

# What factors affect corporate bond financing costs? -- Taking the corporate bonds of Shanghai and Shenzhen Stock Exchanges of China as an example

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**Abstract.** This paper focuses on the factors which influence the corporate bond financing cost. Based on the complexity and diversity of influencing factors of corporate bond financing costs, this paper discusses them from macro and micro dimensions. This paper discovers that PMI, a macroeconomic indicator, influences bond financing costs positively; the higher the PMI, the more prosperous the economy is, and the more expensive bond financing is. Other macroeconomic variables have varying effects on the financing costs of corporate bonds with various ratings and maturities. Among the individual bond characteristic variables at the micro level, the bond maturity, the issuer's asset liability ratio, and whether the bonds are guaranteed have a positive impact on the bond financing cost, while the bond issuance amount, the issuer's return on equity, and the issuer's corporate nature negatively affect the cost of bond financing. Therefore, the suggestions are: Firstly, for the governments, when PMI increases, it is necessary to introduce corresponding policies to reduce the financing costs of enterprises; Secondly, for the issuer, it should improve its ROE and reduce the asset liability ratio, select the appropriate bond covenants, and consider the macroeconomic situation to choose the appropriate time to issue bonds to reduce financing costs; Thirdly, for bond investors, they should pay attention to macroeconomic fluctuations, study bond covenants and financial indicators.

