

Credit Spread Disparity Between Japanese Domestic Bonds and Foreign Bonds

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Research

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Credit spread disparity between Japanese domestic bonds and foreign bonds

Ikuko Shiiyama*

Abstract

This article is an empirical study of credit spread disparity between Japanese domestic bonds and foreign bonds on primary issuance. There exist differences between credit spreads issued in domestic market and that of foreign market, despite that the credit risk of these bonds are considered the same. We explore this issue and find that the disparity can be explained by the sensitivity to risk-free rate and leverage. In other words, foreign investors put more premium on the credit risk which is driven by risk-free rate factor and leverage factor.

Keywords: bond, issuing cost, credit spread, credit risk

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1. Introduction

Recently, bond markets in Japan have been highly active because issuers are able to enjoy benefits to fund with extremely low costs due to declines of interest rates of the Japanese Government Bonds (JGBs). In this circumstance, many corporations have issued Yen-denominated bonds in the Japanese market (hereafter domestic bonds) and foreign currency-denominated (typically, US dollar - denominated) bonds in foreign markets (hereafter foreign bonds).

Theoretically, if a firm issues bonds in two different markets concurrently, there should be no difference between the credit spread of domestic bond and foreign bond because credit spreads must stand for credit risk of the issuer and the credit risk is common to two bonds.

However, as it is well known in practical business, it is evident that there are no same credit spreads between domestic bonds and foreign bonds. Also, we sometimes observe lower credit spread in foreign bonds than in domestic bonds. After exchanging issuance cost of foreign bonds to Japanese Yen, issuers occasionally come across negative spreads and receive positive interests despite they borrowed funds.

Needless to say, credit spreads are very important to issuers because they influence issuance costs and issuers are concerned with an issue in which market they are able to reduce issuance costs.

In this article, we explore a question whether there is a difference of credit spreads between domestic bond and foreign bond, and if so, a question about what determinants affect the differences.

We find empirical evidence for significant differences between the credit spread of foreign bonds and that of domestic bonds. Furthermore, we provide several empirical findings as follows:

- (i) Risk-free rate (JGB yield) negatively affects credit spreads of both domestic and foreign bonds.
- (ii) The leverage of an issuer positively affects credit spreads of both domestic and foreign bonds.

- (iii) The disparity of credit spreads between domestic and foreign bond is due to a difference in sensitivity to risk-free rate (JGB yield).
- (iv) The disparity of credit spreads between domestic and foreign bond is due to a difference in sensitivity to leverage.
- (v) Foreign investors are sensitive to the behavior of UST yield as well as JGB yield, which explain the difference in CS between foreign and domestic bonds.

In the existing literature, Kondo (2000) investigates the relationship between credit spreads at secondary markets and that of primary markets. However, there is no study investigating a relationship between credit spreads of foreign bond and that of domestic bond in the primary market. This study is new in that we empirically study credit spreads of two bonds with the different currency at the primary market and we find that there is a disparity of the credit spreads between domestic bonds and foreign bonds. In addition, our study makes clear which determinants make such disparities.

This article is organized as follows. Section 2 presents a review of the related literatures. Section 3 presents the regression model, hypothesis, and data explanations. Section 4 presents the results of our main empirical studies, the robustness check and additional study. Section 5 presents the conclusion.

2. Related literature

The credit spreads of the corporate bonds reflect the credit risk of the issuers. First, we can find the previous studies related to the credit risk are Credit Derivative Swaps (CDS).

The related literature about the risk of CDS, Jarrow and Turnbull (1995) showed their studies to evaluate the risks of CDS as credit risk of the issuers and as the assets risk of CDS separately. Related to the liquidity of CDS, Longstaff, Mithal, and Neis (2005) mentioned the CDS spreads are consisted by the default risk as credit risk and by the non-default risk and they established this point is not affected by credit rating. They also made the point that the non-default risk is strongly affected to the market liquidity of the corporate bonds. The others are CDS prices are higher than

spread by Blanco, Brennan, and Marsh (2005), the stock prices affect to the CDS prices and CDS spread by Forte and Peña (2009), CDS spreads could not explain the credit spreads of issuers sufficiently by Ericsson, Jacobs, and Oviedo (2009). Alter and Schüller (2012) showed the empirical study that the remedy for the financial crisis affected to the CDS spreads for the short terms. Wang, Zhou, and Zhou (2013) made the empirical study to verify the CDS spread could explain the variance risk premia, Doshi, Ericsson, Jacobs, and Turnbull (2013) mentioned the CDS spread only reflect part of the credit risk of the issuers in the junk bond, Galil, Shapir, Amiram, and Ben-Zion (2014) showed empirical study that the CDS spread could not explain the stock pricing earnings ratio.

