The dynamic characteristics and influencing factors of debt structure of the public companies in China

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Abstract:

Purpose: In a macroeconomic environment with the non-tradable shares reform, financial crisis, tax reform and monetary policy, to examine the dynamic characteristics and factors of the debt maturity structure, this research tends to offer an empirical analysis about Chinese listed companies in different industries.

Design/methodology/approach: Learned from Leary (2009), Voutsinas and Werner (2011), this study designs a model of debt maturity structure with an unbalanced panel data set. Consists of 1352 Chinese listed companies with 8124 observations during the period of 2003-2011, the sample passed Hausman test, and the findings support the fixed effects model.

Findings: Besides the factors that have been confirmed by previous researches, debt maturity structure is also sensitive to other factors, such as economic expectations, monetary policy, financial restrictions and changes in tax rates.

Research limitations/implications: There are still many cases, which affect the debt maturity structure, are worth of further exploring, for instance, the impact of lagged monetary policy, the determinants of short-term debt ratio and the cost of operating.

Practical implications: From the macro point of view, research in this area enables the government to introduce more suitable policies that direct and promote the development of the bond market. From the micro point of view, it spurs corporations to choose proper finance structure.

Firms can learn from the research to adopt the efficient method and term of financing as well as debt structure.

Originality/value: In some way, conclusions of this paper contribute to the study of dynamic characteristics and factors of debt maturity structure in Chinese listed companies.

Keywords: maturity structure, debt structure, dynamic characteristics, panel data

1. Introduction

Since the Miller and Modigliani (1958) carried on the study of capital structure about modern enterprises, a large number of documents concerning the examination of capital structure theory appeared. With the development and innovation of the capital structure theory, the focus is gradually turning from the basic choice of leverage to the debt structure characteristics. And based on the development of the capital structure theory, there formed the trade-off theory, agency costs theory, information asymmetry hypothesis and tax hypothesis of debt maturity structure (Ho & Robinson, 1994). These basic theories have led to a series of derivate research on the determinants of debt structure (Bradley, Gregg & Han Kim, 1984; Titman & Wessels, 1988).

Compared with the mature financing environment abroad, the financing environment in China, under the economic transformation, is immature. The immature market has many restrictions that make the debt structure of the listed companies in China more complicated, for instance, the imbalanced development of capital markets and imperfect protection of investor. Especially after the financial crisis, what are the dynamic characteristics of the debt maturity structure in China's listed companies? Which factors affect the debt maturity structure? Can the western theories of debt maturity structure explain the debt structure problems in China? All these issues need theoretical analysis and empirical testing.

In this context, focusing on the debt structure of listed companies in China, this paper theoretically analyzes the impacts of macroeconomic factors and microeconomic factors on the debt structure. Furthermore, using a data set of 1352 companies during 2003-2011, this study analyzes the debt maturity structure empirically to test the dynamic characteristics and factors of the debt maturity structure in China. Researches in this area, from the macro point of view, enable the government to introduce more suitable policy to direct and promote the development of the bond market; from the micro point of view, they spur corporations to choose proper finance structure. Firms can learn from the researches to choose the efficient method and term of financing as well as debt structure.

2. Literature Review

Begin with the conclusion of Merton (1974), who held that the debt maturity structure is independent of enterprise value, many scholars began to study the debt maturity structure as well as the factors affect it. Now researches about the dynamic characteristics of debt maturity structure at home and abroad mainly focus on the following three aspects:

- **Researches on debt maturity structure theory.** According to the existing literatures, the theory of debt maturity structure falls into three categories: agency costs (Jensen, 1986), the deadline supporting theory (Hart & Moore, 1994), and information economics theory (Flannery, 1986; Kale & Noe, 1990; Diamond, 1991). The agency cost theory holds that the liabilities operations of modern enterprise caused the conflicts between creditors and shareholders, and accompany the conflicts, the agency costs of debt appeared. The main views of agency cost theory are: First, the short-term debt helps companies to avoid the overinvestment problems and solve the problems of insufficient investments; second, debt maturity increased with the increase of the firm size. The main views of the deadline supporting theory are: the debt maturity should be corresponded with the terms of the corporate assets, and debt maturity has an inverse relationship with asset depreciation rate. The main point of information economics theory believes that, the risk of the borrower is positively correlated with the debt maturity, and companies generally prefer to issue short-term debts. What's more, debt maturity is a non-monotonic function of the enterprise risk; borrowers of lowest risk or highest risk both have more short-term debts, while borrowers with moderate risk have more long-term debts.

- **Tests of debt maturity theory.** The test of debt maturity structure theory mainly concentrated on the trade-off theory (Miller, 1977; Myers, 2001) and the pecking order theory (Myers, 1984; Myers & Majluf, 1984). The trade-off theory holds that, instead of equity finance, debt finance can increase the market value of the enterprise due to the exits of the tax shield. But the rising debt levels will increase the financial cost (Philosophov & Philosophov 2005; Bany-Ariffin, Mat Nor & McGowan Jr., 2010), and intensify the agency conflicts of the companies (Jensen & Meckling, 1976 for; Frankfurter & Philippatos, 1992). The pecking order theory believes that, financial managers have the information that investors do not have. Therefore, enterprises tend to prefer internal finance, which do not suffer from information asymmetry, instead of external finance. If external finance is still needed, companies will issue bonds first. They insist that specific target capital structure is inexistence. In the past 30 years, researches about the validity of these two theories have not been unanimously approved so far (Hovakimian, Hovakimian & Tehranian, 2004; Huang & Song, 2006; Kayo &

Kimura, 2011; Gaud, Hoesli, & Bender, 2006; Frank & Goyal, 2004; Fuxiu, Yaohui, Zhengfei & Yan, 2008; Leary, 2009).

