}
 Af_{it} = & \beta_{it} + \beta_1 Alr_{it} + \beta_2 Le_{it} + \beta_3 Ld_{it} + \\
 & \beta_4 Dw_{it} + \beta_5 Af_{it}(-1) + \beta_6 Alr_{it} * Le_{it} * Ld_{it} * Dw_{it} \\
 & + \beta_7 Af_{it}(-1) * Dw + \varepsilon_{it}
 \end{aligned} \quad (12)$$

When the enterprise asset structure is negatively correlated with the trade-off coefficient,  $\beta_7$  is significantly negative.

### IV. PANEL-DATA MODEL TEST

We use Excel2003 for the basic organization of original data and pool data analysis of Eviews6.0 for the empirical analysis of panel data. When the Equation (11) is analyzed, the original least squares (OLS) is used to estimate the fixed effects; and the missing data is processed according to the Eviews9.0.

### A. Descriptive Statistics

The descriptive statistical results of panel-data are shown in Table1 and Table 2 and Table 3.

TABLE II DESCRIPTIVE STATISTICAL RESULTS OF PANEL-DATA

|              | <b>Af</b> | <b>Alr</b> | <b>Le</b> | <b>Ld</b> | <b>Dw</b> | <b>Rin</b> |
|--------------|-----------|------------|-----------|-----------|-----------|------------|
| Mean         | 1.398382  | 0.626951   | 0.257572  | 0.026498  | 0.264137  | 3.23E+10   |
| Median       | 0.872928  | 0.607961   | 0.065683  | 0.018982  | 0.129849  | 0.015612   |
| Maximum      | 19.11519  | 3.108766   | 6.107558  | 0.826480  | 3.071315  | 9.15E+12   |
| Minimum      | 0.033988  | 0.061369   | -2.052350 | -1.789807 | 6.92E-14  | -1.97E+10  |
| Observations | 306       | 306        | 306       | 306       | 306       | 306        |

TABLE III DESCRIPTIVE STATISTICAL RESULTS OF PANEL-DATA (CONTINUED)

|              | <b>R0e</b> | <b>F</b> | <b>Alr<sup>2</sup></b> | <b>Le<sup>2</sup></b> | <b>Ld<sup>2</sup></b> | <b>Dw<sup>2</sup></b> | <b>ALD<sup>2</sup></b> |
|--------------|------------|----------|------------------------|-----------------------|-----------------------|-----------------------|------------------------|
| Mean         | 0.047734   | 0.224928 | 0.497785               | 0.458544              | 0.047706              | 0.269945              | 0.003562               |
| Median       | 0.022140   | 0.191410 | 0.369617               | 0.010379              | 0.003655              | 0.016861              | 1.81E-15               |
| Maximum      | 6.945865   | 0.729388 | 9.664428               | 37.30227              | 3.203409              | 9.432976              | 0.774174               |
| Minimum      | -1.123022  | 1.30E-14 | 0.003766               | 0.000000              | 1.67E-07              | 4.79E-27              | -0.689733              |
| Observations | 306        | 306      | 306                    | 306                   | 306                   | 306                   | 306                    |

Note: where  $ALD^2 = Alr * Le * Ld * Dw$ .

We can see from the descriptive statistical results, (1) the asset structure of listed companies in Class M presents obviously right skewed (mean=1.398382 > median=0.87292). From the relationship of mean, mode and median, it can be determined that current assets accounted for a large proportion in asset structure of most of listed companies in 2009, which is a relatively robust asset structure. (2) Changes between the asset structures of listed companies are larger (maximum=19.11519, minimum=0.033988), which

suggests there are other factors except industry factor, which influences enterprise asset structure, contributing to the differences between the optimization paths of enterprise asset structure. These factors will be analyzed in detail in the following sections.

### B. Fixed Effects Analysis

#### 1) Equation (11)

To test hypothesis, we can do fixed-effect analysis on Equation (11). The estimated results are stated in Table 4.