These are the studies of the CDS credit risks. The CDS credit risk and the credit risk of the corporate bonds are different as below. First, the CDS is optional trading and the CDS securities are traded in itself separate from the issuers, but the issuers of the corporate bonds are responsible to pay the default of corporate bonds, so the price of the corporate bonds reflect the credit risks of the issuers. The next we can mention the difference between CDS spreads and the corporate bonds, as Jarrow and Turnbull (1995) showed, the credit risks are consisted by the risks of the issuers and by the risks of the assets, but the credit risks of the corporate bonds means the repayment ability of the issuers of the corporate bonds and this is the only default risks of the issuers of Jarrow and Turnbull (1995).

Second, the related studies about credit spread, Collin-Dufresne, Goldstein, and Martin (2001) made the empirical study with using Ordinary Least Squares (OLS) regression using variables as corporate leverage, interest rate of the 10 year maturity of U.S. treasury, volatility index of the Chicago VIX, S&P500 and future S&P500 and evaluate the effect of these to the credit spread of the corporate bonds. Another study of Collin-Dufresne and Goldstein (2001), they made the empirical study to evaluate whether the credit spread reflect the corporate leverage or not. Chakravarty, S., and Sarkar (1999) made the empirical study with using credit rating dummy to evaluate the effect of the credit rating to the credit spread. Using the Japanese issuers data, Shirasu and Yonezawa (2007) made the regression formula based on Collin-Dufresne et al. (2001) and made the empirical study for the credit spreads of secondary market data issued by Japanese

companies. A. Ieda and Ooniwa (1998) showed the result that credit spreads of the low credit rating bonds are wider than those of the high credit rating bonds especially with the issuers of the constructing industry. These related studies are based on secondary corporate bonds and intended for point of time for same issuers, they used OLS for panel data. Furthermore, the data are base on secondary corporate bonds, they don't focus on the credit spreads at the issuance.

Crabbe and Turner (1995) made the study for the credit spreads at the issuance. They made empirical study based on the four financial corporate bonds both of straight corporate bonds and Mid Term Note programs (MTN) how liquidity of corporate bonds of the issuance size affect to the credit spreads. In Japan, Kondo (1996) made the same type of study. They used the data of Japanese domestic corporate bonds of Japanese issuers, Samurai bond of foreign issuers issued at Japanese market, Euro bonds of Japanese issuers issued at foreign market and corporate bonds of foreign issuers issued at foreign market and made the empirical study of these credit spreads. They made the OLS tests and used credit rating, terms of years and long-term interest rate as explanatory variables. This study included the foreign market and foreign bond of issuers but they made the study only for the bonds issued by Japanese Yen. Kondo (2000) made the empirical study for the primary market bond which explained the credit spreads is made of factor of credit risks, corporate bond quality, issued market and decision-making. All these studies are only for the bonds issued by Japanese Yen and these are not compared with foreign bonds.

As referred as to above, there are related studies for single currency at primary market with same market, single currency at primary market with multi market, but there is no empirical study for multi currencies at primary market with multi market.

3. Empirical method and data

First, we consider a regression equation similar to equation 1 of Collin-Dufresn et al. (2001): we consider a baseline regression equation:

$$CS_i = a_0 + a_1yield_i + a_2leverage_i + a_3market_i + a_4vix_i + \varepsilon_i \quad (1)$$

The dependent variable CS_i stands for credit spread of each bond at the issuance and the subscript i represents each issue of corporate bonds. Credit spread is calculated by deducting

government bond yield in the country where bond i is issued from the yield of bond i . The corresponding government bond has the same term (maturity) at the same issue date.

