東海大學管理學院財務金融研究所

碩士論文

公司債信用價差之多層次因素：台灣初級市場實證研究

Multi-level Determinants for the Credit Spread of Corporate Bonds: An Empirical Study of the Primary Market in Taiwan

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ABSTRACT

Previous literature considers only single-level variables that determine the credit spread. On the basis of the primary market data from January 2001 to December 2012 in Taiwan, our study not only investigates the variables at the firm, market, and country levels, but also examines them from an integrated aspect in order to better understand the key factors that influence the credit spread. Major empirical findings can be summarized in five points. First, market-level variables show the least influence on the credit spread among the three levels, implying that the bond market remains immature in Taiwan. Second, integrating three levels better explains the credit spread, with predominance of the country-level variables. Third, the dummy variable for tranching exerts a negative influence on the credit spread over the whole sample but this effect disappears after the announcement of the ban on it in December 2005. Fourth, the result for the value of the government bonds outstanding and 180-day stock market volatility appears mixed across the regressions. Eliminating observations with the negative credit spread, the result turns consistent. Finally, the collateral and tranching play a more important role in determination of the credit spread as we only consider non-financial bonds than as we consider both non-financial and financial bonds.

Keywords: Credit spread, Tranche, Primary market, Taiwan

摘要

過去研究信用價差的文獻裡大多只考慮單一層面的變數，本文以2001年1月至2012年12月台灣新發行的五年期公司債為樣本，從公司、市場與國家三個層面來探討影響信用價差的因素，並且同時考慮三個層面對信用價差的整合性影響。主要實證究結果歸納以下五點。第一、市場層面變數解釋信用價差的能力最小，顯示台灣目前的公司債市場發展仍未成熟。第二、同時考慮三個層面較能解釋台灣公司債初級市場的信用價差。第三、分券能降低公司債的信用價差，但在2005年12月政府禁止分券後，此虛擬變數的效果變為不顯著。第四、公債流通在外數量與股票市場波動率所呈現的結果與文獻不一致，但在剔除負信用價差樣本後，結果符合預期。第五、擔保品與分券對非金融債券信用價差的解釋能力較考慮金融與非金融債券的總樣本高。

關鍵字：信用價差、分券、初級市場、台灣

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1. Introduction

The objective of corporate finance is to maximize the value of the stockholders by maximizing the value of the firm. Modigliani and Miller (1958 and 1963) initially propose that no optimal capital structure exists. But under taxes and financial distress, an optimal capital structure that maximizes the firm value may exist. Therefore, how to lower the cost of capital for more profitable investment projects appears vital for firms and constitutes the major subject in corporate finance.

A company can raise the capital from the equity market or the bond market. In the past, owing to the illiquidity in the corporate bond market, most companies raise funds throughout the equity market. But nowadays more and more companies turn to the bond market. The seasoned equity offering value was 129.4 billion new Taiwan dollars in 1997 but dropped to 23.7 billion new Taiwan dollars in 2007. Oppositely, the corporate bond issued amount was 177.2 billion new Taiwan dollars in 1997 but spikes to 877.3 billion new Taiwan dollars in 2007. This makes corporate bond issuance the important issues to be explored and its determinants for the credit spread.

The credit spread refers to the difference in the yield between the corporate bond and the government bond of a comparable maturity. Credit risk, liquidity, call, and conversion features are all the factors that determine the credit spread. Covitz and Downing (2007) show that credit quality plays an important role than liquidity risk for very short-term corporate bonds. Huang and Huang (2003) show that credit risk only explains a small fraction of the credit spread for investment grade bond and it accounts for a larger fraction for junk bonds. From above, we understand that the credit spread can nott be well explained when only the

credit risk is considered. Yu (2009) indicates that firms with a higher accounting disclosure tend to have a lower credit spread. Hattori et al. (2002) analyze the variation in the credit spread, finding that the default risk and the overall financial situation are the most important factors in determining the credit spread in Japan's bond market after 1997. Tang and Yan (2006) use a structural model to examine the interaction between macroeconomic conditions and firm characteristics affecting the credit spread. The authors show findings that the credit spread is negatively correlated to the interest rate, the yield curve is upward sloping for low-grade bonds, and firm characteristics have significant effects on the credit spread and these effects also vary with economic conditions. Lu et al. (2009) propose that as there is information uncertainty and asymmetry between firms and investors, and investors charge a significant risk premium.

Campbell and Taksler (2003) and Mongkonkiattichai and Pattarathammas (2010) indicate that in addition to the factors mentioned above, the credit spread is also associated with relation between the bond market and the stock market. They find that stock market volatility such as the firm's idiosyncratic risk, individual stock return, and market return matter in explanation of the credit spread. Others propose new methodologies to conduct a more precise estimation. Bhar and Handzic (2006), for instance, employ a state-space Vasicek model and show that the long-term bond yield, implied volatility index, and S&P 500 index capture most of the time-variation in credit spreads across ratings for a given maturity. Corelli (2011) applies a Kalman filter to the multifactor Vasicek credit spread model and finds that the filter appears very powerful. In comparison with real data, the study finds that the application of the Kalman filter makes an improvement in forecasting of the credit risk.

