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The Determinants of Enterprise Capital Structure and Its Dynamic Influence

—Based on Panel VAR Model

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Abstract

By using the panel data of quoted company during 2005-2014 and the PVAR model, this paper aims to empirically examine the dynamic and interacting relationships among Debt, Growth of company, PB of company's stock, the Effective income tax rate. The pvar model can estimate the dynamic relationship of all endogenous variables, and the empirical results show that the Growth, PB and ETR are the critical factors of Debt; The PB's ability to explain changes in the capital structure has grown stronger over time, and "invalid periods" may occur in the short term. Enterprise Growth and Effective income tax rates both have positive effects in the short term. At the early stage, the enterprises show the debt financing preferences. With the expansion of the scale, the enterprises slowly show the equity financing preferences.

Keywords

Panel VAR Model, Capital Structure, Impulse Response Analysis

1. Introduction

With the development of China's financial securities market, especially the establishment of small and medium-sized boards and the GEM, more small and medium-sized companies have entered the capital market. Therefore, it is very necessary to analyze the debt financing structure of Chinese enterprises at this time. Debt financing is a corporate financial structure and performance of a very important aspect, MM theory, trade-off theory, agency theory and the pecking order theory is debt leverage of debt financing in different areas, tax shield benefit aspects, corporate finance costs of research.

2. Literature Review

For the debt financing and debt structure, the most important study on the classical capital structure theory, namely the MM theory proposed by American Modigliani and Miller [1], is based on the assumption that there is no corporate income tax, and only the capital structure is in the case of consistent business risks. Variables, when the capital market is developing and operating normally, the capital structure of the firm has nothing to do with the value of the firm. Then Stiglitz [2] combined the market equilibrium theory into the study of classical capital structure theory. The theory holds that when the proportion of corporate debt capital in total capital increases, it will have two effects and thus reduce the value of the enterprise. The probability of a financial crisis; the second is to reduce the expected income of corporate bonds. Thus, in 1976 Miller proposed a Miller model theory that included both corporate tax and personal income tax. When the enterprise is more and more, the income obtained by the enterprise from the tax reduction is difficult to offset the bond interest expenditure, so the enterprise stops the conversion. At this time, the debt capital and equity capital of the enterprise are in equilibrium. In the stage of modern capital structure theory, representative theory is agency cost theory, foraging theory and signal theory. There are also scholars in China who study the capital structure of Chinese enterprises. There is no significant correlation between short-term financial leverage and capital cost. Pandey and Bhama [3] find that profitability, tangibility, liquidity, and debt service capacity seem to be significant determinants of capital structure for both the pre- and post-recession periods. Hoque and Pour [4] find that the capital structure of banks does not evolve only as a result of capital regulations; it is also affected by market forces. And Acaravci [5] suggests that there are significant relationships between growth opportunities, size, profitability, tangibility and leverage variables. But non-debt tax shields explanatory variable has insignificant effect on leverage 1 (book value of total debt/total assets) variable. Hang *et al.* [6] think that in descending order of importance-tangible assets (positive sign), market-to-book ratio (negative sign), and profitability (negative sign) are significant determinants of corporate debt level. Lu Zhengfei and Xin Yu [7] found that except for the significant negative correlation between profitability and capital structure, other business factors have no significant relationship with capital structure.

As can be seen in previous studies, the research methods are mostly biased towards static one-way research, and there is no clear relationship between the two variables. Therefore, this paper mainly adopts the selection of China's Shanghai and Shenzhen Stock Exchanges. The relevant data of the home manufacturing A-shares were constructed by constructing panel VAR model, impulse response analysis and variance decomposition method to study the relationship between variables.

3. Theoretical Model

When studying the corporate financing structure, the debt ratio (the ratio of lia-

bilities to total assets) is used to represent the financing structure of the enterprise. In order to receive better regression effects, the scope of the model is also improved. The original data is divided into six groups of data with large meanings according to the meaning of the data (shown in Table 1), respectively, with the debt ratio for panel VAR. In the analysis, the most significant ones were selected, which are the three most variable price-to-book ratios, effective income tax rate, and growth. In order to ensure the consistency of data statistics, the panel data of 119 A-share listed companies in 2005-2014 were selected. Since the average net profit of the profit rate in 2005-2014 is negative, this is likely to cause other companies to use the listed company's "shell resources" to be listed, which will result in the destruction of the identity of financial data, so in the individual Individuals whose average profit is negative are excluded. This article transport carried out using MATLAB and Excel all data processing, using software Stata 13.0 complete evidence and analysis involved.