We have two main explanatory variables as follows. First, the variable $yield_i$ is the yield of the Japanese Government Bond. Second, the variable $leverage_i$ is the leverage ratio of issuer of bond i . We use the book value because the sample data consist of not only the listing companies but also unlisted companies which don't have market value. We calculate leverage ratio as a ratio of total liabilities over book value total assets at the previous year for each i because some issuers are not listing company and they do not report semiannually or quarterly.

We have two control variables. The variable $market_i$ stands for market condition as a proxy for the overall state of the economy, which corresponds to "changes in business climate" in Collin-Dufresn et al. (2001). We use daily TOPIX index at the same date of the issuance.

As in Collin-Dufresn et al. (2001), we use the vix_i as an alternative to evaluate the volatility of the issuer of bond i . We use the Nikkei Stock Average Volatility Index (Nikkei 225 VI).

Regarding two main explanatory variables in equation 1, we make two hypotheses similar to those of Collin-Dufresn et al. (2001). First, we consider that the credit spread is affected by the risk-free rate. As pointed out by Longstaff and Schwartz (1995), a higher spot rate increases the risk- neutral drift of the firm value process, which reduces the probability of default, and in turn, reduces the credit spreads. Therefore, the first hypothesis becomes

Hypothesis 1 : Risk-free rate $yield_i$ negatively affects credit spreads.

We predict that $a_1 < 0$. This hypothesis is not the same as that of Collin-Dufresn et al. (2001) in that we have not only domestic bonds but also foreign bonds. Our question here is whether JGB yield affects foreign bonds as well as domestic bonds or not. We consider that the hypothesis 1 holds if a higher JGB yield increases the risk- neutral drift of the firm value process, which reduces the credit spreads through a reduction in the probability of default. Alternatively, we have in mind that the credit spread of the foreign bond is not affected by the JGB yield, but is affected by the risk-free rate of the country where bond i is issued.

Second, we consider:

Hypothesis 2: The leverage of an issuer positively affects credit spread.

We predict that $a_2 > 0$. Since the default is triggered when the leverage ratio approaches unity, we consider that credit spreads are expected to increase with leverage. This hypothesis is the same as that of Collin-Dufresne et al. (2001). Since we have not only domestic bonds but also foreign bonds, we naturally expect that the leverage affects foreign bonds as well as domestic bonds. We consider that we need to confirm this as a formal testing.

Regarding control variables, we consider as follows: First, as in Collin-Dufresne et al. (2001), market condition ($market_i$) may change the expected recovery rate, which should be a function of the overall state of the economy which is proxied by TOPIX index.

Second, we consider that credit spreads should increase with volatility because corporate bond has a feature similar to a short position in a put option and option values increase with volatility. Increased volatility increases the probability of default.

To make our main hypothesis, we extend the baseline equation to the following:

$$CS_i = (a_0 + a'_0 D_i) + (a_1 + a'_1 D_i) yield_i + (a_2 + a'_2 D_i) leverage_i + (a_3 + a'_3 D_i) market_i + (a_4 + a'_4 D_i) vix_i + \varepsilon_i \quad (2)$$

where the variable D_i is a dummy for foreign bonds, which takes one for foreign bond and 0 for domestic bond. The coefficient a_k is for the domestic bonds and the coefficient a'_k means a difference in the coefficient between domestic bonds and foreign bonds.

As mentioned in introduction, the credit spread for foreign bond is greater than that of domestic bond. Our main hypotheses are stated as:

Hypothesis 3: The difference of credit spreads between domestic bond and foreign bond is due to a difference in sensitivity of foreign and domestic bonds to risk-free rate (JGB).

Hypothesis 4: The difference of credit spreads between domestic bond and foreign bond is due to a difference in sensitivity of foreign and domestic bonds to leverage.

We predict that $a'_1 > 0$ to have a foreign CS greater than domestic CS. Foreign investors may have an attitude toward credit risk different from the domestic investors. For example, foreign investors do not have advantage in collecting information that helps predicting default risk of the Japanese firms. Hence, foreign investors put higher premium on the credit spread than the

domestic investors do. Therefore, we predict the positive coefficient for the cross-term of foreign dummy and the risk-free rate.