- **Factors affect the debt maturity structure.** The existing literatures suggest that, the main factors affecting debt maturity structure are firm size (Taub, 1975; Chen & Strange, 2005; Zuoping-Xiao, 2009; Zengfu-Li, Yan-Gu & Yujun-Lian, 2012), profitability(Titam & Wessels, 1988; Nunes & Serrasqueiro, 2007), non-debt tax shield (Bradley et al., 1984; Lord & McIntyre, 2003), tangible assets (Titam & Wessels, 1988; Gaud et al., 2006), accounts payable (Atanasova & Wilson, 2004; Steijvers, 2004), tax rates (Gordon & Lee, 2001; Zuoping-Xiao, 2009; Zengfu-Li, Yan-Gu & Yujun-Lian, 2012), ownership (Huacheng, Chunling & Chuan, 2007; Kun & Junrui, 2012), Bank of dependence (Carpenter, Fazzari & Petersen, 1994; Cantillo & Wright, 2000; Leary, 2009; Voutsinas & Werner, 2011) and so on. However, the positive or negative impact of these factors is a big controversial issue. Recently, the studies of Bougheas, Mizen and Yalcin (2006), Faulkender and Petersen (2006), Leary (2009) and Qinglu, Xiang and Qingchuan (2012) found the importance of financial constraints and monetary policy.

There are a large number of literatures researching on capital structure of listed companies in China, but rarely considering the factors and the dynamic characteristics of debt maturity structure under the environment of shareholder structure reform (begin in 2005), financial crisis (2008), tax rate reform (the new corporate income tax law passed through on March 16, 2007, and implemented on January 1, 2008) and monetary policy.

3. Methodology and data set

3.1. Sample

Consisting of companies listed in the A-share and B-share stock market of China over the period 2003-2011, the data set of this paper was taken from the CSMAR Solution database, and was filtered by following limitations:

- Excluding the listed companies in financial sector, because the accounting management and the liabilities characteristics of the enterprises in financial sector and other enterprises are different.

- Excluding the listed companies of ST * ST, SST, S * ST and S, because the financial structure of these companies prevalently have problems.

- Excluding the companies with missing accounting data and abnormal stock price changes, and the assets value of it unchanged.

The resulting data set consists of 8124 observations (see Table 1).

Table 1 presents the changes in the number of the state-owned enterprises and non-state-owned enterprises in various sectors during 2003-2011. As seen from the table, the number of non-state-owned enterprises was significantly greater than the state-owned enterprises after the reform of shareholder structure. And this trend becomes more apparent after 2008.

Industry	Nature of enterprise	2003	2004	2005	2006	2007	2008	2009	2010	2011
Food and beverage	Non state-owned enterprises	9	12	14	17	19	22	45	56	61
	State owned enterprise	42	42	41	40	33	35	17	17	20
Petrochemical	Non state-owned enterprises	10	16	11	20	33	44	85	130	179
	State owned enterprise	94	100	99	98	98	95	56	56	36
Electronics	Non state-owned enterprises	8	9	9	12	19	31	43	81	97
	State owned enterprise	30	32	33	32	43	37	22	26	25
Metal and nonmetal	Non state-owned enterprises	11	14	16	17	29	35	66	110	137
	State owned enterprise	80	81	79	86	85	83	55	40	31
Machinery and equipment	Non state-owned enterprises	27	32	38	41	69	81	147	223	313
	State owned enterprise	128	140	139	141	137	139	97	112	100
Pharmaceutical and biotech	Non state-owned enterprises	14	25	24	23	32	45	68	82	106
	State owned enterprise	55	59	56	59	52	38	21	22	19
Real estate	Non state-owned enterprises	28	30	31	39	33	38	67	78	83
	State owned enterprise	67	68	66	67	64	64	48	36	30
Wholesale and retail	Non state-owned enterprises	9	11	12	17	21	33	62	74	89
	State owned enterprise	72	74	74	70	68	60	33	32	26
Total	Non state-owned enterprises	116	149	155	186	255	329	583	834	1065
	State owned enterprise	568	596	587	593	580	551	349	341	287
	Total	684	745	742	779	835	880	932	1175	1352

Table 1. Distribution table of companies in different industries over the period 2003-2011

Figure 1 and 2 shows that, the average long-term debt ratio of state-owned enterprises is higher than the non-state-owned enterprises after 2006, and the reverse happens with the average short-term debt ratio after 2007. In general, the Asset-liability ratios of the state-owned enterprises are higher than that of the non-state-owned enterprises. This can be explained as that, due to the existence of the natural link between the state-owned enterprises and the five state-owned big banks, the state-owned enterprises faced better financing environment than the non-state-owned enterprises.

Figure 3 shows the changes in the asset-liability ratio and short-term liabilities rate of state-owned enterprises and non-state-owned enterprises during the year 2003-2011. As seen in the figure, there is a strong positive relationship between the asset-liability ratio and short-term

debt ratio to both state-owned enterprises and non-state-owned enterprises. There are two questions need to be thought about: First, the corporate bond market in China is underdeveloped, and corporate debt finance depends mainly on the currency market. Then, although short-term debt can reduce the cost of capital, it may bring financial distress.
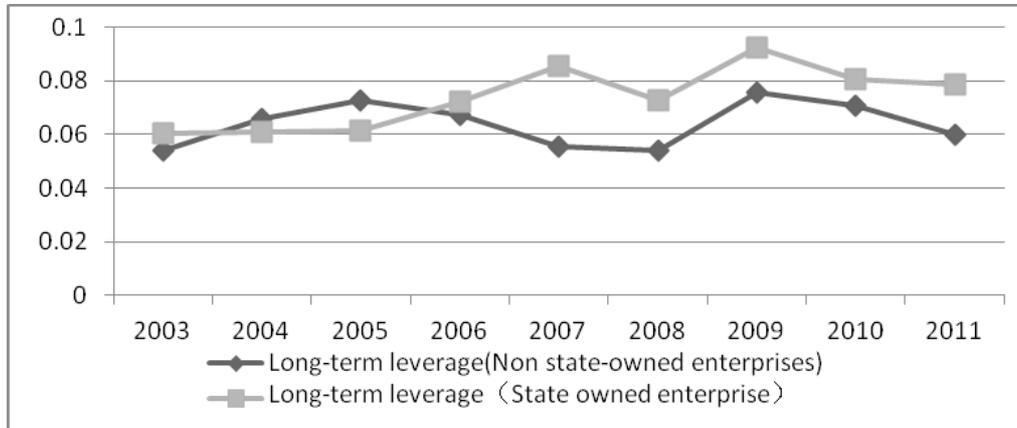