This paper uses the panel VAR model to estimate the dynamic interaction of each sample financing structure and various aspects of its economic activities. Method VAR panel presented by Holtz-Eakin (1988), this method can VAR time series of the panel data advantages binding, not only has the advantages of dynamic analysis of time series, but also through the panel data to resolve the heterogeneity between individuals. Similar to the general VAR model, in this model, all the variables involved are regarded as endogenous variables, and the regression relationship between the variables is obtained through the panel GMM estimation; then an endogenous variable is separated by the impulse response function. other endogenous variables to impact caused by the influence of a period; Finally, the use of the variance of the error term decomposition, to give each of the factors on the panel VAR model relative influence of each of the variables in size.

Based on the panel data, this paper sets up the third-order PVAR equation:

$$y_t = \alpha + \beta_1 y_{t-1} + \cdots + \beta_n y_{t-n} + \mathrm{H}x_t + \varepsilon_t \quad t = 1,2,3$$

y_t represents growth (Growth), PB, the effective income tax rate (Effective Tax Rate, referred ETR) and gearing (Debt/Asset, referred Debt Total). It is assumed that the random disturbance term ε_t obeys a normal distribution.

4. Empirical Test and Result Analysis

4.1. Descriptive Statistical Analysis

Descriptive statistics of variables are shown in Table 1. The growth differences of listed companies are relatively large.

With a minimum of −996.5313, a maximum of 1671.184, an average of 2.169506, the largest is Magic Pharmaceutical (2006), and the smallest is Gong Shenbei (2006); the average price-to-book ratio is 3.747, the largest is 94.0304, which is Huasu Holdings (2014), the smallest is −290.0477, which is Huasu Holdings (2010). It's book value appear relatively large in volatility, through access to relevant information, found that the company starting in 2006, continued to re-

ceive delisting police report, until 2014, the implementation of the split share reform program, The company was re-entered on the right track; the effective income tax rate was 220.3927, the minimum was −2.972461, the relative difference in debt ratio was small, the maximum was 1.47, which belonged to Huasu Holdings (2012); the minimum value was 0.044, which belonged to Shenzhou High Speed Rail (2011). The difference in debt ratio comes from both business operations and industry differences.

4.2. Panel Unit Root Test

Conducting face plate before the VAR model estimation, we need to examine whether the samples to smooth the panel, so as to ensure that the model estimates are accurate and impulse response function and variance decomposition analysis of stability. This paper completes the panel unit root test by LLC criteria and Fisher-ADF test. The results show that (Table 2) each variable is stable, indicating that Growth, PB, ETR, and Debt are all first-order single-sequence sequences.

4.3. Granger Causality Test

In the study of the time series while, if the variable contains x1, x2 at the last condition information, the variable x2 predicted effect than solely by x2 past information x2 predicted effect of better. As long as the variables x1 explanatory

Table 1. Variable grouping situation.

groups	variable	method of obtaining
First group	Tangible asset rate	Tangible assets/total assets
	Current asset ratio	Current assets/total assets
	Operating cash flow ratio	Operating cash flow/total assets
Second Group	Growth	Total operating income for the previous year/total operating income for the current year
	Enterprise Scale Assets (LN)	Take the natural logarithm of the total assets of the enterprise
	The shareholding ratio of the largest shareholder	The largest shareholder's shareholding value/total corporate capital
The third group	Accounts receivable turnover	Business operating income/average balance of accounts receivable
	Current asset turnover	Business operating income/average balance of current assets
	Total asset turnover	Business operating income/average balance of total assets
Fourth group	Return on equity (ROE)	After-tax profit/owner's equity
	Operating profit margin	Marginal profit/sales revenue
	Operating asset return	After-tax profit/total assets
Fifth group	Dividend payout ratio	Dividend per share/net income per share
	P/B ratio	Stock price/net assets per share
The sixth group	Income tax effective tax rate	Total tax paid divided by taxable income
	Non-debt tax shield (LN)	Depreciation of fixed assets, amortization of intangible assets and amortization of long-term deferred expenses

variables x2 future changes helpful then the variable x1 is caused by the variable x2 Granger reasons. Through the Granger test, the causal relationship between variables can be inferred.