In contrast to the firms-level variables and country-levels that are the attributes which affect the firm exclusively or the whole economy, market-level variables are factors that solely influence the bond market, such as the bond market institution. This paper focuses on tranching, which is a special phenomenon in Taiwan's corporate bond market. For example, firms are allowed to issue 5 million dollars of corporate bonds 5 times, each with the value of 1 million and same conditions. The advantage of tranching is to divide the corporate bond into a smaller size. However, it manipulates the fund market closely related with the corporate bond market. Due to the tranching practice, each tranche of corporate bonds is small enough so that investors can buy them and hold to maturity without trading in the secondary market. This increases the bond value which reflects investors' preference for bonds rather than other assets and it sometimes even causes excess demand for corporate bonds. Since tranching misprices the corporate bonds, this practice has been regulated by Taiwan's authority since December 2005. Under the regulation, a firm is allowed to issue corporate bonds with tranching only as the institution that secures the issue, collateral, term to maturity, or interest payment (fixed rate or floating rate) is different. Otherwise, the corporate bonds should be regarded as the same issuance.

Most of the previous studies focus on the individual level that influences the credit spread. In this study, we take overall-level factors into account and evaluate the relative importance at each level. Besides, under the illiquidity in Taiwan's corporate bond market, most investors prefer to buy and hold to maturity. Our empirical study pays attention to the credit spread in the primary market. The sample covers newly issued corporate bonds from January 2001 to June 2012. The ordinary least squares estimation method is employed to explore the multi-level determinants for the credit spread. The objective of our study is to discuss the determinants for the credit spread from firm, market, and country levels and to

propose insights for companies and authorities as firms decide to raise funds through the corporate bond market.

The remainder of this study is organized as follows. Chapter 2 reviews the related literature. Chapter 3 presents the sample data and methodology to be applied. Chapter 4 discusses major empirical results. Chapter 5 concludes with suggestions for future research.

2. Literature Review

In the past, there is abundant literature that studies the determinants for the credit spread. For better understanding the major differences among previous studies, we classify them into three categories.

2.1 Firm-level Studies

Huang and Huang (2003) propose a new calibration approach to calculation of how much of the corporate-Treasury yield spread is due to the credit risk of the individual firm. The results indicate an inconsistent impact of credit risk on differently rated corporate bond. For investment grade bonds, credit risk explains only a small fraction, in particular for bonds with shorter maturities. For junk bonds, credit risk accounts in contrast for a much higher fraction for the yield spread. In Tsuji (2005), it is found that the variables suggested by the theory of credit risk play little explanatory power for the credit spread in Japan. Instead, the author finds a crucial role for the credit rating, illiquidity, investors' preference, and business cycle. Wang and Zhang (2009) break down institutional investors into two groups: transient institutional investors who are more sensitive to information asymmetry but unlikely to participate in corporate governance and dedicated investors who are opposite to the former. Their study shows that the credit spread narrow (widen) with an increase in equity ownership by transient (dedicated) investors. Lu et al. (2010), from the information aspect, adopt American bond data and suggest that the information uncertainty and information asymmetry play important roles in explaining corporate yield spread. The results are robust even as the credit rating is controlled for.

2.2 Market-level Studies

Hattori et al. (2002) analyze the determinants for the variation in the yield spread between government bond and corporate bond in Japan after 1997. The study complies monthly yields for corporate bonds issued with five-year term to maturity and rated by Aa, A or Baa. They show that the Tibor-Libor spread and the first difference of the credit spread can explain the credit spread in all the categories of credit rating. The monetary base and the ratio of corporate bonds issued to government bonds issued also explain in some categories. De (2006) employs a random effect model to study the determinants of corporate bond market capitalization in eight Asian countries (China, Hong Kong, Indonesia, Japan, Korea, Malaysia, Singapore and Thailand) and finds that the level of outstanding foreign-currency bonds has been the major driving force behind the growth of the local corporate bond market. Besides, two variables, the domestic credit provided by the private sector and the level of equity capitalization, are positively related to bond capitalization. Dittmar and Yuan (2008) turn to the sovereign bond market and examine its link with the corporate bond market in the emerging economies from three aspects: spanning enhancement, price discovery, and liquidity. The study investigates dollar-denominated sovereign and corporate bonds in eight emerging markets (Argentine, Brazil, Chile, Korea, Mexico, the Philippines, Thailand, and Venezuela). The empirical evidence shows that sovereign bonds help to develop corporate bond markets in emerging economies through improved information production that thereby reduces adverse selection and enhances liquidity.

2.3 Country-level Studies

Thuraisamy et al. (2008) investigate the sovereign issues from major Latin American economies in international bond markets. They document that the asset, interest rate, exchange rate, and slope of the yield curve are significant determinants of credit spread

changes. Besides, the study conducts an intra-regional analysis and finds that the sovereign yields show a shift in the long-run equilibrium dynamics. Lepone and Wong (2009) examine the determinants in the changes of credit spreads in the Australian corporate bond market with credit spreads calculated by the bond index data provided by the Australian Financial Markets Association Services. They focus on eight credit spread changes on four credit rating levels (AAA, AA, A, and BBB), and four maturities (1-3 years, 3-5 years, 5-7 years and 7-10 years) The empirical findings indicate that changes in the spot rate and changes in the yield curve are the most important determinants for the credit spread and the relation appears negative. Chebbi and Hellara (2010) study the importance of sovereign risk in determining the corporate yield spread in the Tunisian bond market with data of the corporate bonds issued in Tunisia during 1998-2008. The result shows that the credit spread is positively related to sovereign risk measured with the rating provided by Moody's only.

