

# **The Micro-Determinants of Credit Spreads**

**ECO375: Empirical Project**

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# 1 Introduction

Finding the micro-determinants for credit bonds is useful for finding what affects yields over time. The yield that investors require to purchase a firm's bond is the spread over the yield provided by a comparable government bond. Micro-determinants are variables that are related to the probability of default and the liquidity associated with a specific bond issue. This project seeks to assess the importance of firm specific factors in determining the spread for its bonds. The data used covered two points in time: 2022 and 2024. The model is a cross-sectional problem focusing on the changes in spread from 2022 to 2024. Fixed effects were not included as these were not vary across bonds.

This paper is structured as follows: Section 2 is the literature review situating the research question, Section 3 contains the preliminary analyses, Section 4 contains the methodology, Section 6 contains the results, and Section 5 has the hypothesis testing.

difference in percentages: basis points

## 1.1 Description of variables

The variables are as follows

Variable	Description
Issuer	Name of the company that issued the bond
Spread	The difference between the bond's yield and the yield on a government bond of the same maturity. Measured in bps
Ticker Parent	Identifier for the parent company
Enterprise Value to Sales	Measures how expensive a company is relative to its revenue
Enterprise Value to PPE	Measures valuation relative to tangible assets
Price to Sales	How much investors pay for \$1 of revenue
Price to Book Value	Measures how expensive the firm is relative to accounting equity
Dividend Yield	Return shareholders receive from dividends
Return on Average Total Equity	How efficient the firm is with investments
Operating Margin	Core profitability measure
Total Capital Expenses to Total Assets	How much firm invests in long-term assets
Book Value per Share	Accounting value per share
Asset Turnover	Measures how well assets generate revenue
Current Ratio	Measures short-term liquidity

Variable	Description
Cash Dividend Coverage Ratio	Measures if firm can pay dividends purely from operations
Total Debt to Equity	Measures financial leverage
Total Debt to Total Capital	Shows how much of capital is from debt
Amount Outstanding	Size of the bond
Years to Maturity	Number of years until the bond pays back its principal
Coupon	Annual payments made to bond holders

Enterprise value to sales measures how expensive a company is relative to its revenue. Thus, a high ratio means the market expects high growth (or the company is overvalued). Thus, a high enterprise value to sales means lower perceived risk and lower spreads.

PPE is tangible long-term assets. Thus, a high enterprise value to PPE means the firm is growth-oriented, but that also means has more risk and higher spreads.

A high Price to Sales signifies higher confidence in the firm by the general public which indicates lower spreads.

Price to Book Value is how the firm is valued by the general public. A lower ratio indicates undervaluation which produces financial distress and higher spreads.

Divident yield is how much bond holders are receiving from the dividents. A higher ration may indicate higher risk.

A higher Return on Average total equity indicates the firm is more efficient which means lower spreads.

The operating margin shows how much earnings are received before interest and taxes. A higher margin indicates the firm has a lower risk of going default which means lower spreads.

A high total capital expenses to total assets could indicate either lower spreads or a lack of liquidity.

A low book value per share may indicate the firm is close to going default and thus have a higher spread. A high asset turnover indicates the efficiency which implies lower spreads

A low current ratio indicates liquidity risk which implies higher spreads.

A low cash dividend coverage ratio indicates weak cash flow which implies higher spreads

A high total debt to equity means the firm has a high reliance on debt which implies higher spreads

## **1.2 Statement of hypothesis/research question**

The research question this paper will seek to answer is what are the micro-determinants of credit spread. We propose that total debt to equity, price to book value, return on average total equity, and current ratio are the micro-determinants affect the change in bond spreads over time.