In this paper, some cross-section data were randomly selected, and the Granger causality test was carried out for the four key variables included in this paper. Since the Granger causality test is only for partial cross-section data, the data for a single cross-section cannot represent the nature of the entire panel data. After data analysis, it was found that each variable showed a dependent variable for other variables in different cross-section samples:

4.4. Panel VAR Results

According to the previous unit root test results (Table 3), growth, PB, ETR, and Debt are first-order single-order sequences. Therefore, panel VAR model estimation can be performed. By the convergence function of the impulse response, we decided to adopt the panel VAR third-order lag model, using the system GMM square method to estimate, thereby obtaining the dynamic interaction between business operations, shareholders' equity, the tax burden on the

Table 2. Variable descriptive statistics.

variable	observations	average value	Standard deviation	Minimum value	Maximum
Growth	750	2.169506	75.72267	−996.5313	1671.184
PB	750	3.746762	12.88728	−290.0477	94.0304
ETR	750	0.4896696	8.046966	−2.972461	220.3927
Debt	750	0.504091	0.1930965	0.0437055	1.469336

Data Sources: Wind database.

Table 3. Panel unit root test.

	LLC test		Fisher-ADF test	
	Statistics	**p-value**	**Statistics**	**p-value**
Growth	−251.926	0.0000	522.352	0.0000
PB	−19.9687	0.0000	366.341	0.0000
ETR	−70.3577	0.0000	402.649	0.0000
Debt	−9.66832	0.0000	225.642	0.0001

Table 4. Granger causality test.

Chi-square statistic		Independent variable			
		growth	**PB**	**ETR**	**Debt**
Dependent variable	**growth**		8.71***	9.88***	5.25***
	PB	0.17		0.09***	0.01***
	ETR	1.22	3.97***		0
	Debt	8.42***	0.18	0.28	

relationship between the results shown in the following Table 5.

4.5. Summary for the Results

According to the estimation results in Table 4: the lag of the debt ratio has a positive impact on itself, and the lag phase 2 has a negative impact on itself. This indicates that in the early stage of enterprise development, excessive debt will cause bad reputation and may even increase. The cost of further financing of the enterprise. But the advantages of the latter part of business growth, low interest rates, debt financing Bunsen, low cost of capital will be gradually offset this negative impact; effect on the debt ratio is a lagging growth of the company is negative, this table Ming listed company late development, Generally, the equity financing method is preferred, rather than the debt financing method; the lag of the price-to-book ratio has a negative impact on the debt ratio, and the impact of the lag period 3 on the debt ratio is positive, indicating that the impact of the price-to-book ratio is intermittent. When the P/B ratio is high, this reflects the company's strong ability to profit from shareholders, and the company will use

Table 5. Panel VAR results.

	h_Grouth		
	β	Se	t
L.h_Growth	0.01808502	0.02249688	0.80388986
L.h_PB	−0.04555587	0.04155192	−1.0963601
L2.h_ETR	0.02204854	0.01386053	1.5907434*
	h_PB		
	β	Se	t
L.h_Growth	0.00719002	0.0127164	0.56541302
L.h_PB	0.49585893	0.33741845	1.4695668*
L2.h_ETR	−0.01361687	0.00776021	−1.7547033**
	h_Debt		
	β	Se	t
L.h_Growth	−0.00034601	0.000129	−2.6821906***
L.h_ETR	−0.00060461	0.00014408	−4.1964994***
L.h_Debt	0.72094056	0.184597	3.9054836***
L2.h_Growth	−0.00007161	0.00002051	−3.4913674***
L2.h_PB	−0.00134341	0.00016001	−8.3959867***
L2.h_ETR	0.00010335	0.00002938	3.5177591***
L3.h_PB	0.00144887	0.00031559	4.5910384***
L3.h_Debt	0.02901699	0.05185795	0.55954755

(Note: ***, **, * means significant at the confidence levels of 0.01, 0.05, and 0.1. h_ represents the Helmert conversion of the variable. Lh_ represents the first-order lag and Helmert conversion of the variable, similar to L2 is the second-order lag, L3 is the third-order lag.)

its good reputation to obtain more debt financing. Over time, companies will use equity financing to replace debt financing in order to protect their good reputation; the effective tax rate of income tax lags behind the impact of the debt ratio is negative, and the lag of the second period is positive. This shows that enterprises will raise debts in the early stage of raising the income tax rate to form a tax shield. In the later stage of the increase in the income tax rate, the company may have a positive expectation of the tax rate, and this behavior will be weakened.