**Keywords:** Corporate bond; the financing cost; interfering factor.

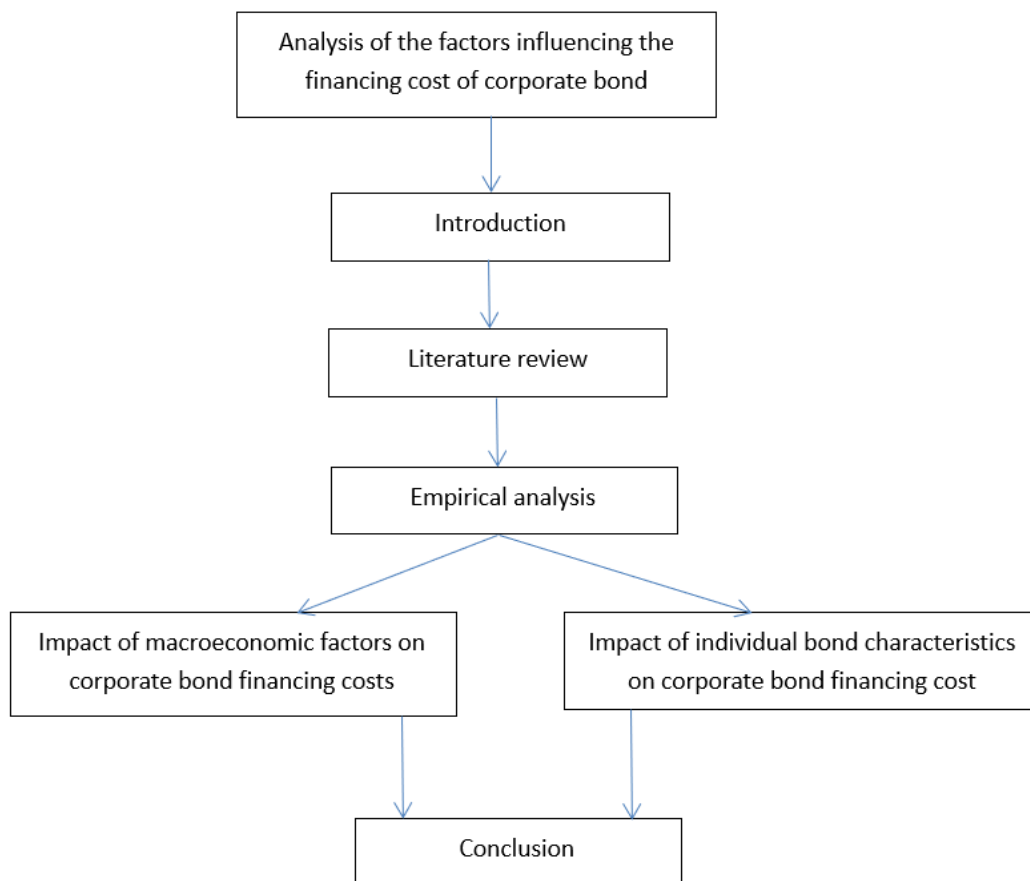
## 1. Introduction

Corporate bonds have evolved in China for 15 years since the first one was issued and listed on the Shanghai Stock Exchange in 2007. In particular, China's corporate bond issuance has turned to the direction of a registration system since 2015, and the corporate bond market has made significant progress. Corporate bonds have recently grown in importance as a method for funding large and medium-sized businesses in China. In order to improve the market-based pricing mechanism of corporate bonds and provide theoretical direction for businesses seeking to raise funds through corporate bonds, it is of major practical value to research the factors influencing the financing cost of Chinese corporate bonds.

This paper discusses the factors that affect the financing cost of corporate bond from both macro and micro levels. In practice, given that Chinese corporate bonds are mostly issued at parity, the coupon rate and yield to maturity can be regarded as consistent. When analyzing the effects of macroeconomic factors on corporate bond financing cost and the effects of individual bond characteristics on corporate bond financing cost, this paper will use yield to maturity and coupon rate to express the bond financing cost taking into account the availability of data. At the macro level, this paper takes the yield to maturity of corporate bonds with four different ratings and different maturities as the explanatory variables, CPI, M2, social financing scale, PPI, PMI, GDP and SHIBOR overnight interest rate as the explanatory variables, and establishes a time series model based on the monthly data from 2016 to 2021. At the micro level, this paper takes the coupon rate of corporate bonds on the Shenzhen and Shanghai Stock Exchanges as the explanatory variable, and takes the amount of bonds issued, bond maturity, asset liability ratio, return on net assets, shareholding ratio of major shareholders, interest payment frequency, yield quality, cash flow health, enterprise nature, whether guaranteed, and current ratio as the explanatory variables for multiple linear regression analysis. The National Bureau of Statistics website and the Wind database provided the information for this paper.

According to the research results, this paper makes the following recommendations: First, for government departments, when PMI increases, it is necessary to introduce corresponding policies to reduce the financing costs of enterprises; Second, for the issuer, it should improve its ROE and reduce the asset liability ratio, select the appropriate bond covenants (such as bond maturity, amount of issue, and whether there is guarantee), and consider the macroeconomic situation to choose the appropriate time to issue bonds to reduce financing costs; Third, for bond investors, they should pay attention to macroeconomic fluctuations, study bond covenants and financial indicators (such as ROE, asset liability ratio).

Figure 1 shows the research framework:



**Fig. 1** The research framework

## 2. Literature review

This paper summarizes the previous research results from the macro and micro levels, as described below.

### 2.1 Research on the impact of macro factors on bond financing cost.

Black and Scholes believed that loose monetary policy could reduce the financing cost of corporate bonds [1]. Cavallo and Valenzuela believed that the spread of corporate bonds was determined by macro-environmental factors, individual factors, national political risks factors and others [2]. Avramov found that common factors and basic corporate factors can explain 54% of the changes in bond credit spread. These factors include most of the changes in the credit spread system, as well as the explanation of FF factors for all credit rated bonds. [3]. Chen found that there was a strong positive correlation between trade union strength and corporate bond yield spread. Most researchers believed that corporate characteristics, economic conditions and political changes were the determinants of

corporate bond yield spread [4]. Collin Dufresne used traders' quotations and trading prices to study changes in credit spreads. The results showed that changes in credit spreads were caused by demand shocks or local supply [5]. Tsuji found that the decisive factor of credit spread was different credit values between companies according to the theoretical model of credit risk [6].