A second bunch of country level studies investigate the link between the stock market and the bond market. Campbell and Taksler (2003) employ a relatively unstructured econometric approach and explore the connection between the equity volatility and the credit spread. This approach appears to better explain the credit spread than that explained by the standard structural model of Merton (1974). The authors show that volatility explains as much variation in the credit spread as credit ratings and that volatility contribute a high explanatory power even in the presence of credit ratings. Their findings are robust as the fixed effects for each bond issuer, monthly effect, idiosyncratic returns evaluated by the market mode, volatility measured by different time windows, and zero-coupon term structure to control for maturities are incorporated. Finally, the study analyzes corporate bond yield indexes between 1963 and 1999, showing that aggregate corporate yield spreads widen during periods of higher idiosyncratic risk, and suggesting that equity volatility helps to explain both short-term

and long-term movements in the credit spread.

Mongkonkiattichai and Pattarathammas (2010) follow Campbell and Taksler (2003) and investigate the association among the credit spread, equity volatility, macroeconomic variables, credit ratings and financial ratios in the Thailand bond market. The results indicate that equity volatility in both firm-specific risk and market risk matter to the credit spread is consistent with Campbell and Taksler (2003). Furthermore, this study finds that an increase in the interest rate level and slope enlarges the credit spread. Mongkonkiattichai and Pattarathammas (2010) also propose the standard deviation in GARCH (1,1) model rather the standard deviation of daily excess returns as the proxy for individual stock volatility. This proxy yields stronger evidence that individual stock volatility positively affects the corporate bond yield spread.

Despite a family of studies that focus on the determinants for the credit spread, few spread puzzles still exist in literature. An alternative class of studies hence proposes new methodology to conduct a more precise estimation. Bhar and Handzic (2006) employ a state-space Vasicek model. The results show that a three-factor model, which includes for instance the long-term bond yield, implied volatility index, and S&P 500 index, captures most of the time-variation in credit spreads across ratings for a given maturity. Corelli (2011) applies a Kalman filter to the multifactor Vasicek credit spread model to correct estimation. The filter appears very powerful as it supports estimation of the past, present, and even future data for an unknown state. The author analyses a dataset of ten distressed US companies with the similar capitalization and outstanding AA rated debt for a 10-year term to maturity in order to assess default probability generated from the estimated spread. In comparison with real data, the study finds that the application of the Kalman filter makes an improvement in

forecasting of the credit risk. In order to complement the studies reviewed above, our study intends to integrate the three levels of analysis and contribute to the extent literature on the credit spread.

3. Data and Methodology

The initial sample covers all the newly issued corporate bonds during the period from January 2002 to June 2012. The data sources include the GreTai Security Market (GTSM), Taiwan Economic Journal (TEJ), and CMoney database. We restrict our sample to straight corporate bond with a five-year maturity and a fixed coupon rate. Issuing companies which are not listed on Taiwan Stock Market Exchange (TWSE) or GTSM are excluded. After deletion of observations with missing data, the final sample contains 158 issuance cases. In our study we examine the determinants causing the credit spread could be observed from three dimensions: firm, market and country levels. In addition to the credit spread as the dependent variable, variables at each level are respectively explained below.

3.1 Dependent Variable: Credit Spread

The credit spread (*CS*) is equal to the yield to maturity of the newly issued 5-year corporate bond minus the yield to maturity of 5-year government bond based on secondary market transactions on the corresponding issue date. The credit spread represents a premium from the corporate bond over the government bond and stems from factors of the firm-specific, market, and country levels. Table 1 summarizes the descriptive statistics of our sample. Panel A shows that the average credit spread in the sample is 0.419%. It is noted that minimum credit spread equals -1.565%, implying excess demand for certain corporate bonds over the sample period. In this case, institutional investors, especially those who search for long-term fixed-income vehicles, purchase the corporate bonds even though the bond yield is lower than the government bond yield and bank term deposit rate.

3.2 Firm-level Variables

The firm-level variables include coupon rate (*CR*), issue size (*ISSUE*), capitalization (*CAP*), debt-to-capitalization ratio (*DBT1*), and long debt–to-asset ratio (*DBT2*). Since all corporate bonds are issued at par, the coupon rate is the effective yield to investors. Elton et al. (2001) indicates that coupon income is taxable, making the higher the coupon rate, the higher credit spread bond. Hence, two variables of the firm size are considered. Yu (2005) agree issue size is a good proxy of corporate bond liquidity as the amount issued presents the depth of the secondary market. In subsequent analysis the issue size is taken in logarithm. Companies of greater capitalization tend to have more access to low-cost capital than those of smaller one. As for capitalization, Nayak (2011) studies the attributes that influence corporate debt issuance and shows capitalization drives the firms to issue bonds.

We consider the debt-to-capitalization ratio and long debt-to-asset ratio as two proxies for measurement of the firm's leverage. The more frequently the company issues bonds, the more levered the company becomes. Mongkonkiattichai and Pattarathammas (2010) indicate that highly levered companies have a higher chance to default, leading a higher yield premium. We expect that a company with higher capitalization and high leverage ratio would have a higher credit spread.