## **2 Literature Review**

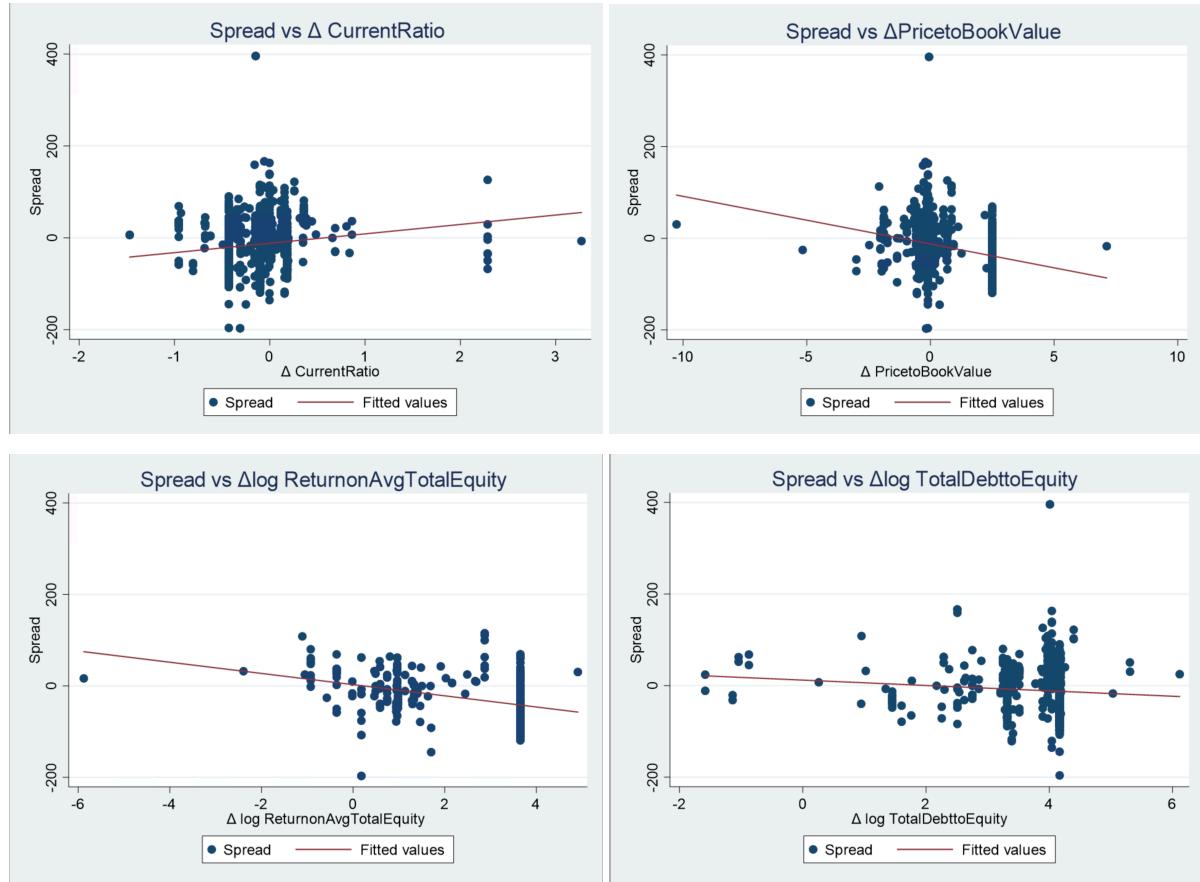
In “Credit Default Swap Spreads”, Fu et. al employed a multi-factor analysis from both a firm-specific and market-specific perspective to examine the determinants of credit spreads in the USA, the UK, and Japan between 2005 and 2012. Their results indicated that the degree of firm leverage has a significant influence on spreads. They mention re-testing the influence of leverage on spreads as done in Collin-Dufresne et al. in 2001 Collin-Dufresne, Goldstein, and Martin (2001) and Aunon-Nerin et al. in 2002 Aunon-Nerin et al. (2002). From the data used, leverage is seen in Total Debt to Equity.

In “Liquidity of Corporate Bonds and Credit Spread”, Wang examined corporate bond liquidity’s impact on credit spreads for listed companies in China. He found that the better the liquidity of listed corporate bonds, the smaller the credit spread. He found that “the higher the ROE, the higher the current ratio, the better the ability to service debt...the smaller the credit spread” (Wang 2023). From the data used, return on net assets can be seen as Return on Average Total Equity, and Current ratio is directly used in the data.

In “Loand Spreads and Credit Cycles”, Carvalho et. al find evidence that lender optimism can lead to excessive fluctuations in credit spreads. Carvalho means “Equity Volatility, Size, Firm Age, Profitability, Tangibility, M/B (market-to-book), Leverage...” as determinants for bond spreads (Carvalho, Gao, and Ma 2023). From the data used, Price to Book Value corresponds with Market-to-book

### 3 Descriptive

#### 3.1 Plots



#### 3.2 Summary of key variables

Spread is numeric with a range from [-196.8, 395.8]. It had a mean of -14.6 and a standard deviation of 57.6. It had skewness of 1.017

PricetoBook Value is numeric with a range from [-10.3, 7.1]. It had a mean of 0.214 and a standard deviation of 1.17. It had skewness of 0.106.