Also, we predict that $a'_2 > 0$ to have a foreign CS greater than domestic CS for the same reason as above. Therefore, we predict the positive coefficient for the cross-term of foreign dummy and the leverage.

In the regression analysis, we also examine the foreign bond dummy and the cross-term of two control variables and the dummy.

In this study, the sample period is from January 1st 2010 to March 31st 2020. We exclude the floating rate bonds from our sample. We select fixed rate corporate bonds and match each of bonds with government bonds having the same term with it. The issuers are 13 Japanese company which issued both domestic bonds and foreign bonds at the sample period.

We manually collect data for domestic bonds from Japan Securities Dealers Association (JSDA) website “Public and corporate bond issue list”, and for foreign bonds from Moody’s.com website. Japanese Governments bonds (JGB) Data are downloaded from Ministry of Finance website. The leverage data source is eol database of PRONEXUS INC. TOPIX are collected from Yahoo! Finance Japan website. We downloaded the Nikkei 225 VI from the website of investing.com.

4. Results and Discussion

4.1. Descriptive statistics

Table 1 reports the summary statistics for the sample data. Our sample consists of 357 observations with domestic 220 and foreign 137. The CS has an overall mean of 0.377 and standard deviation of 0.391. The CS for domestic bond is 0.143 and that of foreign bond is 0.754. The difference is statistically significant at 1% level, as is indicated on the right two columns. The overall sample mean of risk-free rate(*yield*) is 0.186, that of leverage is 0.821, that of market condition (*market*) is 1.343, and that of vix is 0.022.

Table 2 displays a correlation coefficient between each variable. We don’t see high coefficients except for the coefficient of Dummy and CS.

4.2. Main results

Table 3 provides our main estimated results of regression analysis. Model 1 corresponds to equation 1. The coefficient of *yield* is significantly negative, which supports our hypothesis 1. The risk-free rate, the JGB yield negatively affects credit spreads of our overall sample bonds consisting of both foreign and domestic bonds.

The coefficient of *leverage* is significantly positive, which supports our hypothesis 2. As in Collin-Dufresne et al. (2001), we confirmed that credit spreads increase with leverage.

Models from 2 to 8 correspond to equation 2. In all these models, the coefficients of *yield* are significantly negative, which supports our hypothesis 1. Also, the coefficients of *leverage* are significantly positive, which supports our hypothesis 2.

Model 3 is used to test hypothesis 3. As predicted, the cross-term of the dummy and *yield* is significantly positive at 1% level, which supports the hypothesis 3. The credit spread for foreign bond does not decline much even when the JGB yield becomes higher. This tends to explain the difference of credit spreads between domestic bond and foreign bond.

Model 4 is used to test hypothesis 4. As predicted, the cross-term of the dummy and *leverage* is significantly positive at 1% level, which supports the hypothesis 4. The credit spread for foreign bond increase much when the firm leverage becomes higher. This also tends to explain the difference of credit spreads between domestic bond and foreign bond.

These qualitative results regarding the coefficients a'_1 and a'_2 of equation 2 do not change much in model 7 where both of these cross-terms are included. However, in model 8 where all the variables in equation 2 are included, we lose the impact of leverage through the coefficient of a'_2 of equation 2. Instead, the vix has significantly positive impact on the foreign bonds.

4.3. Robustness check

We extend our analysis as robustness check. As the first robustness check, we explore a possibility that the foreign credit spread is not affected by domestic risk-free rate, but is affected by foreign risk-free rate. For this purpose, we define a new variable *yield2* which is JGB yield

for domestic bond and U.S. Treasury (UST) bonds, which is downloaded from the Federal Reserve System website.

Table 4 reports the estimated results using *yield2*. We also use *market2* and *vix2*, instead of *market* and *vix*, respectively. The variable *market2* is TOPIX for domestic bond and S&P500 for foreign bond. The variable *vix2* is Nikkei 225 VI for domestic bond and VIX index of the CBOE for foreign bond. S&P500 data are collected from Yahoo! Finance USA website and VIX index of the CBOE from Yahoo! Finance USA website, respectively.