Figure 1. Long-term debt ratio of the state-owned enterprises and non-state-owned enterprises over the period 2003-2011
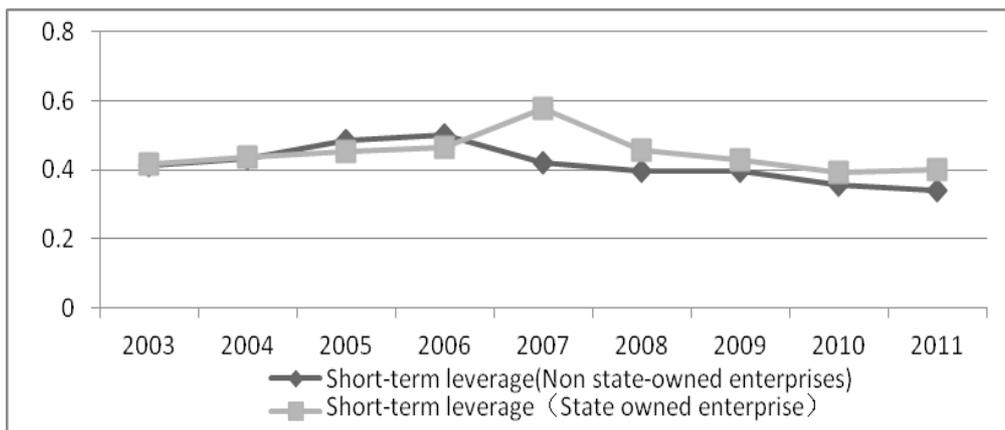

Figure 2. Short-term debt ratio of the state-owned enterprises and non-state-owned enterprises over the period 2003-2011
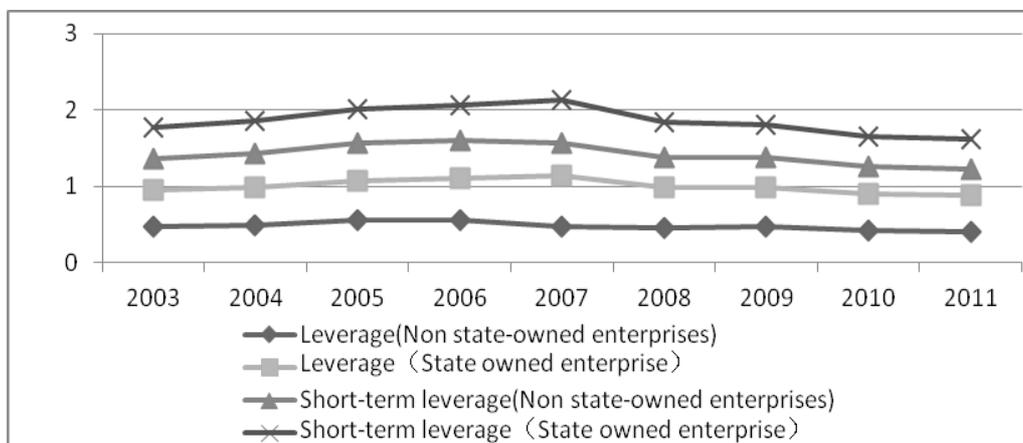

Figure 3. The tendency of the Asset-liability ratio and short-term debt ratio of the state-owned enterprises and non-state-owned enterprises over the period 2003-2011

3.2. Variables

This research is designed to examine the dynamic characteristics and factors of the debt maturity structure in various industries of Chinese listed companies. It takes into consideration of important changes in the macroeconomic environment, like tradable share, financial crisis, tax reform and monetary policy. Inspired by existing domestic and international literatures, following variables have been set with the consideration of the macroeconomic environment in China. Specific definition of the variables is shown in Table 2.

Variable	Variable definition
Leverage	Total debts/ total assets
Short-term leverage	(Commercial paper + short-term borrowings + short-term corporate bonds + long -term debt and maturities within 1 year) / total assets
Long-term leverage	(Long-term corporate bonds + long-term debt)
Bankdep$_1$	Dummy variable. 1 if total debt increased than the year before, and 0 if not.
Bankdep$_2$	Dummy variable. 1 if current liabilities increased than the year before, and 0 if not.
Money Policy	Dummy variable. 1 if interest rate increased than the year before, and 0 if not
Money Policy(t-1)	Dummy variable. 1 if the growth rate of total loans in all banks increased than the year before, and 0 if not and unchanged.
Tangfassets	Total tangible fixed assets/total assets
EBIT	EBIT/total assets
Retearnings	(Profit reserves+various voluntary reserves +retained earnings carnings forward)/total assets
Non-debt tax shields	Over the period 2003-2008：[PROFIT-(T/0.33)]/total assets；over the period 2009-2011：[PROFIT-(T/0.25)]/total assets. PROFIT is the net profit before tax, and T is the taxes of the sample corporate.
Accountspay	(Notes payable and accounts payable)/total assets
Logsales	Natural logarithm of sales and operating revenue
Equity to debt ratio	Equity/Debt
Nature of enterprise	Dummy variable. 1 if state-owned corporate, and 0 if not (A firm is classified as a state-owned corporate only if the ownership share of the state is more than 0)
Gdp Growth	[(Gdp$_t$-Gdp$_{t-1}$)/ Gdp$_{t-1}$]*100%
Industry$_i$	Dummy variable. The food and beverage industry has the value of 1, petrochemical industry of 2, electronics industry of 3, metal and nonmetal industry of 4, machinery and equipment industry of 5, pharmaceutical and biotech industry of 6, real estate industry of 7, and wholesale and retail industry of 8.