## 2.2 Research on the influence of micro factors on bond financing cost.

### 2.2.1 The impact of the nature of enterprise property rights on bond financing costs.

Kornai pointed out that there is a "soft budget constraint" phenomenon in society and economy, and state-owned property enterprises can obtain funds at a lower cost [7]. Faccio et al. found that the state-owned property rights enterprises can obtain larger loans at lower costs [8]. Sanchez and Garcia took Spanish listed companies as an empirical sample and found that the bond financing cost of state-owned property companies was significantly lower [9]. Lin and Li believed that China's state-owned enterprises generally bear the burden of strategic and social policies, and the government will cover their debts [10]. Li Guangzi and Liu Li found that Chinese private listed companies bear higher financing cost of debt [11].

### 2.2.2 The influence of profitability on the debt financing cost of the company.

Sengupta, Bhojraj, Minnis found that profitability has impact on the debt financing cost for listed companies [12-14]. Jiang Yan found that investors, as creditors, were very concerned about the profitability of the company, and took profitability as an important basis to judge the price of corporate debt financing [15]. Hao Dongyang and Zhang Tianxi believed that companies with higher profitability can withstand higher accounting conservatism, while companies with higher conservatism have lower debt financing costs [16].

### 2.2.3 The influence of financial leverage ratio on the debt financing cost of the company.

Baxter and Gragg believed that the higher the debt ratio of enterprises, the more likely they are to fall into financial crisis, and enterprises need to pay additional default risk costs when issuing bonds [17]. Zhao Xiaoqin and Wan Difang found that issuers with higher financial leverage ratio could obtain favorable coupon margin [18]. Yan Yanyang and Liu Pengfei based on the monthly panel data of the secondary market of corporate bonds, research shows that the asset liability ratio is positively related to the credit spread of corporate bonds [19].

## 3. Empirical analysis

### 3.1 Impact of macroeconomic factors on corporate bond financing costs

In Section 3.1, this paper use the yield to maturity index to express bond financing costs.

#### 3.1.1 Variable selection

Table 1 shows the variable Settings, all variables in the table have been logarithmized.

**Table 1.** Variable table

| Variable properties  | Variable name                                                 | Variable symbol |
|----------------------|---------------------------------------------------------------|-----------------|
| Interpreted variable | the yield to maturity of 10-year corporate bonds at 3A level  | lnym3a10        |
|                      | the yield to maturity of one-year corporate bonds at 3A level | lnym3a1         |
|                      | the yield to maturity of 10-year corporate bonds at 2A level  | lnym2a10        |
|                      | the yield to maturity of one-year corporate bonds at 2A level | lnym2a1         |
| Explanatory variable | GDP growth rate                                               | lnGDP           |
|                      | CPI                                                           | lnCPI           |
|                      | social financing scale                                        | lnSFS           |
|                      | purchasing manager index (PMI)                                | lnPMI           |
|                      | PPI                                                           | lnPPI           |
|                      | SHIBOR overnight interest rate                                | lnSHIBOR        |
|                      | M2                                                            | lnM2            |

### 3.1.2 Empirical analysis

#### 3.1.2.1 Stability test

This paper uses STATA software to perform DF test on time series data. As shown in the table 2 and 3, the explanatory variable  $\ln SFS$  is non-stationary, and its first-order difference  $D\ln SFS$  is stationary, so the first-order difference form is used in the model. According to this method, other explanatory variables are stationary, which will not be listed.

**Table 2.** The DF test result of  $\ln SFS$

| dfuller $\ln SFS$                             |                |                   |                   |                    |
|-----------------------------------------------|----------------|-------------------|-------------------|--------------------|
| Dickey-Fuller test for unit root              |                |                   | Number of obs=71  |                    |
|                                               | Test Statistic | 1% Critical Value | 5% Critical Value | 10% Critical Value |
| Z(t)                                          | -1.069         | -3.551            | -2.913            | -2.592             |
| Mackinnon approximate p-value for z(t)=0.7274 |                |                   |                   |                    |

**Table 3.** The DF test result of the first-order difference form of  $\ln SFS$

| dfuller $D\ln SFS$                            |                |                   |                   |                    |
|-----------------------------------------------|----------------|-------------------|-------------------|--------------------|
| Dickey-Fuller test for unit root              |                |                   | Number of obs=70  |                    |
|                                               | Test Statistic | 1% Critical Value | 5% Critical Value | 10% Critical Value |
| Z(t)                                          | -8.015         | -3.552            | -2.914            | -2.592             |
| Mackinnon approximate p-value for z(t)=0.0000 |                |                   |                   |                    |