In model 1, the coefficient of *yield2* is significantly negative, which confirms the previous result supporting hypothesis 1. Also, the coefficient of the cross-term of the dummy and *yield2* is significantly positive, which supports the hypothesis 3. These results imply a possibility that the foreign investors evaluate the credit spreads or default probability using the foreign risk-free rate. However, when we include a cross-term of other variable in models 2, 3, and 4, we lose the significance of *yield2*. Also, the coefficients of *leverage* also become insignificant in these models. Therefore, we consider that there may be some model misspecifications when we use *yield2*.

As the second robustness check, we explore a possibility that the credit spread is affected by UST yield as well as JGB yield. In Table 5, we use UST yield as well as *yield* (JGB yield) as explanatory variables. We consider that both risk-free rate affects the credit spreads of both foreign and domestic bond in model 1. In model 2, we consider that JGB yield affects the credit spreads of both foreign and domestic bond while UST yield affects only foreign bond.

According to the estimated results, we can see that the coefficient of UST is not significant in model 1. We cannot consider that UST yield affect both of foreign and domestic bonds. However, JGB yield affects both.

However, in model 2, we see that the coefficient of the cross-term of the dummy and UST yield is significantly positive. The result implies that foreign investors are sensitive to the behavior of UST yield as well as JGB yield, which explain the difference in CS between foreign and domestic bonds.

5. Conclusions

We investigate the effects of risk-free rate (JGB yield) on both domestic and foreign bonds and find that JGB yield negatively affects credit spreads both domestic bonds and foreign bonds. Also, the coefficient of leverage is significantly positive and that supports our hypothesis, too. Furthermore, we investigate the magnitude of JGB yield and leverage to the credit spread of each domestic and foreign bond. We find that the difference of the credit spreads between domestic bond and foreign bond is due to a sensitivity to JGB yield and also the difference in sensitivity of domestic and foreign bond. Our results show that the credit spread for foreign bond does not decline as much as the credit spread of domestic bond does when JGB yield becomes higher and that the credit spread for foreign bond increase much more than domestic bond when firm leverage becomes higher.

These results show that foreign investors require more premium on the credit risk to the foreign bond even though the issuer is the same as domestic bond and credit risk is also the same. However, these results leave us further interesting research theme about what makes the difference between domestic bond and foreign bond.

References

- Ieda, Akira, & Ooniwa, Toshikazu (1998), "Current trend of Libor spread at the secondary market of the Japanese domestic corporate bonds (in Japanese)", *IMES Discussion Paper*, No. 98-J-10, pp.1-22.
- Alter, Adrian, & Schuler, Yves S. (2012), "Credit spread interdependencies of European states and banks during the financial crisis", *Journal of Banking & Finance*, 36(12), pp.3444-3468.
- Blanco, Robert, Brennan, Simon, & Marsh, Ian W. (2005), "An Empirical Analysis of the Dynamic Relation between Investment-Grade Bonds and Credit Default Swaps", *Journal of Finance*, 60(5), pp.2255-2281.
- Chakravarty, Sugato, & Sarkar, Asani (1999), "Liquidity in fixed income markets: A comparison of the bid-ask spread in corporate, government, and municipal bond markets" *Working paper*, Federal Reserve Bank of New York.
- Collin-Dufresne, Pierre, Goldstein, Robert S., & Martin, J. Spencer (2001), "The Determinants of Credit Spread Changes", *Journal of Finance*, 56(6), pp.2177-2207.
- Collin-Dufresne, Pierre, & Goldstein, Robert S. (2001), "Do Credit Spreads Reflect Stationary Leverage Ratios?", *Journal of Finance*, 56(5), pp.1929-1957.
- Crabbe, Leland E., & Turner, Christopher M. (1995), "Does the Liquidity of a Debt Issue Increase with Its Size? Evidence from the Corporate Bond and Medium-Term Note Markets", *Journal of Finance*, 50, pp.1719-1734.
- Doshi, Hitesh, Ericsson, Jan, Jacobs, Kris, & Turnbull, Stuart M. (2013), "Pricing Credit Default Swaps with Observable Covariates", *Review of Financial Studies*, 26(8), pp.2049-2094.
- Ericsson, Jan, Jacobs, Kris, & Oviedo, Rodolfo (2009), "The Determinants of Credit Default Swap Premia", *Journal of Financial and Quantitative Analysis*, 44(01), pp.109-132.
- Forte, Santiago, & Peña, Juan Ignacio (2009), "Credit spreads: An empirical analysis on the informational content of stocks, bonds, and CDS", *Journal of Banking & Finance*, 33(11), pp.2013-2025.
- Galil, Koresh, Shapir, Offer Moshe, Amiram, Dan, & Ben-Zion, Uri (2014), "The determinants of CDS spreads", *Journal of Banking & Finance*, 41, pp.271-282.

