The Impact of Debt Maturity Structure on Equity Returns

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Abstract: Debt financing is more flexible than equity financing, and the debt maturity structure significantly impacts financing costs and risks, as well as corporate operations. Using data from non-financial A-share listed companies in China from 2002 to 2022, this study examines the impact of debt maturity structure (long-term debt / debttotal) on equity returns. Results show a significant positive correlation between debt maturity structure and equity returns. Under a given leverage ratio, high-debt-maturity-structure portfolios deliver higher excess returns than low-debt-maturity-structure portfolios. This research highlights the importance of debt maturity structure in corporate value and financing decisions, providing insights into optimizing corporate capital structure.

***Keywords*:** debt maturity structure, equity return, factor model

1. Introduction

The revised MM theory highlights that excessive debt can damage firm value due to bankruptcy costs, emphasizing the importance of capital structure decisions. Companies should consider both leverage ratios and the mix of long-term and short-term debt. This paper examines the relationship between corporate leverage and equity returns through the lens of debt maturity structure. It finds that short-term debt may raise financial risks, while long-term debt may increase risk premiums. Using cross-sectional regression and portfolio analysis, along with the Fama-French three-factor and five-factor models, the study explores how debt maturity structure affects equity returns.

2. Theoretical Analysis and Hypothesis Development

The debt maturity structure affects financing costs, with short-term debt having lower rates and long-term debt being more expensive. By using both types of debt wisely and adjusting the maturity structure based on market conditions, companies can lower financing costs and boost equity returns[1]. This approach helps firms optimize their debt structure to better adapt to market changes and create more opportunities for growth.

When leverage is constant, high long-term debt limits a company's flexibility to expand, invest, and adapt to market changes, increasing credit risk and reducing profitability and equity returns[2]. In contrast, short-term debt enhances financial flexibility, eases debt accumulation, and lowers equity risk. Thus, higher short-term debt allows a company to better manage leverage in adverse conditions. Based on the above analysis, this paper proposes:

Hypothesis 1: An increase in a company's debt maturity structure will lead to higher equity returns.

Hypothesis 2: At constant leverage, portfolios with higher debt maturity structures have higher excess returns, explained by standard systematic risk factors.

3. Empirical Analysis

This paper selects A-share companies from 2002 to 2022 as the initial sample and screens the data. Table 1 shows descriptive statistics for key variables: Excess return (RET%) is the monthly stock return, adjusted for cash dividends and minus the risk-free rate. Debt maturity structure (Mat) is long-term debt divided by total debt[3].

3.1 Data Description and Descriptive Statistics

Table 1: Descriptive Statistics

Variable	Obs	Mean	SD	Min	Max
RET(%)	382974	1.338	14.254	-78.373	456.190
LEV	382974	0.451	0.201	0.008	9.699
Mat	382974	0.751	0.205	0.017	0.983
β	382974	1.105	0.768	-77	59.333

Variable	Obs	Mean	SD	Min	Max
ME	382974	1.213	4.570	0.023	278.600
I/A	382974	0.070	0.005	0.017	0.082
ROE(%)	382974	1.032	23.124	-5879.34	80.354
BM	382974	0.028	0.013	-0.096	0.107

Data Source: Guotaian Listed Company Database

3.2 Baseline Regression

This paper uses debt maturity structure as the core explanatory variable and excess return as the dependent variable, with leverage and market value of equity as controls. The benchmark model is constructed as follows:

$$RET = \beta_0 + \beta_1 * Mat + \varepsilon \tag{1}$$

$$RET = \beta_0 + \beta_1 * Mat + \beta_2 * LEV + \beta_3 * ME + \varepsilon \tag{2}$$

Table 2: Empirical Results of Baseline Regression

	RET	
	(1)	(2)
Mat	0.810*** (7.23)	0.644*** (5.49)
LEV		-0.188 (-1.58)
ME		0.00564*** (11.22)
Cons	0.706*** (8.09)	0.847*** (7.22)
N	382974	382974

Note: ① *p<0.05,**p<0.01,***p<0.001; ② The numbers in parentheses are t-values.

Table 2 shows a significant positive correlation between debt maturity structure and equity returns, consistent with the theoretical analysis. When controlling for leverage and market value of equity, the significance of debt maturity structure weakens, indicating correlation between leverage and debt maturity[4]. This underscores the need to jointly analyze their effects.

4. Portfolio Construction for Factor Model Analysis

To isolate the premiums associated with leverage and debt maturity structure, while controlling for potential size effects, we conduct a triple 2×3×3 sorting based on company size (i=1,2), leverage (j=1,2,3), and debt maturity structure (k=1,2,3). We denote the excess returns of the resulting 18 portfolios and capture the return differentials related to size, leverage, and debt maturity structure $R_{Mat,\ t}$ from the respective portfolio intersections.

$$R_{LEV,\ t} \equiv \frac{1}{6}\left(\sum_{i=1}^{2}\sum_{k=1}^{3} R_t^{i3k} - \sum_{i=1}^{2}\sum_{k=1}^{3} R_t^{i1k}\right) \tag{3}$$

$$R_{Mat,\ t} \equiv \frac{1}{6}\left(\sum_{i=1}^{2}\sum_{j=1}^{3} R_t^{ij3} - \sum_{i=1}^{2}\sum_{j=1}^{3} R_t^{ij1}\right) \tag{4}$$

4.1 Average Characteristics of Portfolios

This paper summarizes the average characteristics of portfolios from three independent 2×3×3 groupings based on size, leverage, and debt maturity structure.