Panel B in Table 1 presents the descriptive statistics of the firm-level variables in the samples. It shows that the firm-specific variables exhibit high heterogeneity, especially in the issue volume and capitalization. The maximum for the issue size and capitalization are 86 and 184 times the respective minimum value, which implies that the companies able to issue corporate bonds are not limited to particular firm size. For leverage proxies, there are firms whose long-debt-to-asset ratio equals zero. It should be noted that these leverage proxies are

based on accounting data in the previous year. We do not exclude them from our sample that focuses the current year of bond issuance.

3.3 Market-level Variables

The market-level variables included in the analysis contain collateral (*UNCOL*), financial sector (*FIN*), credit rating (*RATING*), tranche (*TRANCHE*), the ratio of corporate bonds issued to government bonds issued (*CBG*), sovereign bond outstanding (*GBO*), total return in 180 days (*TRN180*), and excess return in 180 days (*ERN180*). We define the market-level variables as those which mainly reflect the particular mechanism and institutions in the bond market rather than in other markets such as the stock market. Hence, the collateral and credit rating are classified at the market level. There are two dummy variables included. The collateral guarantees the payment as the bond defaults. The corporate bond secured with collateral has hence a lower credit spread. The collateral variable is represented by a dummy variable which equals one as the corporate bond is issued without collateral. The second dummy variable is equal to one for financial bonds and zero for non-financial bonds. Mongkonkiattichai and Pattarathammas (2010) point out that the financial sector in Thailand has lower credit risk for the reason that it has been keenly aware of creditworthiness since the past crisis. Tsuji (2005) investigates the credit spread puzzle in Japanese market, and finds that the credit rating exerts a positive influence on the credit spread but fails to fully explain the credit spread. Under data availability, we distinguish bonds rated with a high grade and bonds rated with a low grade based on the rating score of twAA. The dummy variable is one for rating below twAA and zero for rating at twAA or above.

The variable *TRANCHE* relates to a special phenomenon in Taiwan's corporate bond market in the past. It refers to the issuance of the corporate bonds with the same condition

several times within a short time span. But this market anomaly has been banned since December in 2005. According to the approval date, if a bond is issued more than once, it is regarded as tranching and marked by a dummy variable of one.

In Hattori et al. (2002), the issue volume of corporate bonds and government bonds (CBG) is important for market participants to understand the supply-demand balance within each bond market and in the overall bond market, which changes the yield and the credit spread. We calculate the ratio of newly issued corporate bonds to government bonds at the end of the previous month to reflect the substitution between corporate bonds and government bonds. Hattori et al. (2002) also highlights that the sovereign bond outstanding significantly in explaining credit spread, since government bonds crowd out the investors' available funds to purchase the corporate bonds, which increases the credit spread. We take the government bonds outstanding in logarithm to reduce the size effect at the end of the previous month.

Finally, we try to capture the link between the bond market and the stock market. Campbell and Taksler (2003) and Mongkonkiattichai and Pattarathammas (2010) indicate that a firm who has a higher growth rate would have low probability of default. We focus on the daily return and the daily excess return, which equals to the daily return minus the return on the Taiwan Stock Exchange Weighted Index. The data are from the Taiwan Economic Journal and we calculate average return in 180 days preceding the bond approval date.

Panel C in Table 1 recapitulates the descriptive statistics of the market-level variables. It shows that only 26% of the bonds are issued with collateral, one-fifth are financial bonds, 57% have a credit rating score below twAA, and one-fourth of bonds involve tranching. The ratio of corporate bonds issued to government bonds issued has high variation. However, the

value of government bonds outstanding remains relatively stable over the sample period. The 180-day total return and 180-day excess return are strikingly dispersed partly because the sample period covers the financial crisis in 2008 where most of the stock prices dramatically plunge worldwide.

Table 2 and Table 3 present the descriptive statistics of firm-level variables for non-financial bonds and financial bonds. The coupon rate is lower for non-financial bonds and for bonds with tranching than for financial bonds and for bonds without tranching. Firms that issue financial bonds have smaller capitalization than those that issue non-financial bonds and show a higher debt-to-capitalization ratio.

3.4 Country-level variables

The country-level variables include overnight rate (*ON*), 30- day commercial paper rate (*CP30*), changes in overnight rate (*ON_CHG*), changes in 30-day commercial paper rate (*CP30_CHG*), 5-yaer government bond yield (*YTM5*), 10-year government bond yield (*YTM10*), the term spread between 10-year and 2-year government bond yields (*YTM10-YTM2*), 180-day average return (*MRN180*) and standard deviation (*MVL180*) of the stock market, and exchange rate (*ER*).

For the short-term interest rate, Chang (2007) indicates that the overnight rate is at an extremely low level, investors may have excess funds that force them to invest in riskier assets such as bonds. We additionally take into account the 30-day commercial paper rate to capture the short-term interest effect on the credit spread. The commercial paper rate is obtained from the primary market at the end of the previous month. In addition to the level of short-term interest rates, we add changes in the overnight rate and change in the 30-day

commercial paper rate. Chiu (2007) observes a U-shape relation between overnight rate change and the credit spread. The change is based on the difference between the approval date and date 30 days earlier.

Longstaff and Schwartz (1995) point out that a higher government bond yield lowers the probability of default and hence the corporate bond yield. We consider 5-year and 10-year government bond yields. The term spread in the yield between 10-year and 2-year government bond is also included to capture the slope of the term structure that reflects by theory providing the expectations of the economic conditions. However, Zang et al. (2005) argue that a steeper term spread may cause inflation.