5. Further Analysis

5.1. Impulse Response Analysis

The impulse response function can measure the current and future effects of other variables generated by the variation of a standard deviation of the random disturbance term, and visually display the dynamic interaction between the variables, and obtain the empirical basis for determining the time-lag relationship between the variables.

The orthogonal impulse response function is used in this paper. The figure below shows the results of the impulse response function obtained by simulating 500 times based on the Monte Carlo method and the 95% confidence interval.

Figure 1 (the first in the fourth row) gives Debt a standard deviation impact.

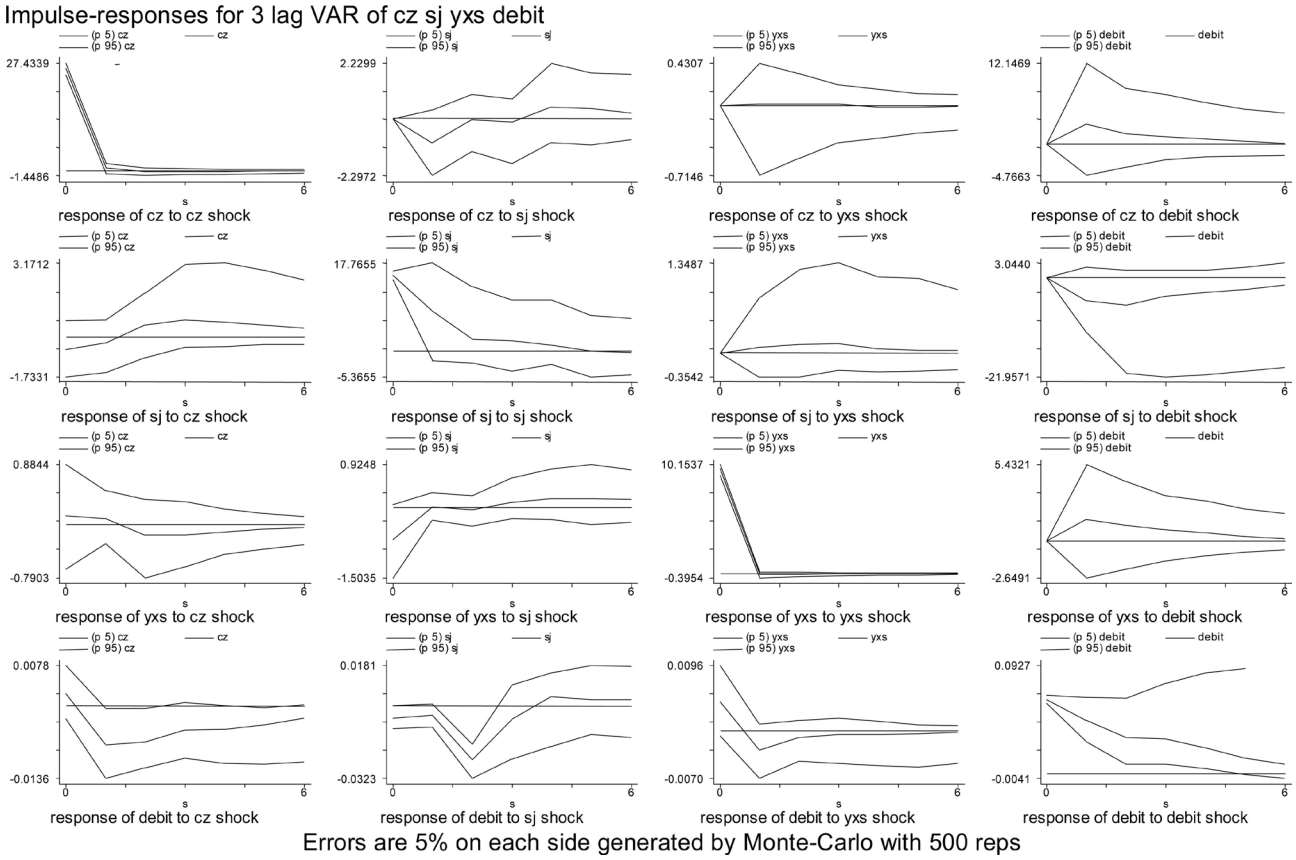

Figure 1. Impulse response analysis.