Return on Average total equity was numeric with a range [-90.96, 135.03]. It had a mean of -0.47 and a standard deviation of 19.466. It had a skewness of 1.236.

Current Ratio is numeric with a range from [-1.47, 3.27]. It had a mean of -0.14 and a standard deviation of 0.395. It had a skewness of 2.86.

Total Debt to Equity is numeric with range from [-80.36, 452.69]. It had a mean of 30.07 and a standard deviation of 39.65. It had a skewness of 39.65.

## 4 Methodology

### 4.1 Clear statement of the model and its assumptions

$$\Delta y_i = \beta_0 + \beta_1 \log(x_{i1}) + \beta_2 x_{i2} + \beta_3 \log(x_{i3}) + \beta_4 x_{i4}$$

Where  $\Delta y$  is the difference in the spread of bonds from 2022 to 2024,

$x_1$  is the difference in Total Debt to Equity.  $x_2$  is the difference in Price to Book Value.  $x_3$  is the different in Return on Average Total Equity.  $x_4$  is the difference in Current Ratio.

#### Linearity in Parameters

From the model above, it is clear that the model is linear in parameters.

#### Random Sampling

This is an assumption about the data given. It is randomly sampled.

#### No Perfect Collinearity

We ran correlation between all the variables and got the following table. Since none of the columns are a repeat, there is no perfect collinearity.

```

. pwcorr Spread EntrprValuetoSales PricetoBookValue AssetTurnover ///
>          DivYield CurrentRatio ReturnnonAvgTotalEquity ///
>          CashDivCoveragRatio OperMargin TotalDebttoEquity ///
>          EntrprValuetooPPE TotalCapExptoTotalAssets ///
>          TotalDebttoTotalCapital PricetoSales BookValuePerShare

```

	Spread	Entrpr~s	Pricet~e	Asset~er	DivYield	Curren~o	Return~y
Spread	1.0000						
EntrprValuetoS	-0.0001	1.0000					
PricetoBookValue	-0.2129	0.5153	1.0000				
AssetTurnover	-0.0143	0.2364	0.1378	1.0000			
DivYield	0.0807	-0.2190	-0.3081	0.0600	1.0000		
CurrentRatio	0.1404	0.1441	0.0565	0.0057	0.0499	1.0000	
ReturnnonAv~y	-0.1537	0.5742	0.6466	0.1732	-0.4685	0.1143	1.0000
CashDivCov~o	0.2976	0.0654	-0.2499	-0.0928	-0.5760	0.2872	0.0793
OperMargin	0.0477	0.8210	0.3071	0.3258	-0.1963	0.2027	0.5919
TotalDebtto~y	0.0764	-0.6385	-0.2976	-0.2265	0.3430	-0.1456	-0.5005
EntrprValuet~E	-0.1837	0.1563	0.0737	0.0295	0.0256	-0.2055	0.0551
TotalCapEx~s	-0.0022	0.2476	0.0351	0.2420	-0.1337	-0.0593	0.1256
TotalDebtto~l	0.3005	-0.2997	-0.1842	-0.2153	0.1537	0.1786	-0.3437
PricetoSales	-0.1857	0.8317	0.6506	0.1674	-0.2384	-0.0445	0.5133
BookValuePerShare	-0.1209	-0.6254	-0.4051	-0.1731	0.1552	-0.6203	-0.5457

	CashDiv~o	OperMa~n	TotalD~y	Entrpr~E	TotalC~s	TotalD~l	Pricet~s
CashDivCov~o	1.0000						
OperMargin	0.3003	1.0000					
TotalDebtto~y	-0.2820	-0.7082	1.0000				
EntrprValuet~E	-0.2207	0.1279	-0.1126	1.0000			
TotalCapEx~s	0.0814	0.2820	-0.1952	0.0161	1.0000		
TotalDebtto~l	0.1256	-0.3333	0.6329	-0.1410	-0.1830	1.0000	
PricetoSales	-0.2584	0.4924	-0.4399	0.0704	0.1862	-0.3839	1.0000
BookValuePerShare	-0.3134	-0.6814	0.4254	0.0571	-0.0909	-0.1190	-0.3331
BookValuePerShare							
BookValuePerShare	1.0000						

## Zero Conditional Mean

This is an assumption about the population.