Table 2. Variables definitions

3.3. Methodology

According to the dynamic characteristics of the debt maturity structure (asset-liability ratio, long-term debt ratio and short-term debt ratio) of the listed companies in China, this paper builds a panel data model. Learned from Leary (2009), Voutsinas and Werner (2011), we designed the following models:

$$y_{i,t} = a + a_1 Bankdep_1 + a_2 Bankdep_2 + a_3 Monetarypolicy$$

$$+ \sum_{t=1}^{9} W_t + \sum_{i=1}^{8} Industy_i + \sum_{i=1}^{2} D_i + \sum_{i=1}^{6} \beta_{i,t} x_{i,t} + u_i + \varepsilon_{i,t} \tag{1}$$

$$y_{i,t} = a + a_1 Bankdep_1 + a_2 Bankdep_2 + a_3 Monetarypolicy_{t-1}$$

$$+ \sum_{t=1}^{9} W_t + \sum_{i=1}^{8} Industy_i + \sum_{i=1}^{2} D_i + \sum_{i=1}^{6} \beta_{i,t} x_{i,t} + u_i + \varepsilon_{i,t}$$

(2)

Where $y_{i,t}$ is for Leverage, Short-term leverage and Long-term leverage; $Bankdep_1$ is for bank dependence 1; $Bankdep_2$ is for bank dependence 2; Monetarypolicy is monetary policy; $\beta_{i,t}$ is the coefficient of $x_{i,t}$; a is the constant term; $x_{i,t}$ is for Tangfassets, EBIT, Retearnings, Non-debt overtax shields, Accountspay, Logsales, Gdp Growth and Equity to debt over ratio; W_t is a dummy variable, and 1 If it belonging to the t cross-section, and 0 if not, t=1,2,…T; D_i is a dummy variable, and 1 If it belonging to the i cross-section, and 0 if not, i=1,2; Industry is a dummy variable; u_i is the fixed effects; $\varepsilon_{i,t}$ is the residuals.

4. Results and discussion

4.1. Descriptive statistics

Table 3 depicts the results about the descriptive statistics of the financial indicators in the panel data set, which consists of 8124 observations of different ownership over the period 2003-2011. Among them, the number of state-owned enterprises observations is 4452 and non-state-owned enterprises is 3672. The average ratio of leverage, long-term leverages and short-term leverage of state-owned enterprises are 0.527, 0.072 and 0.455, higher than the non-state-owned enterprises of 0.449, 0.065 and 0.3844. And the Retearnings of non-state-owned enterprises is at an average of 0.073, significantly higher than the state-owned enterprises (-0.112). What's more, the average equity to debt ratio of non-state-owned enterprises is 2.443, significantly higher than the state-owned enterprises (1.487). As a result, the asset quality of non-state-owned enterprises is better than that of state-owned enterprises.

Nature of enterprise		Leverage	Long-term leverage	Short-term leverage	Tangfassets	EBIT	Retearnings	Non-debt tax shields	Accountspay	Logsales	Equity to debt ratio
Non state-owned enterprises	Mean	0.4495	0.0650	0.3844	0.9625	0.0675	0.0729	0.0584	0.1225	2.0844	2.4433
	N	3672	3672	3672	3672	3672	3672	3672	3672	3666	3672
	Std.	0.2388	0.0963	0.1995	0.0344	0.0562	0.9893	0.0592	0.0955	0.5748	3.6322
	Min	0.0203	0.0000	0.0117	0.7555	-0.3979	-58.150	-0.4324	0.0000	-1.4407	-0.8325
	Max	5.9700	2.2968	3.6732	1.0000	0.4927	0.7171	0.4424	0.5621	4.2097	48.359
State owned enterprise	Mean	0.5269	0.0722	0.4547	0.9670	0.0619	-0.1128	0.0507	0.1235	2.1672	1.4874
	N	4452	4452	4452	4452	4452	4451	4452	4451	4444	4452
	Std.	1.2442	0.1600	1.1128	0.0364	0.5930	6.4025	0.5936	0.0998	0.5980	1.9868
	Min	0.0283	0.0000	0.0260	0.4930	-1.0210	-251.76	-1.1183	0.0000	-0.1823	-0.9879
	Max	82.5596	8.8267	73.732	1.0000	39.313	12.773	39.313	0.5544	4.4948	34.361

Table 3. The descriptive statistics of the panel data for enterprise's financial indicators in different ownerships (where *m* is the mass, *x* is the displacement)

It depicts the descriptive statistics results of the financial indicators about different industries during the year of 2003-2011 in Table 4.