As to the financial market at the country level, Mongkonkiattichai and Pattarathammas (2010) indicate high market return and low risk are associated with good economic conditions, thereby lowering the chance to default. The daily Taiwan Stock Exchange Weighted Index return is acquired from the Taiwan Economic Journal and we calculate the average return and standard deviation in 180 days preceding the bond approval date.

Finally, Thuraisamy et al. (2008) argue that changes in the exchange rate represent an important country-specific risk. The depreciation of the home currency increases the risk associated with the issuer and thereby raises the credit spread. De (2006) finds that under a smaller size in the local-currency bond market, foreign-currency bonds have exerted a major outstanding has been the major influence on the growth of the local bond market in eight Asian economies. Changes in the exchange rate are calculated by the average of the change over the 30 days prior to the bond approval date.

Panel D in Table 1 presents the descriptive statistics of country-level variables for all samples. Both short-term and long-term interest rates are stable and remain at relatively low levels. Since our sample period covers the financial crisis, the stock market and the foreign exchange market appear volatile. The 180-day stock market return ranges from -57.8% to 40.6%, while the 180-day stock market volatility ranges from 0.739 to 2.516, and change in the exchange rate ranges from -17.4% to 20.4%.

4. Empirical Results

In this chapter, we first conduct the correlation analysis of the variables at each level. Then we discuss the results at the respective level and at the integrated level. Finally we establish the robustness check and present a brief summary of major findings.

4.1 Correlation Analysis

Table 4 reports the correlation among variables by levels. Panel A shows that the coupon rate, issue size, and capitalization positively influence the credit spread. And it also indicates highly correlation between the issue size and capitalization. Panel B describes that collateral, credit rating, and government bonds outstanding have a positive relation, but tranching appears to have a negative impact on the credit spread. Panel C illustrates that the overnight rate, commercial paper rate in 30 days, changes in the overnight rate and commercial rate and 180-day stock market return negatively affect the credit spread. The 180-day stock market volatility positively influence the credit spread. Besides, Panel C displays high correlation among the overnight rate, 30-day commercial paper rate, and 5- and 10-year government bond yields.

4.2 Estimation Results with Firm-level Variables

The estimated results of Regressions (1) to (3) in Table 5 reveal that the coupon rate, issue size, and capitalization all positively affect the credit spread at the 1% significance level. Because of high relation between the issue size and the capitalization, Regressions (1) and (2) are respectively presented. The positive relation between the coupon rate and the credit spread implies that bond investors take into account the tax effect on the bond yield. The sign for the issue size is however, inconsistent with previous studies. Yu (2005) finds that the issue size is

negatively correlated to the credit spread for the reason that the issuance volume reflects the depth of the secondary market, as it determines bond liquidity. In our study, positive relation may be associated with the fact that the corporate bond secondary market is illiquid in Taiwan. Investors, mostly of institutional nature, hold corporate bonds to maturity, since they only consider the chance of default, as a large issue size is more likely to default. Capitalization, a proxy for the firm size, is positively affects the credit spread. Larger firms get finance in the corporate bond market more frequently, conveying higher leverage to investors. Finally, the debt-to-capitalization ratio and long debt–to-asset ratio have no effect on the credit spread, as accounting data are updated only at the end of the previous calendar year, and default risk may not be reflected in time.

4.3 Estimation Results with Market-level Variables

Table 6 summarizes results for regressions with market-level variables. Only collateral, the ratio of corporate bonds issued to government bonds issued and the value of government bonds outstanding show significant coefficients. The company issuing bonds without any collateral has to pay higher risk premium in order to compensate bond investors, resulting in a higher credit spread. An increase in supply on one bond market, the yield rises in that market. Simultaneously, the yield on the other market rises following the increase in supply on the whole bond market. If the ratio of corporate bonds issued to the government bonds issued increase, which means that the supply of the corporate bond increases more than that of the government bond, the yield on corporate bonds usually rises more than that on government bonds. As result, the credit spread between corporate bonds and government bonds enlarges. The value of government bonds outstanding is positively related to the credit spread. As the government bonds serve as a substitute for corporate bonds, the value of government bonds outstanding affects the demand for corporate bonds. A larger value of the government bonds

outstanding crowds out the investors' demand for corporate bonds, which leads to a positively sign for government bonds outstanding. Our result is consistent with Hattori et al. (2002).

Financial bonds and non-financial bonds show no difference in the credit spread. This may be in part related to the limited subsample, which contains 32 observations only. As mentioned before, the sample is split at twAA. Most of the corporate bonds in our sample is rated between twAA and twAA-. As a result, the credit rating fails to play a significant role in the credit spread. In other words, companies in Taiwan able to issue corporate bonds are those of high creditworthiness. The practice of tranching was a special phenomenon in Taiwan's bond market in the past. We find that the tranching dummy has a negative sign but is not statistically significant when only market-level variables are included in the regressions.

Both 180-day total return and 180-day excess return have no effect on the credit spread. Campbell and Taksler (2003) argue that as investors become more optimistic about the future corporate perspective, stock prices will increase. However, the stock return benefits stockholders much more than bondholders, as stockholders receive the residual profit while bondholders receive the promised principal and interests only. Moreover, the corporate bonds examined in our sample mature in a five-year time-span, the short-term stock market return observed on the issue date has little to promise repayment at maturity.

From the above, it is found that the adjusted R-squared is 15.5% when only the market-level variables are considered while the adjusted R-squared rises to 24.9% when the firm-level variables are included. Comparing the firm-level variables with the market-level variables, firm-level variables are more critical in explaining the credit spread.