## Homoskedasticity

We performed robust on all our entries and did not assume homoskedasticity.

Thus, following all these assumptions, the model is consistent and unbiased

```
. reg Spread lTotalDebttoEquity PricetoBookValue ///
>           lReturnonAvgTotalEquity CurrentRatio ///
>           ///
>           , robust

Linear regression                                         Number of obs      =       63
                                                               F(4, 58)          =      5.74
                                                               Prob > F        =     0.0006
                                                               R-squared        =     0.2348
                                                               Root MSE         =    34.404
```

Spread	Robust					
	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lTotalDebttoEquity	6.945233	3.578155	1.94	0.057	-.2172218	14.10769
PricetoBookValue	-4.968845	1.504929	-3.30	0.002	-7.981288	-1.956402
lReturnonAvgTotalEquity	-12.45153	3.361894	-3.70	0.000	-19.18109	-5.721968
CurrentRatio	1.02294	8.24629	0.12	0.902	-15.4838	17.52968
_cons	-5.586531	11.96125	-0.47	0.642	-29.52957	18.35651

## 4.2 Specification tests

Before Adjusting for non linearity: F(12,809) value for estat ovtest, rhs ( linearity test) = 6.22 with p value 0.0000

After adjusting for non linearity (the model with logs and nooooo cubes) : estat ovtest, rhs F(12, 46) value is 1.46 with p-value 0.1749

The estat ovtest (test for omitted variable bias) only run after adjusting for non linearity gave F(3,55) value 1.55 with p-value 0.2129

## 4.3 Robustness considerations

For robustness considerations, we used robust every time we used regression. Thus, we never assumed homoskedasticity.

## 5 Hypothesis Testing

```
. *JOINT F TEST FOR ALL VARIABLES IN THE REGRESSION
. test lTotalDebttoEquity PricetoBookValue ///
>           lReturnonAvgTotalEquity CurrentRatio

( 1) lTotalDebttoEquity = 0
( 2) PricetoBookValue = 0
( 3) lReturnonAvgTotalEquity = 0
( 4) CurrentRatio = 0

F(  4,      58) =     5.74
                  Prob > F =    0.0006
```

---

```
. * T TESTS
. test lTotalDebttoEquity = 0

( 1) lTotalDebttoEquity = 0

F(  1,      58) =     3.77
                  Prob > F =    0.0571

. test PricetoBookValue = 0

( 1) PricetoBookValue = 0

F(  1,      58) =    10.90
                  Prob > F =    0.0016
```

```

. test lReturnonAvgTotalEquity = 0

( 1) lReturnonAvgTotalEquity = 0

F( 1,      58) =   13.72
Prob > F =    0.0005

. test CurrentRatio = 0

( 1) CurrentRatio = 0

F( 1,      58) =    0.02
Prob > F =    0.9017

```

## 5.1 Choise of appropriate test

We chose to do a joint f test to see whether any of the parameters should be 0. We also completed a t test to see individual significance against the yield.

# 6 Results

## 6.1 Correct interpretation of results

### Economic intuition provided

Aunon-Nerin, Daniel, Didier Cossin, Tomas Hricko, and Zhijiang Huang. 2002. "Exploring for the Determinants of Credit Risk in Credit Default Swap Transaction Data: Is Fixed-Income Markets' Information Sufficient to Evaluate Credit Risk?" *FAME Research Paper*, no. 65.

Carvalho, Daniel, Janet Gao, and Pengfei Ma. 2023. "Loan Spreads and Credit Cycles: The Role of Lenders' Personal Economic Experiences." *Journal of Financial Economics* 148 (2): 118–49.

Collin-Dufresn, Pierre, Robert S Goldstein, and J Spencer Martin. 2001. "The Determinants of Credit Spread Changes." *The Journal of Finance* 56 (6): 2177–207.

Wang, Haiyang. 2023. "Liquidity of Corporate Bonds and Credit Spread." *Finance Research Letters* 55: 103941.