Industry		Leverage	Long-leverage	Short-m leverage	Tangfassets	EBIT	Retearnings	Non-debt tax shields	Accountspay	Logsales	Equity to debt ratio
The food and beverage	Mean	0.451	0.044	0.407	0.950	0.063	0.058	0.052	0.080	2.081	2.089
	N	542	542	542	542	542	542	542	542	542	542
	Std.	0.210	0.058	0.196	0.043	0.080	0.235	0.086	0.068	0.557	3.154
	Min	0.027	0.000	0.019	0.772	-0.311	-1.659	-0.325	0.000	0.517	-0.459
	Max	1.848	0.350	1.846	1.000	0.392	0.647	0.364	0.414	3.855	35.440
Petrochemical	Mean	0.458	0.084	0.374	0.963	0.061	0.102	0.047	0.110	2.135	2.104
	N	1260	1260	1260	1260	1260	1260	1260	1260	1260	1260
	Std.	0.189	0.102	0.168	0.035	0.063	0.128	0.066	0.075	0.460	3.204
	Min	0.020	0.000	0.019	0.773	-0.322	-1.319	-0.362	0.000	0.102	-0.051
	Max	1.054	0.535	1.034	1.000	0.502	0.576	0.497	0.422	3.980	48.360
Electronics	Mean	0.371	0.048	0.322	0.970	0.054	0.092	0.045	0.118	1.955	3.191
	N	589	589	589	589	589	589	589	589	590	589
	Std.	0.183	0.073	0.170	0.025	0.064	0.165	0.067	0.084	0.529	4.156
	Min	0.028	0.000	0.012	0.802	-0.509	-1.820	-0.528	0.000	-1.074	0.044
	Max	0.958	0.517	0.907	1.000	0.245	0.551	0.233	0.548	3.784	34.279
Metal and nonmetal	Mean	0.516	0.102	0.413	0.968	0.064	0.096	0.049	0.117	2.440	1.476
	N	1055	1055	1055	1055	1055	1054	1055	1054	1055	1055
	Std.	0.175	0.097	0.161	0.031	0.058	0.192	0.061	0.076	0.671	2.277
	Min	0.032	0.000	0.018	0.796	-0.265	-4.287	-0.284	0.000	0.487	0.020
	Max	0.981	0.479	0.971	1.000	0.599	0.591	0.561	0.422	4.171	30.489
Machinery and equipment	Mean	0.459	0.040	0.418	0.963	0.059	0.086	0.052	0.166	2.115	2.045
	N	2104	2104	2104	2104	2104	2104	2104	2104	2103	2104
	Std.	0.197	0.071	0.182	0.032	0.051	0.165	0.054	0.112	0.585	2.826
	Min	0.028	0.000	0.028	0.695	-0.431	-2.795	-0.460	0.000	-0.182	-0.560
	Max	2.271	2.083	0.980	1.000	0.352	0.510	0.347	0.562	4.495	34.978
Pharmaceutical and biotech	Mean	0.402	0.045	0.357	0.951	0.074	0.119	0.064	0.092	1.950	2.741
	N	800	800	800	800	800	800	800	800	800	800
	Std.	0.194	0.060	0.180	0.039	0.069	0.170	0.072	0.077	0.502	3.618
	Min	0.028	0.000	0.023	0.741	-0.257	-0.962	-0.285	0.000	0.385	0.035
	Max	0.966	0.413	0.954	1.000	0.493	0.717	0.442	0.459	3.740	34.362
Real estate	Mean	0.707	0.141	0.566	0.986	0.089	-0.952	0.081	0.068	1.911	0.940
	N	937	937	937	937	937	937	937	937	925	937
	Std.	2.692	0.316	2.404	0.031	1.287	14.058	1.287	0.064	0.579	1.361
	Min	0.045	0.000	0.045	0.493	-1.021	-251.76	-1.118	0.000	-1.441	-0.988
	Max	82.560	8.827	73.733	1.000	39.313	12.774	39.313	0.454	3.856	21.006
Wholesale and retail	Mean	0.553	0.048	0.504	0.965	0.056	0.080	0.046	0.164	2.337	1.191
	N	837	837	837	837	837	837	837	837	835	837
	Std.	0.182	0.067	0.175	0.040	0.052	0.132	0.054	0.124	0.581	1.461
	Min	0.069	0.000	0.063	0.750	-0.398	-1.507	-0.432	0.000	0.511	-0.114
	Max	1.128	0.411	0.931	1.000	0.365	0.617	0.359	0.560	4.210	13.579
Total	Mean	0.492	0.069	0.423	0.965	0.064	-0.029	0.054	0.123	2.130	1.919
	N	8124	8124	8124	8124	8124	8123	8124	8123	8110	8124
	Std.	0.936	0.135	0.835	0.036	0.441	4.786	0.441	0.098	0.589	2.890
	Min	0.020	0.000	0.012	0.493	-1.021	-251.76	-1.118	0.000	-1.441	-0.988
	Max	82.560	8.827	73.733	1.000	39.313	12.774	39.313	0.562	4.495	48.360

Table 4. The descriptive statistics of the financial indicators panel data in different industries

Among them, the number of food and beverage industry observations is 542, the petrochemical industry is 1260, the electronics industry is 589, the metal and nonmetal industry is 1055, the machinery and equipment industry is 2104, the pharmaceutical and biotech industry is 800, the real estate industry is 937, and the wholesale and retail industry is 837. The average ratio of leverage, long-term leverages and short-term leverage of the real estate industry are 0.527, 0.072 and 0.455, apparently higher than any other industries. And the average Accountspay of machinery and equipment industry and the wholesale and retail industry are 0.166 and 0.164, generally higher than any other industries. In addition, the electronic industry (3.19) has the highest equity to debt ratio and the real estate industry (0.94) the lowest. So asset structure of the real estate industry is different from that of other industries, and its debt structure was significantly greater than other industries.

Table 5 and Table 6 are the results about the Pearson correlation test of each variable. Leverage is significantly positively correlated with Long-term leverage and Short-term leverages (0.776, 0.995); especially the correlation between Leverage and Short-term leverage almost approaches 1. Distinctively, both Leverage and Short-term leverage have strong positive relationship with EBIT, Non-debt over tax shields, Accountspay, and Logsales, while Long-term leverage and Accountspay are significantly negatively related. This illustrates that, corporations with stronger profitability have higher asset-liability ratio and short-term debt rate, and mainly depend on short-term debt to solve the accounts payable rate problems. Leverage, Long-term leverage, and Short-term leverage have a significantly negative correlation with Retearnings and Equity to debt ratio (-0.161, -0.182 and -0.151), which indicates that the debt maturity structure can be reduced as the Retearnings and equity increased.