- Jarrow, Robert. A., & Turnbull, Stuart M (1995), "Pricing Derivatives on Financial Securities Subject to Credit Risk", *Journal of Finance*, 50(1), pp.53-85.
- Kondo, Yorishige (1996), "Yield spread analysis of Samurai bonds and foreign bond in Japanese Yen (in Japanese)". *Society for the Economic Studies of Securities year book*, pp.95-104.
- Kondo, Yorishige (2000), "A Comparative Survey on Launch Spread, Over-The-Counter Standard Quotation and Broker's Broker Quotation : Corporate Straight Bond Yield Spread Analysis (in Japanese)", *International Public Policy Studies*, 4(2), pp.59-76.
- Longstaff, Francis A., Mithal, Sanjay, & Neis, Eric (2005). "Corporate Yield Spreads: Default Risk or Liquidity? New Evidence from the Credit Default Swap Market", *Journal of Finance*, 60(5), pp.2213-2253.
- Shirasu, Youko, & Yonezawa, Yasuhiro (2007), "Empirical study of variable factors of corporate bond at the secondary market (in Japanese)", *Financial Research Center, Discussion paper*, 2007-2, pp.1-31.
- Wang, Hao, Zhou, Hao, & Zhou, Yi (2013), "Credit default swap spreads and variance risk premia", *Journal of Banking & Finance*, 37(10), pp.3733-3746.

Table 1: Summary statistics

		Obs	Mean	Std. Dev	Min	Max	t stat.	p-value
Sample All								
	CS	357	0.377	0.391	2.410	0.009	-22.137	0.000
	yield	357	0.186	0.402	1.728	-0.376	3.102	0.002
	leverage	357	0.821	0.115	0.966	0.233	-0.491	0.624
	market	357	1.343	0.298	1.911	0.717	-1.703	0.089
	vix	357	0.022	0.005	0.051	0.012	0.388	0.698
Domestic								
	CS	220	0.143	0.094	0.691	0.009		
	yield	220	0.238	0.442	1.728	-0.376		
	market	220	0.819	0.105	0.961	0.233		
	vix	220	1.322	0.307	1.876	0.717		
	leverage	220	0.022	0.005	0.051	0.013		
Foreign								
	CS	137	0.754	0.392	2.410	0.180		
	yield	137	0.104	0.311	1.631	-0.364		
	market	137	0.825	0.131	0.966	0.420		
	vix	137	1.377	0.281	1.911	0.717		
	leverage	137	0.021	0.006	0.039	0.012		

Table 2: Correlation matrix

	CS	yield	leverage	market	vix	Dummy D _i	US yield
CS	1						
yield	-0.075	1					
leverage	-0.103	-0.151	1				
market	0.056	-0.374	-0.170	1			
vix	0.106	0.211	0.038	-0.290	1		
Dummy D _i	0.761	-0.160	0.023	0.092	-0.024	1	
US yield	0.013	0.384	-0.280	0.495	-0.167	-0.032	1

(Note) The table reports the summary statistics for our main variables and control variables. T statistics is for the null hypothesis that there is no difference between domestic and foreign markets.