4.4 Estimation Results with Country-level Variables

Table 7 reports the regressions with country-level variables. Under high correlation among the overnight rate, 30-day commercial paper rate, and 5-and 10-year government bond yields, the results are shown individually in Regressions (1) to (4). The overnight rate, 30-day commercial paper rate, 5- and 10- year government bond yield, each, are negatively correlated to the credit spread as an increase in interest refers to good economics and the default risk decreases. The term spread between 10-and 2-year government bond yields and stock market volatility are significant in explaining the credit spread. Both 5- and 10-year government bond yields present the long-term risk-free rate. Since the credit spread is equal to the bond yield minus the 5-year government bond yield, a higher government bond yield lowers the probability of default and hence the corporate bond yield. The result is consistent with Longstaff and Schwartz (1995).

Changes in the overnight rate and changes in the 30-day commercial paper have a negative but insignificant coefficient, implying that changes in the short-term market interest rate do not explain the credit spread at the country level. In contrast, the slope of the yield curve, term spread between 10- and 2-year government bond yields, which is a proxy for business cycle, negatively influence the credit spread, and responds to the prior result that a larger term spread leads to lower chance to default. Stock market volatility refers to the economic health, which is positively correlated to credit spread and consistent with Mongkonkiattichai and Pattarathammas (2010). The exchange rate movement has no significant effect on the credit spread. This is partly due to the fact that corporate bonds are mostly held by domestic institutional investors such as the insurance companies or local companies, which are not as sensitive to exchange rate as export-based companies. Overall, the adjusted R-squared is around 34% for regression with country-level variables, which is

higher than those with firm or market levels.

4.5 Estimation Results with Variables at All Levels

In previous studies, we investigate the factors that influence the credit spread at each of the three levels and find that the explaining power of those variables is not complete. Table 8 shows the correlation among variables at all levels and suggests that the coupon rate and 10-year government bond yield have high correlation. Table 9 presents the regressions that integrate variables at all the three levels. From the perspective of the firm level, both the coupon rate and the issue size are positively related to the credit spread as in Table 5. From the perspective of the market level, the *TRANCHE* dummy is now negatively correlated to the credit spread at 1% level significance in Regressions (1) and (2). This implies that as the corporate bond is issued with tranching, the credit spread will be smaller. In contrast with Table 6, the value of government bonds outstanding is negatively associated to the credit spread in Regression (3) and inconsistent with the prior result. Dittmar and Yuan (2008) argue that government bonds improve corporate bond markets. For development of the corporate bond market, government bonds actually provide more information and thereby reduce adverse selection cost.

From the perspective of the country level, changes in both the overnight rate and 30-day commercial paper rate have now a significantly negative coefficient. The 10-year government bond yield and the term spread between 10- and 2- year government bonds show a similar result as Table 7. As to 180-day stock market volatility, it plays an important role in explaining the credit spread. The relation is however ambiguous. The 180-day stock market volatility shows a negative coefficient in Regressions (1) and (2), but a positively coefficient in Regressions (3) and (4). From the results above, we conclude that considering the three

levels simultaneously does provides a better explanation of the credit spread. Overall, country-level variables seem to dominate in Taiwan's primary bond market. In other words, firms need to take the economic conditions into account as they raise demand capital through issuance of bonds. From our results, the impact of market-level variables on the credit spread is not evident, which demonstrates that the local bond market is still immature in Taiwan.

4.6 Robustness Check and Summary

Table 10 presents estimation results for the robustness check. First, since excess demand for corporate bonds leads to a negative credit spread, we eliminate the observations with a negative credit spread. The results are shown in Regressions (1) and (2). The debt-to-capitalization ratio is now significant and positively affects the credit spread as our previous expectation that highly leveraged firms should pay a larger risk premium to investors. The value of the government bonds outstanding now shows a consistent effect on the credit spread for the reason that government bonds enhance the development of the corporate bond market. And the 180-day stock market volatility also shows a consistent effect with previous literature. As the stock market becomes volatile in the short term, firms will be more likely to default and have to pay more interests to compensate uncertainty. The term spread between the 10- and 2- year government bond yields, however, positively affects the credit spread. This is probably due to the financial crisis in 2008, resulting in the widened credit spread.

The second robustness check involves tranching phenomenon, where firms issue corporate bonds with the same condition several times within a short time span. However, this phenomenon may mislead the net asset value of funds. The authority has regulated the practice December 2005. Regressions (3) and (4) compare the credit spread before and after the announcement of ban. The ratio of corporate bonds issued to government bonds issued has

a significant influence on the credit spread in Regression (3) but not in Regression (4), implying its effect on the credit spread is transitory.

The third check considers non-financial bonds only. The positive relation between 180-day stock market return and the credit spread seems inconsistent with prior studies. A possible reason is that in the bullish market, firms can easily raise funds through the stock market and firms that decide to issue bonds may signal to the investors that the firms not expect a promising performance in the following years, despite a rise in the stock price.