	Leverage	Long-leverage	Short-leverage	Tangfassets	EBIT	Retearnings	Non-debt tax shields	Accountspay	Logsales
Leverage	1								
Long-term leverage	.776**	1							
Short-term leverage	.995**	.707**	1						
Tangfassets	.011	.043**	.005	1					
EBIT	.955**	.707**	.955**	.018	1				
Retearnings	-.57**	-.418**	-.573**	-.020	-.57**	1			
Non-debt tax shields	.950**	.703**	.951**	.022*	1.00**	-.576**	1		
Accountspay	.052**	-.114**	.077**	-.004	-.02*	.028*	-.023*	1	
Logsales	.324**	.176**	.274**	.081**	.18**	.206**	.166**	.366**	1
N	8124	8124	8124	8124	8124	8124	8124	8124	8124

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed)

Table5. Correlations matrix, table of Pearson correlation test for each variable

Table 6 shows that Leverage, Long-term leverage and Short-term leverage are inversely related to industry and the ownership of enterprise significantly, indicating that the debt levels

of mechanical and equipment, medical biology, real estate, and wholesale and retail industry are higher than those of the food, petrochemical, electronics and metal industry. Moreover, the debt level of state-owned enterprises is higher than that of the non-state-owned enterprises. Leverage and Short-term leverage have a significantly negative correlation with the Year (-0.032 and -0.039), showing that, the debt financing circumstance of enterprises in the sample, which is affected by monetary policy and financial restrictions, is increasingly tightening over the period 2003-2011.

	Leverage	Long-term leverage	Short-term leverage	Industry	Year	Nature of enterprise	Equity to debt ratio
Leverage	1						
Long-term leverage	.776**	1					
Short-term leverage	.995**	.707**	1				
Industry	.052**	.022*	.055**	1			
Year	-.032**	.020	-.039**	-.041**	1		
Nature of enterprise	.041**	.026*	.042**	.006	-.457**	1	
Equity to debt ratio	-.161**	-.182**	-.151**	-.106**	.195**	-.165**	1
N	8124	8124	8124	8124	8124	8124	8124

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed)

Table 6. Correlations matrix, table of Pearson correlation test for each variable

4.2. Regressions results

First, we analyze the dynamic characteristics and factors of Leverage, Short-term leverage and Long-term leverage under the influence of the current monetary policy, and the main results of fixed effects regression are shown in Table 7.

Leverage is positively correlated with Bankdep1, EBIT, Accountspay and Logsales significantly, indicating that enterprises with bigger asset size and higher profitability have easier access to bank loans, thus resulting in an increase of asset-liability ratio. This is consistent with the conclusions of many researches both in China and abroad (Leary, 2009; Voutsinas & Werner, 2011; Xunan-Feng, 2012). Leverage has a significantly positive association with Year2005, Year2006, Year2008, Year2009 and Year2011, stating that regardless of the financial constraints and the impact of monetary policy, the listed companies in China tend to depend on long-term bank debt finance. Significantly, Leverage is negatively related to Retearnings and Equity to debt ratio, indicating that the higher the equity ratio of the corporation the lower the asset-liability ratio is. In addition, Leverage was negatively associated with the Non-debt tax shields and Nature of enterprise, which declaring that the asset-liability ratio reduced due to the decline of tax ratio. And relative to non-state-owned enterprises, the state-owned enterprises push down the asset-liability ratio more. The value of R2 (within) and R2 (between) are 0.574 and 0.689, which indicate a good fit for the model created. And the P value of Hausman test is 0, so a fixed effects model was supported.

Variable	Leverage	Short-term leverage	Long-term leverage
Bankdep1	0.0318 ***	0.0576***	-0.0257***
	(9.58)	(20.54)	(-7.52)
Bankdep2	0.0025	-0.0539***	0.0564***
	(0.78)	(-19.89)	(17.08)
Money Policy	0.0065	0.0143**	-0.0078
	(0.84)	(2.2)	(-0.99)
Tangfassets	0.0651	0.0433	0.0217
	(1.74)	(1.38)	(0.57)
EBIT	3.9874***	0.0167	3.9706***
	(28.5)	(0.14)	(27.63)
Retearnings	-0.2483***	-0.0923***	-0.1560***
	(-37.5)	(-16.55)	(-22.94)
Non-debt tax shields	-4.2197***	-0.0299	-4.1898***
	(-30.87)	(-0.26)	(-29.85)
Accountspay	0.1814***	-0.1717***	0.3530***
	(11.2)	(-12.59)	(21.23)
Logsales	0.0654***	0.0177***	0.0477***
	(14.07)	(4.52)	(9.99)
Nature of enterprise	-0.0064**	0.0006	-0.0070**
	(-2.34)	(0.28)	(-2.5)
equity to debt ratio	-0.0347***	-0.0090***	-0.0257***
	(-42.39)	(-13.08)	(-30.55)
GDPg	0.0031	-0.0011	0.0042*
	(1.56)	(-0.65)	(2.05)
Year2004	0.0107	-0.0107	0.0213***
	(1.39)	(-1.65)	(2.71)
Year2005	0.0236***	0.0056	0.0180***
	(5.42)	(1.52)	(4.03)
Year2006	0.0346***	-0.0198***	0.0545***
	(7.66)	(-5.22)	(11.74)
Year2007	(omitted)	(omitted)	(omitted)
Year2008	0.0149***	0.0133***	0.0016
	(3.34)	(3.54)	(0.35)
Year2009	0.0376***	0.0312***	0.0064
	(7.54)	(7.43)	(1.24)
Year2010	0.0054	0.0146**	-0.0092
	(0.67)	(2.18)	(-1.13)
Year2011	0.0355***	0.0182**	0.0173
	(3.42)	(2.09)	(1.62)
Constant	0.2357***	0.0265	0.2091***
	(5.51)	(0.74)	(4.76)
R-sq: within	0.5738	0.1835	0.4819
between	0.6886	0.1934	0.6909
overall	0.6866	0.2125	0.6276
corr(u_i, Xb)	0.0316	0.0559	0.0476
sigma_u	0.1232	0.0588	0.1049
sigma_e	0.0713	0.0601	0.0733
rho	0.7489	0.4897	0.6720
chi2	841.38	101.05	412.81
Hausman	0.0000	0.0000	0.0000