Table 3: Average Characteristics of Portfolios

	ME		LEV		Mat	
	Small	Big	Low	High	Low	High
LEV	0.447	0.455	0.239	0.687	0.500	0.431
Mat	0.715	0.787	0.759	0.706	0.493	0.955
RET(%)	0.5	2.2	1.4	1.3	1.1	1.5
β	1.103	1.107	1.126	1.088	1.114	1.093
ME	0.268	2.158	1.056	1.246	0.634	1.560
I/A	0.070	0.071	0.070	0.070	0.071	0.070
ROE(%)	0.4	1.6	1.6	-0.3	0.5	1.6
BM	0.030	0.026	0.035	0.020	0.027	0.030

Table 3 shows little dispersion in debt maturity structure between low- and high-leverage portfolios, and minimal difference in leverage between low- and high-debt-maturity portfolios[5]. This suggests the portfolio can effectively separate the debt maturity premium from the leverage premium.

4.2 Regression Analysis Using the Three-Factor Model

This paper uses the three-factor model to analyze premiums related to leverage and debt maturity structure, testing if these return differences compensate equity holders for systematic risk exposure. The model is constructed as follows:

$$R_{LEV\ /\ Mat} = \beta_0 + \beta_1 * \text{MKTRF} + \beta_2 * \text{SMB} + \beta_3 * \text{HML} + \varepsilon \tag{5}$$

In the model, β_0 is the stock's systematic risk, MKTRF is the market risk factor, SMB is the size factor, and HML is the book-to-market factor. Results are in Table 4.

Table 4: Regression Results of the Three-Factor Model

	R_{LEV}	R_{Mat}
MKTRF	6.992*** (3.59)	-5.348*** (-3.82)
SMB	-10.25** (-3.19)	-17.95*** (-7.77)
HML	17.74*** (3.42)	-2.595 (-0.70)
Cons	-0.0905 (-0.62)	0.195 (1.85)
N	382974	382974

Table 4 shows that for leverage-related premiums, MKTRF and HML have significant positive exposures, while SMB has a notable negative exposure, with MKTRF being the key driver. This means high-leverage portfolios are more sensitive to market fluctuations and driven by overall market risk compared to low-leverage portfolios.

For the premium related to debt maturity structure, MKTRF and SMB have significantly negative coefficients, while HML is insignificant, with SMB being the key driver[6]. This suggests high-debt-maturity portfolios avoid market volatility risks compared to low-debt-maturity portfolios. The negative SMB coefficient implies that high-debt-maturity portfolios may underperform when smaller firms outperform larger ones.

4.3 Regression Analysis Using the Five-Factor Model

The five-factor model, considering more factors than the three-factor model, better explains complex stock market phenomena. To enhance the comprehensiveness and credibility of the results, this paper conducts regression analysis using the five-factor model, with the model constructed as follows:

$$R_{LEV} / R_{Mat} = \beta_0 + \beta_1 * \text{MKTRF} + \beta_2 * \text{SMB} + \beta_3 * \text{HML} + \beta_4 * \text{RMW} + \beta_5 * \text{CMA} + \varepsilon \tag{6}$$

Building on Model (5), RMW is the investment factor, and CMA is the profitability factor. The regression results are presented in Table 5.

Table 5: Regression Results of the Five-Factor Model

	R_{LEV}	R_{Mat}
MKTRF	3.911* (1.99)	-3.095* (-2.16)
SMB	-32.92*** (-6.21)	-4.894 (-1.27)
HML	3.701 (0.67)	1.096 (0.27)
RMW	-22.62* (-2.58)	28.17*** (4.42)
CMA	18.74* (2.13)	2.825 (0.44)
Cons	0.0664 (0.47)	0.113 (1.10)
N	382974	382974

The regression results in Table 5 show that compared to low-leverage portfolios, high-leverage portfolios are more sensitive to overall market performance and changes in firm size. Additionally, high-leverage portfolios are more sensitive to increases or fluctuations in profitability, and a decline or volatility in performance can have a greater negative impact on their profitability.

According to the regression results in Table 5, the negative significance of the MKTRF factor related to debt maturity structure is weakened, and the coefficient of the SMB factor becomes insignificant[7].This indicates that the returns of high-debt-maturity portfolios are influenced by corporate profitability, with strong profitability potentially having a positive impact on their returns. Meanwhile, the negative coefficient of the MKTRF factor suggests that high-debt-maturity portfolios perform poorly when the overall market performs well.

5. Conclusions and Policy Recommendations

This paper examines the impact of debt maturity structure on equity returns of listed companies. Results show a significant positive correlation between debt maturity structure and excess returns,but no correlation with leverage[8].High-debt-maturity portfolios achieve higher excess returns than low-debt-maturity portfolios,confirming the importance of debt maturity structure in influencing investment returns.

With constant leverage, a higher debt maturity structure can mitigate interest rate volatility and short-term liquidity risks. Extending debt maturities reduces interest rate risks and eases repayment pressures, while also attracting long-term investors due to more stable financial prospects[9]. However, it also brings potential challenges. Thus, companies need to balance these factors to support sustainable development.

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