For the four explained variables, this paper also use DF test. According to this method, the four explained variables are non-stationary, so they are all in the form of first-order difference. Therefore, the interpreted variables are  $D\ln ytm3a10$ ,  $D\ln ytm3a1$ ,  $D\ln ytm2a1$ , and  $D\ln ytm2a10$ .

#### 3.1.2.2 Model Setting

$$DY_t = \beta_0 + \beta_1 \ln GDP + \beta_2 \ln M2 + \beta_3 \ln PMI + \beta_4 D\ln SFS + \beta_5 \ln SHIBOR + \beta_6 \ln CPI + \beta_7 \ln PPI + \gamma \quad (1)$$

### 3.1.3 Descriptive analysis

In this paper, STATA software is used to make descriptive statistics. Table 4 shows the results:

**Table 4.** Results of descriptive statistics

| Variable       | Mean     | Std. Dev. | Min      | Max      |
|----------------|----------|-----------|----------|----------|
| $D\ln ytm3a10$ | 0.000205 | 0.0357269 | -0.07885 | 0.156855 |
| $D\ln ytm3a1$  | -0.00077 | 0.0728278 | -0.2447  | 0.27424  |
| $D\ln ytm2a10$ | -0.00174 | 0.0346145 | -0.09466 | 0.140086 |
| $D\ln ytm2a1$  | -0.0032  | 0.0650704 | -0.15316 | 0.265512 |
| $\ln GDP$      | 1.617896 | 0.7259258 | -1.84055 | 2.895912 |
| $\ln PPI$      | 0.528056 | 1.41688   | -2.30259 | 2.60269  |
| $\ln CPI$      | 0.636337 | 0.5661928 | -1.60944 | 1.686399 |
| $\ln SHIBOR$   | 0.747394 | 0.2064989 | 0.009545 | 1.037101 |
| $D\ln SFS$     | -0.00339 | 0.0429582 | -0.07816 | 0.248508 |
| $\ln M2$       | 2.241333 | 0.1481793 | 2.079442 | 2.639057 |
| $\ln PMI$      | 3.921129 | 0.044743  | 3.575151 | 3.958907 |

### 3.1.4 Regression result analysis

Table 5 shows the regression results:

**Table 5.** Regression result analysis

|                | (1)                     | (2)                     | (3)                     | (4)                     |
|----------------|-------------------------|-------------------------|-------------------------|-------------------------|
|                | Dlnym2a1                | Dlnym2a10               | Dlnym3a1                | Dlnym3a10               |
| lnGDP          | -0.0086<br>(-0.5879)    | -0.0118***<br>(-2.8736) | 0.0055<br>(0.2622)      | -0.0141***<br>(-3.6237) |
| lnM2           | 0.2041**<br>(2.5321)    | 0.0444<br>(0.8752)      | 0.2329***<br>(2.9778)   | 0.1053**<br>(2.2418)    |
| lnPMI          | 0.2161**<br>(2.5414)    | 0.1625***<br>(4.2684)   | 0.1659*<br>(1.7642)     | 0.1631***<br>(4.3765)   |
| lnPPI          | 0.0108*<br>(1.8528)     | 0.0042<br>(1.0368)      | 0.0067<br>(1.0256)      | 0.0045<br>(1.0943)      |
| DlnSFS         | -0.3261**<br>(-2.1009)  | -0.0151<br>(-0.1214)    | -0.2008<br>(-1.2864)    | -0.0499<br>(-0.4697)    |
| lnSHIBOR       | 0.0598<br>(1.3850)      | 0.0437**<br>(2.3043)    | 0.1162**<br>(2.5011)    | 0.0507***<br>(3.2269)   |
| lnCPI          | 0.0109<br>(0.7131)      | 0.0010<br>(0.1168)      | 0.0109<br>(0.7496)      | 0.0019<br>(0.2492)      |
| _cons          | -1.3527***<br>(-3.6942) | -0.7548***<br>(-3.7748) | -1.2803***<br>(-3.2581) | -0.8941***<br>(-4.5160) |
| N              | 70                      | 70                      | 70                      | 70                      |
| r <sup>2</sup> | 0.2101                  | 0.1709                  | 0.2329                  | 0.2826                  |
| F              | 5.3740                  | 11.8877                 | 6.3942                  | 16.5593                 |