TABLE IV FIXED-EFFECT VARIABLE INTERCEPT MODEL ESTIMATION TABLE

| <b>Variable</b>  | <b>Coefficient</b> | <b>Std. Error</b> | <b>t-Statistic</b> | <b>Prob.</b> |
|------------------|--------------------|-------------------|--------------------|--------------|
| C                | -0.383350          | 0.894812          | -0.428414          | 0.6690       |
| Af(-1)           | 0.167471           | 0.089008          | 1.881532           | 0.0620       |
| Alr              | 2.597872           | 2.268251          | 1.145319           | 0.2540       |
| Le               | 0.748186           | 0.503271          | 1.486647           | 0.1394       |
| Ld               | 0.293011           | 0.618825          | 0.473496           | 0.6366       |
| Dw               | 7.754552           | 1.110589          | 6.982379           | 0.0000       |
| Rin              | 7.97E-13           | 1.75E-13          | 4.556569           | 0.0000       |
| Roe              | -0.027486          | 0.147449          | -0.186409          | 0.8524       |
| F                | -6.297819          | 1.252187          | -5.029455          | 0.0000       |
| Alr <sup>2</sup> | -1.156308          | 1.467321          | -0.788040          | 0.4320       |
| Le <sup>2</sup>  | -0.114879          | 0.078958          | -1.454935          | 0.1479       |
| Ld <sup>2</sup>  | 1.454675           | 0.491942          | 2.957005           | 0.0037       |
| Dw <sup>2</sup>  | -1.212278          | 0.308111          | -3.934543          | 0.0001       |
| ALD <sup>2</sup> | -4.948376          | 1.715133          | -2.885127          | 0.0045       |

We analyze the results: (1) the effect of capital structure on corporate assets structure is not obvious. The coefficients of *Alr* and *Le* are both positive, which indicates that the capital structure of the enterprises with long-term debt is positively related to the optimization of the capital structure of the enterprise. The reasons may be: on one hand, the long-term debt constraints the enterprise capital structure more weakly than the liquidity of short-term debt; on the other hand, long-term debt provides more stable sources of

capital, and more asset optimization paths can be chosen by the enterprise. Although the coefficients of the two variables are in line with the economic theory, the influence of the two is not significant. Therefore, in the sample of this paper, the influence of capital structure on asset structure is relatively weak. (2) The coefficient of *Alr<sup>2</sup>* is -1.156308 and the coefficient of *Le<sup>2</sup>* is -0.114879. Hypothesis 1.1 is supported: The optimization of enterprise asset structure and its capital structure presents inverted U relationship, but the impact is

relatively small and statistically insignificant. (3) managers' trade-off between profitability and liquidity significantly affected the enterprise asset structure ( $Dw$  is significant at the confidence level of 1% ), but the coefficient of  $Ld$  is smaller and not significant, indicating that the financial contract constraint is not particularly valued by the managers, which means facing the financial contract constraint, the higher moral hazard is exposed to managers in the trade-off between profitability and liquidity. The influence coefficient of  $Dw$  is larger, which indicates that the managers' trade-off coefficient can lead to great changes of enterprise asset structure. Therefore, according to the existing results, we can accept the Hypothesis 2. (4) The coefficient of  $Dw^2$  is -1.212278, which is statistically significant (Prob. = 0.0001), so Hypothesis 2.1 is acceptable: the optimization of enterprise asset structure and managers' trade-off coefficient presents inverted U type relationship. (5)  $ALD^2$  in Table 3

(coefficient= -4.948376) is significant, which shows that capital structure significantly affects the optimization influence of managers' trade-off coefficient on enterprise asset structure; with the build-up of debt, managers' optimization ability upon the asset structure is increasingly limited to the financial contracts. (6) The coefficient of  $Af(-1)$  is positive and statistically significant, which indicates that the optimization of asset structure is significantly positively dependent of previous asset structures. (7) The control variables,  $Rin$  (investment income/long-term investment) and  $F$  (fixed assets/total assets) have a significantly positive impact on the asset structure, but the impact of  $Roe$  is not significant.