In the previous 0.5, Growth has a positive effect and quickly decreases to 0. In about 0.5 to 1.75, the Growth negative impact gradually reaches its maximum. Then, in the next three periods, it tends to 0 slowly, and in the long run, it will continue to have a small negative impact. Figure 1 (the second line of the fourth line) gives Debt a standard deviation impact. Similar to Growth's situation, PB will fluctuate in the first 3.5 periods. The difference is that the impact of the P/B ratio on the debt ratio is in the early stage. An "invalid" period, after about 0.75 period, will have a negative impact on steady growth. In the long run, there will be a small positive impact. Figure 1 (the third line of the fourth line) gives Debt a standard deviation impact. The impact of ETR in the first three periods will also fluctuate up and down, but the positive and negative effects will not exceed ± 0.01. The impact of the net rate, the growth of the enterprise and the effective tax rate of the income tax on the capital structure of the enterprise is volatility. The impact of the P/B ratio on the capital structure may have an "invalid period" in the short term, and the response time is slow, but the later explanation The ability to change capital structure is growing stronger; corporate growth and effective income tax rates are positively impacted in the short term and continue to have a negative impact in the long run.

5.2. Variance Decomposition Analysis

In order to more accurately describe business operations, shareholders' equity, tax burden, financing structure interaction effects of the degree, this variance decomposition by this tool, it has been the contribution of the impact of different endogenous variables VAR equations fluctuations. Table 6 gives the results of the variance decomposition for the 10^{th}, 20^{th} and 30^{th} forecast periods.

Specifically, the financing structure is greatly affected by itself. The operating operations, shareholders' equity, and tax burden contribute only about 10.5% to the variance contribution rate. The shareholder's equity contribution to the variance is the largest of these three, and its share. The increase in the number of periods is still rising slightly.

6. Conclusions

This paper empirically analyzes the dynamic interaction effects of business operations, shareholders' equity, tax burden, and financing structure. The results show that the impact of the P/B ratio, corporate growth rate and effective income tax rate on the capital structure of the enterprise is volatility. The impact of the P/B ratio on the capital structure may have an "invalid period" in the short term, and the response time is slow. However, the ability to explain changes in capital structure is becoming stronger and stronger in the later period; the growth rate of enterprises and the effective tax rate of income tax are positively affected in the short term and have a negative impact in the long run; the results of this paper reflect the development of enterprises in the process of enterprise development. Affected by the different nature of various aspects, the previous

Table 6. Variance decomposition.

	Forecast period	Growth	PB	ETR	Debt
Growth	10	0.97772106	0.00203013	0.000001577	0.02024724
PB		0.0047664	0.75355919	0.00014472	0.24152969
ETR		0.00098225	0.00609369	0.94812238	0.04480168
Debt		0.0169173	0.07442304	0.00289172	0.90576793
Growth	20	0.97770955	0.00203503	0.000001581	0.02025384
PB		0.00477605	0.7535896	0.0001447	0.24148965
ETR		0.00098243	0.00610963	0.94809458	0.04481336
Debt		0.01691692	0.07481215	0.00289032	0.9053806
Growth	30	0.97770955	0.00203503	0.000001581	0.02025384
PB		0.00477606	0.75358956	0.0001447	0.24148968
ETR		0.00098243	0.00610964	0.94809457	0.04481336
Debt		0.01691693	0.07481229	0.00289032	0.90538047

period was the debt financing preference, and the equity financing preference gradually appeared as the scale of the enterprise expanded.

The reasons for the above phenomenon may be: First of all, from the modified MM theory, the trade-off theory, it can be known that with the increase of the proportion of corporate debt in total assets, the risks faced by enterprises will also rise and they will easily fall into financial crisis. At the same time, this will increase the cost of additional capital and reduce the value of the business. Therefore, the optimal capital structure of an enterprise should be related to the operating conditions of the enterprise, tax burden, and shareholders' interests.

Secondly, for a company with a high P/B ratio, investors can get more shares of listed companies with lower investment when purchasing the company's stock. Therefore, it can reflect the investment value of the stock and the market's evaluation of the company's asset quality through the P/B ratio. A higher price-to-book ratio can lead to greater investment demand, that is, the company can raise equity at the same or lower cost of capital. In the long run, the impact of the rising P/B ratio will have a negative impact on the corporate debt ratio and reduce the proportion of corporate debt financing. However, equity financing requires a certain amount of preparation and review, so at the beginning of the shock, there appeared an "invalid period".

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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