Notes: t statistics in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

M2, PMI, PPI and SFS have a significant impact on the yield to maturity of 2A level 1-year corporate bonds, and M2, PMI and PPI have a positive impact on it, while SFS has a negative impact on it. For the yield to maturity of 2A level 10-year corporate bonds, GDP, PMI and SHIBOR are significant, and GDP has a negative impact on it, while PMI and SHIBOR have a positive impact on it. For the yield to maturity of one year corporate bonds at 3A level, M2, PMI and SHIBOR are significant, and M2, PMI and SHIBOR are positive. For the yield to maturity of 3A 10-year corporate bonds, GDP, M2, PMI and SHIBOR are significant, and GDP has a negative impact on it, while M2, PMI and SHIBOR have a positive impact on it.

In summary, PMI has a significant positive impact on corporate bond yield to maturity of different ratings and maturities. From the perspective of bond maturity, the influence of M2 and PMI on the yield to maturity of 1-year corporate bonds is significantly positive. GDP, PMI, SHIBOR for 10-year bonds yield to maturity is significant, the influence of PMI, SHIBOR is positive, the influence of GDP is negative influence on it. From the perspective of bond rating, the change rates of M2, SHIBOR and PMI have a significantly positive impact on the yield to maturity of 3A corporate bonds. The impact of PMI on the yield to maturity of 2A level corporate bonds is significantly positive.

This paper finds that, for regression analysis of the impact of corporate bond yield to maturity with different maturities and ratings, although the significance of explanatory variables may be different, the direction of influence of explanatory variables is basically the same (in the third column of table 5, the coefficient of lnGDP is positive, contrary to the other three equations, but because it is not significant, it will not be discussed here). The impact of the aforementioned seven explanatory variables on bond yield is covered in the following discussion of economic and financial principles.

- (1) The impact of GDP on bond yield is negative: the higher the GDP growth rate is, the faster the economic growth is. The market is often in a low interest rate environment, and bond yield decreases.
- (2) The impact of M2 on bond yield is positive: the higher the M2 growth rate is, the greater the money supply is, and the economy is expected to improve. Investors are more willing to invest in the

real economy or the equity market. Bond prices fall and bond yields rise. (3) The impact of PMI on bond yield is positive: the higher the PMI is, the higher the economic prosperity is. Investors are more willing to invest in the real economy or the equity market. Bond prices fall and bond yields rise. (4) The impact of PPI on bond yield is positive: the higher the PPI, the more likely the economy is to experience inflation, the higher the return on investment required by bond investors, and the higher the bond yield. (5) The influence of social financing scale (SFS) on bond yield is negative: the higher the social financing scale (SFS) is, the greater the financial support for the real economy is. The market is often in a low interest rate environment, and bond yield decreases. (6) The impact of SHIBOR on bond yield is positive: the higher the SHIBOR interest rate, the tighter the market capital, the less demand for bond investment, the lower the bond price, and the higher the bond yield. (7) The impact of CPI on bond yield is positive: the higher the CPI, the more likely the economy is to experience inflation, the higher the return on investment required by bond investors, and the higher the bond yield.

### 3.2 Impact of individual bond characteristics on corporate bond financing cost

When studying the influence of individual bond characteristics on corporate bond financing cost, this paper uses corporate bond coupon rate to express debt financing cost. These bond characteristics can be divided into two categories: bond issuer characteristic variables and bond maturity variables.