Overall, our empirical findings can be summarized in five points. First, market-level variables show the least influence on the credit spread among the three levels, which implies that the corporate bond market is still underdeveloped in Taiwan. Second, integrating three levels better explains the credit spread with predominance of the country-level variables, indicating that firms finds the economic conditions crucial as they issue bonds. Third, the dummy variable for tranching exerts an influence on the credit spread over the whole sample but this effect disappears after the announcement of the ban, suggesting that the regulation on tranching phenomenon does reduce its distortion to the bond issuance. Fourth, the result for the value of the government bonds outstanding and 180-day stock market volatility appears mixed across the regressions. After eliminating the observations with a negative credit spread caused by excess demand for corporate bonds, the result turns consistent. Finally, the collateral and tranching play a more important role as we only consider non-financial bonds than as we consider both non-financial and financial bonds.

5. Conclusion

In previous literatures, most studies consider only single-level variables that determine the credit spread. In this study, we not only investigate the variables at each of the levels but also examine these variables from an integrated aspect in order to better understand the factors that jointly influence the credit spread. The sample covers newly issued of corporate bonds from January 2001 to June 2012. The ordinary least squares estimation method is employed to determinants for the credit spread. The objective of our study is to discuss the determinants for the credit spread from the firm, market, and country levels and to propose insights for companies and the authorities as firms decide to raise funds through the corporate bond market.

First, we examine variables from each level. From firm-level perspectives, the coupon rate, issue size and capitalization are significantly and positively related with the credit spread. From market-level perspectives, issue without collateral, tranching, the ratio of corporate bonds issued to government bonds issued, and the value of the government bonds outstanding significantly affect the credit spread and market-level variables show least effect on the credit spread of all the three levels. When it comes to country level, both long-term and short-term interest rate, the term spread between 10- and 2- year government bond yields and 180-day market volatility are significant to the credit spread. Second, we find better explanation of the credit spread when three levels are integrated with predominance of the country-level variables. Third, the result of robustness check shows that the regulation on the tranching phenomenon does reduce its distortion to the bond issuance. Fourth, the mixed result in the value of the government bonds outstanding and 180-day stock market volatility can be solved by excluding negative credit spread samples. Finally, tht collateral and tranching play a more

important role as we only consider non-financial bonds than as we consider both non-financial and financial bonds.

Although the corporate bond issuance has surged in Taiwan in recent years, most bonds are issued with call and conversion features. This leads to the small size of our sample. For future research, increased availability of data may help to better understand the evolution of Taiwan’s bond issuance.

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Table 1. Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Obs.
Panel A. Dependent Variable						
CS	0.419	0.379	1.702	-1.565	0.448	158
Panel B. Firm-level Variables						
CR	1.884	1.790	3.300	0.255	0.537	158
ISSUE	3810.335	4000.000	13000.000	150.000	2549.674	158
CAP	276647.400	157707.000	1964449.000	1067.000	333605.600	158
DBT1	2.496	0.806	19.556	0.076	4.084	158
DBT2	0.177	0.171	0.707	0.000	0.117	158
Panel C. Market-level Variables						
UNCOL	0.741	1.000	1.000	0.000	0.440	158
FIN	0.203	0.000	1.000	0.000	0.403	158
RATING	0.570	1.000	1.000	0.000	0.497	158
TRANCHE	0.247	0.000	1.000	0.000	0.433	158
CBG	0.792	0.655	5.060	0.040	0.614	158
GBO	3797537	3870689	4784367	2446825	643647	158
TRN180	3.244	2.042	95.154	-71.614	24.989	158
ERN180	4.362	2.029	77.844	-58.064	17.797	158
Panel D. Country-level Variables						
ON	0.841	0.512	2.168	0.096	0.674	158
ON_CHG	-0.002	0.000	0.042	-0.081	0.014	158
CP30	1.129	0.880	2.310	0.370	0.612	158
CP30_CHG	-0.005	0.010	0.110	-0.310	0.071	158
YTM5	1.466	1.130	2.721	0.843	0.556	158
YTM10	1.773	1.525	2.924	1.144	0.509	158
YTM10_YTM2	0.725	0.622	1.618	-0.082	0.421	158
MRN180	-0.009	0.019	0.406	-0.578	0.166	158
MVL180	1.333	1.231	2.516	0.739	0.458	158
ER	0.010	0.006	0.204	-0.174	0.065	158

Note: *CR, ISSUE, CAP, DBT1, DBT2, UNCOL, FIN, RATING, TRANCHE, CBG, GBO, TRN180, ERN180, ON, ON_CHG, CP30, CP30_CHG, YTM5, YTM10, MRN180, MVL180,* and *ER* denote for the coupon rate, issue size, capitalization, debt to capitalization ratio, long debt to asset ratio, collateral (dummy = 1 if it has no collateral), financial bond (dummy = 1 if it is a financial bond), credit rating (dummy = 1 if it is rated below twAA), tranche (dummy =1 if it involves tranching), ratio of corporate bonds issued to government bonds issued, value of government bonds outstanding, 180-day total return, 180-day excess return, overnight rate, change in the overnight rate, 30-day commercial paper rate, change in the 30-day commercial paper rate, 5-year government bond yield, 10-year government bond yield, term spread between two- and ten-year government bonds, 180-day stock market mean return, 180-day stock market return volatility, and change in the exchange rate. *ISSUE, CAP,* and *GBO* are in million new Taiwan dollars. *CR, YTM10_YTM2, TRN180, ERN180, ON, ON_CHG, CP30, CP30_CHG, YTM5, YTM10, MRN180,* and *ER* are in percentage. *UNCOL, FIN, RATING,* and *TRANCHE* are dummy variables.