P-values are in parenthesis; *** Indicates statistical significance at the 0.01 level; ** Indicates statistical significance at the 0.05 level. * Indicates statistical significance at the 0.10 level

Table 7. Fixed-effects Regression of model-1

Short-term leverage has significantly positive relation to Bankdep1, Money Policy and Logsales, declaring that corporations with more profit would increase the ratio of short-term debts in the crunch. This is in line with the report of Wenchao-Ma and Siyue-Hu (2012). Short-term leverage is positively and significantly related to Year2008, Year2009, Year2010, Year2011, showing that after the financial crisis, the deterioration of the operating environment led a number of listed companies to make up the gap of working capital by short-term debts. There is a negative and significant relationship between Short-term leverage and Bankdep2, Retearnings and Equity to debt ratio, indicating that corporations with high equity to debt ratio have low short-term debt ratio. In addition, Short-term leverage has a negative and significant

correlation with Accountspay, stating that listed companies in China mainly rely on long-term liabilities to solve the problems of Accounts Payable. However, one needs to think over this question from the cost of working capital. The P value of Hausman test is 0, which supports the fixed effects model. While the value of R2 (within) and R2 (between) are 0.183 and 0.193, suggesting a poor fit for the model.

Long-term leverage has positive association with Bankdep2, EBIT, Accountspay, Logsales and GDPg, significantly. It indicates that enterprises with strong profitability have easier access to bank loans, thus led to an increase of their asset-liability ratio. While the enterprises will increase the ratio of long-term debt since they take an optimistic view about the economic situation. This is in accordance with many researching results in both China and aboard (Leary, 2009; Wenchao-Ma & Siyue-Hu, 2012; Xunan-Feng, 2012). Long-term leverage is positively and significantly related to Year2004, Year2005, Year2006, declaring that the long-term bank debt finance of listed companies in China is related to economic expectations and financial restrictions. Long-term leverage has significant and negative correlation with Bankdep1, Retearnings and Equity to debt ratio, showing that the higher the equity ratio of the corporate is, the lower the asset-liability ratio is. Moreover, Long-term leverage is negatively associated with the Non-debt tax shields and Nature of enterprise, which declaring that the asset-liability ratio reduced due to the decline of tax ratio. And relative to non-state-owned enterprises, the state-owned enterprises have lower asset-liability ratio. With a good fit for the model, the R2 (within) and R2 (between) have the value of 0.482 and 0.691, and the P value of Hausman test is 0, so a fixed effects model was accepted.

Table 8 shows the results of the fixed effects regression under the influence of monetary policy, which has been lagged once.

Leverage has significantly positive correlation with Bankdep1, EBIT, Accountspay and Logsales. It indicates that enterprises with bigger asset size and higher profitability have easier access to bank loans, thus result in an increase of their asset-liability ratio, which is consistent with the empirical results in Table 7. Significantly, Leverage is positively related to Year2006, but it is negatively correlated with Year2008, stating that the debt structure of listed companies in China is vulnerable to the impact of financial constraints and monetary policy.

Leverage is negatively correlated to Retearnings and Equity to debt ratio significantly, this indicates that the corporate with higher equity ratio would have a lower asset-liability ratio. In addition, Leverage was negatively associated with the Non-debt tax shields, Nature of enterprise and GDPg, which declaring that the asset-liability ratio reduced due to the decline of tax ratio. And relative to non-state-owned enterprises, the state-owned enterprises will have lower asset-liability ratio. At the same time, enterprises will decrease the asset-liability ratio since they have optimistic economic expectations, which is in contrast with the conclusions of Table 7. With a good fit for the model, R2 (within) and R2 (between) have the value of 0.572

and 0.690, and the P value of Hausman test is 0, so the regression model of Leverage supports the fixed effects model.