#### 3.2.1 Variable selection

Specific variables are shown in Table 6:

**Table 6.** Variable table

| Variable properties  | Variable name                            | Variable symbol | Specific meaning                                                                                                         |
|----------------------|------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------|
| Interpreted variable | Coupon rate                              | cr              | The interest rate stated on a bond                                                                                       |
|                      | Issue amount                             | ti              | Amount of bonds raised                                                                                                   |
|                      | Bond maturity                            | bd              | Bond repayment period                                                                                                    |
|                      | Asset liability ratio                    | alr             | Measuring long-term solvency                                                                                             |
|                      | Return on net assets                     | roe             | Measuring enterprise profitability                                                                                       |
|                      | Shareholding ratio of major shareholders | sr              | Shareholding ratio of shareholders of bond issuers                                                                       |
| Explanatory variable | Interest payment frequency               | ipy             | Number of interest payments per year                                                                                     |
|                      | Quality of earnings                      | qe              | Net income/profit from operating activities                                                                              |
|                      | The health of Cash flow                  | cfh             | Net cash flow from operating activities/operating income                                                                 |
|                      | The nature of Enterprise                 | cp              | Property right nature, state-owned (1) or private (0) (dummy variable)                                                   |
|                      | With or without guarantee                | g               | This bond issue is guaranteed by the guarantor or not, 1 for guaranteed bonds and 0 for unsecured bonds (dummy variable) |
|                      | Current ratio                            | ca              | Measuring short-term solvency, current assets/current liabilities                                                        |

### 3.2.2 Descriptive statistics

In this paper, STATA software is used for descriptive statistics of all variables of table 7.

**Table 7.** Results of descriptive statistics

| Variable | Obs   | Mean     | Std. Dev. | Min      | Max      |
|----------|-------|----------|-----------|----------|----------|
| cr       | 4,274 | 0.040204 | 0.010446  | 0        | 0.1      |
| ti       | 4,257 | 11.64315 | 7.854431  | 0.5      | 130      |
| bd       | 4,274 | 4.610283 | 2.109096  | 0.3342   | 25       |
| ipy      | 4,252 | 1.000941 | 0.030661  | 1        | 2        |
| roe      | 4,274 | 0.067075 | 0.064167  | -0.04841 | 0.485535 |
| qe       | 4,274 | -0.22954 | 9.168911  | -467.338 | 3.922812 |
| cfh      | 4,274 | -31.5909 | 837.4274  | -22363.5 | 22.4322  |
| alr      | 4,274 | 0.651874 | 0.140163  | 0.053634 | 2.968173 |
| ca       | 4,255 | 1.559202 | 1.172409  | 0.1439   | 20.1429  |
| cp       | 4,274 | 0.949228 | 0.219558  | 0        | 1        |
| sr       | 4,274 | 0.790676 | 0.25493   | 0        | 1        |
| g        | 4,274 | 0.088676 | 0.284308  | 0        | 1        |

### 3.2.3 Model construction

$$cr = \beta_0 + \beta_1 ti + \beta_2 bd + \beta_3 ipy + \beta_4 roe + \beta_5 qe + \beta_6 cfh + \beta_7 alr + \beta_8 ca + \beta_{10} cp + \beta_{11} sr + \beta_{12} g + \varepsilon \quad (2)$$

### 3.2.4 Regression analysis

**Table 8.** Regression results

|       | cr                       |
|-------|--------------------------|
| ti    | -0.0001***<br>(-6.0455)  |
| bd    | 0.0005***<br>(8.2521)    |
| ipy   | 0.0087<br>(1.1492)       |
| roe   | -0.0172***<br>(-7.5430)  |
| qe    | -0.0000<br>(-0.6911)     |
| cfh   | 0.0000<br>(0.7424)       |
| alr   | 0.0030***<br>(2.6293)    |
| ca    | 0.0000<br>(0.3763)       |
| cp    | -0.0189***<br>(-20.8421) |
| sr    | 0.0002<br>(0.3380)       |
| g     | 0.0056***<br>(8.7830)    |
| _cons | 0.0470***<br>(6.0515)    |
| N     | 4216                     |
| r2    | 0.2191                   |
| F     | 68.6259                  |

Notes: statistics in parentheses

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01

the issue amount (ti), the bond maturity (bd), the asset liability ratio (alr), the return on equity (roe), the nature of the enterprise (cp), and whether there is guarantee (g), have a big impact on the corporate bond coupon rate. The issuing amount (ti), the return on equity (roe), and the nature of the enterprise (cp) have negative effects on the corporate bond coupon rate. Bond maturity (bd), asset liability ratio (alr) and whether there is guarantee (g) have a favorable effect on the corporate bond coupon rate.