Table 3: Regression results: Domestic variables only

Dep. Var. = CS

Model	1	2	3	4	5	6	7	8
Explanatory variables								
yield	-0.317** (0.113)	-0.201** (0.072)	-0.555*** (0.145)	-0.216** (0.078)	-0.218** (0.075)	-0.163* (0.079)	-0.337*** (0.091)	-0.289*** (0.092)
leverage	2.267* (1.096)	1.665** (0.677)	2.503*** (0.740)	1.670* (0.827)	1.347* (0.746)	1.460* (0.711)	1.836** (0.692)	1.698** (0.682)
market	0.109 (0.108)	0.046 (0.040)	0.073 (0.106)	0.044 (0.039)	-0.085 (0.066)	0.054 (0.049)	0.033 (0.049)	0.042 (0.034)
vix	8.269 (5.455)	6.347*** (1.923)	6.954 (4.671)	5.276** (1.731)	7.113** (2.654)	-4.616 (3.570)	4.932** (1.804)	-0.389 (1.963)
Dummy D _i		0.581*** (0.092)						
Dummy X yield			0.812*** (0.179)				0.382*** (0.084)	0.326*** (0.073)
Dummy X leverage				0.690*** (0.099)			0.627*** (0.095)	0.292 (0.168)
Dummy X market					0.393*** (0.075)			-0.009 (0.082)
Dummy X vix						25.780*** (3.405)		13.789*** (4.184)
Constant	-1.919* (0.904)	-1.527** (0.581)	-2.070*** (0.620)	-1.529** (0.696)	-1.089 (0.623)	-1.064* (0.588)	-1.636** (0.569)	-1.376** (0.562)
Fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Number of Observations	357	357	357	357	357	357	357	357
R-squared	0.146	0.663	0.318	0.659	0.593	0.678	0.693	0.706

(Note) The table reports the results of panel estimation with fixed effects. The dependent variable is spread. The variable Dummy takes one for foreign issue and zero otherwise. The robust standard errors are reported in parentheses. *, **, and *** shows 10, 5, 1% significance levels, respectively.

Table 4: Regression results: Domestic and foreign variables

Dep. Var. = CS

Model	1	2	3	4
Explanatory variables				
yield2	-0.320*** (0.086)	-0.059 (0.042)	-0.054 (0.045)	0.011 (0.041)
leverage	2.154*** (0.595)	1.366 (1.000)	1.036 (0.920)	1.105 (0.916)
market2	1.671** (0.698)	0.888 (1.047)	-1.567 (1.370)	0.571 (0.994)
vix2	-1.412 (2.543)	-0.073 (2.094)	-4.196 (2.749)	-10.481* (5.019)
Dummy X yield2	0.485*** (0.078)			
Dummy X leverage		0.737*** (0.097)		
Dummy X market2			4.800*** (0.872)	
Dummy X vix2				28.778*** (5.381)
Constant	-1.757*** (0.458)	-1.143 (0.881)	-0.547 (0.820)	-0.578 (0.777)
Observations	357	357	357	357
R-squared	0.570	0.636	0.558	0.618

(Note) The table reports the results of panel estimation with fixed effects. The dependent variable is spread. The variable Dummy takes one for foreign issue and zero otherwise. The robust standard errors are reported in parentheses. *, **, and *** shows 10, 5, 1% significance levels, respectively.

Table 5: Regression results: Domestic variables and US yield

Dep. Var. = CS

Model	1	2
Explanatory variables		
yield	-0.341** (0.127)	-0.368*** (0.088)
leverage	2.298* (1.129)	1.865** (0.835)
market	0.075 (0.088)	-0.108 (0.064)
vix	8.557 (5.873)	8.741** (3.161)
UST yield	0.021 (0.049)	
Dummy X UST yield		0.273*** (0.045)
Constant	-1.922* (0.929)	-1.462* (0.692)
Observations	355	355
R-squared	0.146	0.561

(Note) The table reports the results of panel estimation with fixed effects. The dependent variable is spread. The variable Dummy takes one for foreign issue and zero otherwise. The robust standard errors are reported in parentheses. *, **, and *** shows 10, 5, 1% significance levels, respectively.

Declarations

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

It is to confirm that there are no known conflicts of interest associated with this study and there has been no significant financial support for this work that could have influenced its outcome.