Variable	Leverage	Short-term leverage	Long-term leverage
Bankdep1	0.0265***	0.0509***	-0.0244***
	(9.11)	(19.49)	(-7.42)
Bankdep2	0.0030	-0.0505***	0.0535***
	(1.08)	(-20.12)	(16.96)
Money Policy$_{(t-1)}$	0.0008	-0.0116	0.0124
	(0.09)	(-1.5)	(1.28)
Tangfassets	0.0296	0.0029	0.0267
	(0.77)	(0.08)	(0.62)
EBIT	2.9317***	-0.3029**	3.2346***
	(20.83)	(-2.4)	(20.38)
Retearnings	-0.1408***	0.0044	-0.1452***
	(-16.04)	(0.55)	(-14.67)
Non-debt tax shields	-3.1893***	0.2325*	-3.4219***
	(-23.13)	(1.95)	(-22.01)
Accountspay	0.1670***	-0.1605***	0.3274***
	(10.41)	(-11.16)	(18.11)
Logsales	0.0471***	0.0099**	0.0372***
	(9.91)	(2.32)	(6.93)
Nature of enterprise	-0.0044	0.0007	-0.0051
	(-1.76)	(0.29)	(-1.79)
equity to debt ratio	-0.0477***	-0.0135***	-0.0342***
	(-47.21)	(-14.89)	(-30.02)
GDPg	-0.0024***	-0.0044***	0.0019**
	(-3.37)	(-6.75)	(2.38)
Year2004	-0.0142	-0.0377***	0.0236**
	(-1.66)	(-4.93)	(2.45)
Year2005	-0.0054	-0.0194***	0.0140***
	(-1.6)	(-6.39)	(3.67)
Year2006	0.0204**	-0.0384***	0.0588***
	(2.21)	(-4.64)	(5.65)
Year2007	(omitted)	(omitted)	(omitted)
Year2008	-0.0169***	-0.0160***	-0.0009
	(-5.28)	(-5.58)	(-0.24)
Year2009	0.0028	-0.0130	0.0158
	(0.31)	(-1.62)	(1.56)
Year2010	-0.0072	-0.0016	-0.0056
	(-0.8)	(-0.19)	(-0.55)
Year2011	(omitted)	(omitted)	(omitted)
Constant	0.4261***	0.1602***	0.2660***
	(10.65)	(4.46)	(5.89)
R-sq: within	0.5716	0.1871	0.4666
between	0.6902	0.1815	0.6846
overall	0.6842	0.2125	0.6175
corr(u_i, Xb)	0.0752	0.0915	0.0813
sigma_u	0.1175	0.0627	0.1017
sigma_e	0.0596	0.0534	0.0672
rho	0.7955	0.5794	0.6964
chi2	973.51	228.47	463.87
Hausman	0.0000	0.0000	0.0000

P-values are in parenthesis; *** Indicates statistical significance at the 0.01 level; ** Indicates statistical significance at the 0.05 level. * Indicates statistical significance at the 0.10 level

Table 8. Fixed-effects Regression of model-2

Short-term leverage has significantly positive relationship with Bankdep1 and Logsales, indicating that more profitable corporations would increase their ratio of short-term debt. Short-term leverage was positively associated with the Non-debt tax shields, declaring that the asset-liability ratio increased due to the decline of tax ratio. There is significant and negative relation between the Short-term leverage and Year2004, Year2005, Year2006, Year2008, and it is in contrast with the conclusions of Table 7. What's more, Short-term leverage is significantly

and negatively related to Bankdep2, Retearnings and Equity to debt ratio, indicating that corporations with higher equity ratio have lower short-term debt ratio. In addition, Short-term leverage has a negative correlation with EBIT, Accountspay and CDPg, and it is statistically significant. This states that listed companies in China mainly rely on long-term liabilities to solve the problems of Accounts Payable. At the same time, the enterprises will decrease the asset-liability ratio since they have optimistic expectations. The P value of Hausman test is 0, which supports the fixed effects model. While the value of R2 (within) and R2 (between) are 0.183 and 0.193, suggesting the poor fit for the model.

Significantly, Long-term leverage has positive association with Bankdep2, EBIT, Accountspay, Logsales and GDPg, significantly. It indicates that enterprises with strong profitability have easier access to bank loans, thus led to an increase of their asset-liability ratio. While the enterprises will increase the ratio of long-term debt since they take an optimistic view about the economic. This is in accordance with many research both in China and aboard (Leary, 2009; Wenchao-Ma & Siyue-Hu, 2012; Xunan-Feng, 2012). What's more, Long-term leverage is positively related to Year2004, Year2005, Year2006, declaring that the long-term bank debt finance of listed companies is related to economic expectations and financial restrictions. Long-term leverage was significantly and negatively correlated with Bankdep1, Retearnings and Equity to debt ratio, showing that the higher the equity ratio of the corporate is, and the lower the asset-liability ratio is. In addition, Long-term leverage is negatively associated with the Non-debt tax shields, declaring that the asset-liability ratio reduced due to the decline of tax ratio. With a good fit for the model, the value of R2 (within) and R2 (between) are 0.467 and 0.685, and the P value of Hausman test is 0, so a fixed effects model of Long-term leverage was supported.

5. Conclusions

Based on the debt maturity structure theory and learning from Leary (2009), Voutsinas and Werner (2011), this study designs a model to investigate the dynamic characteristics and factors of debt maturity structure. It offers an empirical analysis of Chinese listed companies in different industries under a macroeconomic environment of non-tradable shares reform, financial crisis, tax reform and monetary policy. Using a panel data set of 8124 observations during 2003-2011, we found that, besides the enterprise characteristic factors, corporate debt maturity structure is sensitive to economic expectations, monetary policy, financial restrictions and changes in tax rates. The results of the empirical study show that:

- The debt maturity structure of state-owned enterprises is significantly higher than that of non-state-owned enterprises, indicating that state-owned enterprises faced more favorable financing environment than the non-state-owned enterprises;

- Corporations with larger scale of assets and more profitable have higher asset-liability ratio, and the phenomenon is reversed when it comes to the corporations with higher equity to debt ratio.

- Long-term debt ratio and asset-liability ratio is related to economic expectations, monetary policy, financial restrictions and changes in tax rates.

- After the financial crisis, the deterioration of the operating environment caused a number of listed companies in China to make up the gap of working capital by short-term debt.

- Resulting from reduction in tax rate, the short-term debts of corporations increased, but the long-term debts ratio and asset-liability ratio dropped down.

- Listed companies in China mainly rely on long-term liabilities to solve the problems of Accounts Payable, however, ones still need think over this question from the point of view of the cost of working capital.

Overall, in some way, the conclusions of this paper contribute to the study of dynamic characteristics and factors of debt maturity structure. However, there is still a lot can be further studied, for instance, the impact of lagged monetary policy, the determinants of short-term debt ratio and the cost of operating.

Acknowledgements

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