## 2) Equation (12)

The estimation results of Equation (12) is shown in Table 5.

TABLE V FIXED-EFFECT VARIABLE INTERCEPT MODEL ESTIMATION TABLE

| Variable         | Coefficient | Std. Error | t-Statistic | Prob.  |
|------------------|-------------|------------|-------------|--------|
| C                | -0.370916   | 0.099730   | -3.719193   | 0.0003 |
| AF(-1)           | 0.513844    | 0.058228   | 8.824646    | 0.0000 |
| ALR              | -0.086032   | 0.093906   | -0.916148   | 0.3611 |
| LE               | -0.175701   | 0.041443   | -4.239548   | 0.0000 |
| LD               | 0.072593    | 0.075710   | 0.958837    | 0.3392 |
| DW               | 5.647060    | 0.189428   | 29.81109    | 0.0000 |
| ALD <sup>2</sup> | -3.541613   | 0.379834   | -9.324097   | 0.0000 |
| AF(-1)*DW        | -0.414339   | 0.080150   | -5.169564   | 0.0000 |

As shown in Table 5,  $\beta_7$  is significantly negative ( $\beta_7 = -0.414339$ ,  $t = -5.169564$ ), indicating that Hypothesis 3.1 is accepted: the previous enterprise asset structure limits managers' asset optimization capabilities in subsequent periods.

0.0000) is stable.

At the same time, we test whether there is a stable co-integration relationship between that the sequence of  $Af_{it}$ ,  $Alr_{it}$ ,  $Le_{it}$  and  $Dw_{it}$  (probabilities of all the statistics between or within dimension are zero), and the results show that these sequences have a stable co-integration relationship.

## C. Relevant Test for Panel-Data Model

### 1) Fixed Effects Test

To further determine the rationality of the Equation (11), we use the Likelihood Ratio Test to test whether the introduction of a fixed effect model is reasonable. Test results (pro=0.0000 of both cross-section F and Chi-square) suggest that the introduction of fixed effects is reasonable

At the same time, we examine the effect of the fixed effect model. Model test results show that the fixed effect model fits the path dependence relationship moderately well between asset structure and capital structure and managers' trade-off coefficient of profitability and liquidity (adjusted determination coefficient=0.768029, F-statistic=59.06780, D.W. = 2.523849).

### 2) Unit Root Test and Co-integration Test

With the consideration of robustness, this paper tests whether the sequence of  $Af_{it}$ ,  $Alr_{it}$ ,  $Le_{it}$  and  $Dw_{it}$  is stable. It is obvious that the homogeneous unit root test or the heterogeneous unit root test can show that the sequence of  $Af_{it}$ ,  $Alr_{it}$ ,  $Le_{it}$  and  $Dw_{it}$  (p-values of all statistics are

## V. CONCLUSION AND DEFICIENCY

Through the research, we can clear identify asset structure optimization path: (1) the optimization of asset structure is significantly dependent on managers' trade-off coefficient and presents an inverted U-shaped relationship with it; (2) asset structure is weakly dependent on the capital structure, however, capital structure has significant influence on managers' trade-off coefficient, thus affecting the optimization effect of the trade-off coefficient on asset structure; (3) optimization path presents a significantly dynamic correlation: asset structure optimization depends significantly on previous asset structures; previous capital structure limits managers' optimization ability on asset structure in subsequent periods.

There are obvious deficiencies in our research: (1) the variable selection may be biased. On one hand, due to the difficulty in data collection, it limits the selection of more suitable variables; on the other hand, asset structure is similar with alternative variable of trade-off coefficient, which has increased difficulty in choosing appropriate alternative

variable. (2) Macroeconomic variables are not included in the model.

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