The impact of the aforementioned six explanatory variables on bond coupon rates is covered in the following discussion of economic and financial principles. (1) The effect of issuance amount on bond coupon rate: The financial pressure undertaken by bond issuers increases with the increase of bond issuance amount, and the lower the coupon rate that bond issuers can bear. (2) The effect of stock return on bond coupon rate: A higher ROE indicates greater profitability. Bond investors' investment risk is reduced as profitability rises, and their demand for investment return is also reduced as investment risk is reduced. As a result, bond coupon rates are lower. (3) The effect of the company's type on the bond coupon rate: The bond coupon rate will be greater if the bond issuer is a private company because the investor would be taking on more investment risk. (4) Bond term's effect on bond coupon rate: The longer the bond period, the more financial strain the issuer is under and the more investment risk investors are taking on. (5) The effect of asset liability ratio on bond coupon rate: a larger asset liability ratio indicates a poorer solvency of the issuer and a higher investment risk for investors. Consequently, a higher bond coupon rate is indicated. (6) The effect of guarantee on the bond coupon rate: if there is guarantee in the terms of the bond, it means that the issuer's credit rating is low, and it needs credit enhancement measures to issue successfully. Investors bear relatively large investment risks, and the bond coupon rate is relatively high.

#### 4. Conclusion

This paper focuses on the factors that influence corporate bond financing cost. In the macro dimension, the yield to maturity of corporate bonds is used as the explained variable, and the macroeconomic variables such as CPI, M2, social financing scale, PPI, PMI, GDP, SHIBOR overnight interest rate are used as the explanatory variables; In the micro dimension, the coupon rate is used as the explained variable, and the bond issue amount, bond maturity, asset liability ratio, return on equity, major shareholders' shareholding ratio, interest payment frequency, yield quality, cash flow health, enterprise nature, whether guaranteed, liquidity ratio and other individual bond characteristic variables are used as explanatory variables. This paper finds that at the macro level, bond financing costs increase with the increase of PMI. The impact of other macroeconomic factors on the financing costs of corporate bonds with different ratings and maturities is heterogeneous. At the micro level, the bond maturity, the issuer's asset liability ratio, and whether the bonds are guaranteed have a positive impact on the bond financing cost, while the bond issuance amount, the issuer's return on equity, and the issuer's corporate nature have a negative impact on the bond financing cost. Therefore, the enlightenments are as following: First, government agencies should be aware that appropriate policies must be introduced to lower the cost of financing for businesses as a result of the growth in PMI; Secondly, for the issuer, it should improve its ROE and reduce the asset liability ratio, select the appropriate bond covenants such as bond maturity, amount of issuance, and whether there is guarantee, and consider the macroeconomic situation, select the appropriate time to issue bonds to raise funds and reduce the financing cost; Thirdly, for bond investors, they should focus on macroeconomic fluctuations by observing indicators such as PMI, study financial indicators such as corporate bond issuer's ROE, asset liability ratio and bond covenants, reduce investment risk and obtain the maximum investment income. In this study, there are two shortcomings: First, in many studies on bond financing costs, bond yield spread is often used to represent bond financing costs. The calculation of bond yield spreads requires the individual bond yields. However, data on individual corporate bond yields are not available, and the paper can only use the coupon rate to represent the bond financing cost in the second measurement model. Second, due to the availability

of data, monthly data of GDP growth rate cannot be obtained. Therefore, this paper uses industrial added value above designated size to replace GDP, which may cause inaccurate measurement results.

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