Table 2. Descriptive Statistics of Firm-level Variables for Non-financial Bonds

		Mean	Median	Maximum	Minimum	Std. Dev.	Obs.
	No Tranching	1.845	1.650	3.150	1.230	0.523	99
CR	**Tranching**	1.675	1.500	2.500	1.210	0.381	27
	All Bonds	1.809	1.590	3.150	1.210	0.497	127
	No Tranching	4397.172	5000.000	13000.000	150.000	2666.192	99
ISSUE	**Tranching**	2983.333	2500.000	8000.000	450.000	2145.344	27
	All Bonds	4065.906	4500.000	13000.000	150.000	2629.998	127
	No Tranching	379949	296357	1964449	1067	375179	99
CAP	**Tranching**	89527	49449	626965	8097	135795	27
	All Bonds	315533.	173414	1964449	1067	357897	127
	No Tranching	0.713	0.481	5.890	0.076	0.734	99
DBT1	**Tranching**	1.448	1.238	8.687	0.171	1.554	27
	All Bonds	0.872	0.640	8.687	0.076	1.004	127
	No Tranching	0.182	0.185	0.707	0.000	0.095	99
DBT2	**Tranching**	0.279	0.305	0.511	0.002	0.146	27
	All Bonds	0.203	0.197	0.707	0.000	0.114	127

Note: See note in Table 1.

Table 3. Descriptive Statistics of Firm-level Variables for Financial Bonds

		Mean	Median	Maximum	Minimum	Std. Dev.	Obs.
	No Tranching	2.223	2.200	2.890	1.400	0.400	19
CR	**Tranching**	2.149	2.250	3.300	0.255	0.821	12
	All Bonds	2.194	2.250	3.300	0.255	0.587	31
	No Tranching	3153.684	2000.000	7000.000	300.000	2175.235	19
ISSUE	**Tranching**	2145.250	2000.000	4300.000	500.000	1135.224	12
	All Bonds	2763.323	2000.000	7000.000	300.000	1887.018	31
	No Tranching	158437	145837	327470	17520	109357	19
CAP	**Tranching**	52268	25860	255669	16390	71722	12
	All Bonds	117339	95393	327470	16390	108743	31
	No Tranching	8.569	9.430	16.004	1.321	5.171	19
DBT1	**Tranching**	10.060	8.687	19.556	0.827	5.119	12
	All Bonds	9.146	8.908	19.556	0.827	5.118	31
	No Tranching	0.064	0.047	0.201	0.010	0.052	19
DBT2	**Tranching**	0.074	0.074	0.157	0.015	0.036	12
	All Bonds	0.068	0.059	0.201	0.010	0.046	31

Note: See note in Table 1.

Table 4. Correlation Analysis of Variables by Levels

Panel A. Firm Level	***CS***	***CR***	***ISSUE***	***CAP***	***DBT1***
CR	**0.374**				
ISSUE	**0.266**	**-0.178**			
CAP	**0.209**	-0.127	**0.771**		
DBT1	-0.091	**0.187**	**-0.238**	**-0.298**	
DBT2	-0.031	-0.154	**0.160**	0.027	-0.372

Panel B. Market Level	***CS***	***UNCOL***	***FIN***	***RATING***	***TRANCHE***	***CBG***	***GBO***	***TRN180***
UNCOL	**0.260**							
FIN	-0.017	**0.298**						
RATING	**0.172**	**0.419**	-0.103					
TRANCHE	**-0.280**	**-0.431**	0.150	**-0.303**				
CBG	0.127	0.078	**0.296**	-0.076	0.008			
GBO	**0.315**	0.131	**-0.370**	**0.168**	**-0.399**	-0.123		
TRN180	-0.109	0.022	0.085	0.016	0.054	-0.127	-0.081	
ERN180	0.031	0.039	-0.036	-0.031	-0.046	0.079	-0.040	0.581

Note: Correlation coefficients between variables (see Table 1); coefficients in bold for significance at the 5% level.

Table 4. Correlation Analysis of Variables by Levels (Continued)

Panel C. Country Level	*CS*	*ON*	*ON_CHG*	*CP30*	*CP30_CHG*	*YTM5*	*YTM10*	*MRN180*	*YTM10-YTM2*	*MVL180*
ON	**-0.263**									
ON_CHG	**-0.264**	0.024								
CP30	-0.102	**0.913**	**-0.186**							
CP30_CHG	**-0.238**	0.145	**0.370**	-0.067						
YTM5	**-0.445**	**0.913**	0.091	**0.776**	0.097					
YTM10	**-0.504**	**0.750**	0.113	**0.603**	-0.010	**0.945**				
YTM10-YTM2	**-0.170**	**-0.491**	**0.203**	**-0.612**	-0.150	-0.155	0.145			
MRN180	-0.146	**-0.233**	**0.394**	**-0.462**	**0.275**	-0.113	-0.008	**0.443**		
MVL180	**0.207**	0.093	**-0.353**	**0.354**	**-0.634**	0.103	**0.157**	0.014	**-0.528**	
ER	0.033	**0.214**	-0.118	**0.191**	-0.105	**0.196**	0.134	**-0.185**	**-0.319**	**0.182**

Note: Correlation coefficients between variables (see Table 1); coefficients in bold for significance at the 5% level.

Table 5. Estimation Results with Firm-level Variables

	Regression (1)			Regression (2)			Regression (3)		
Intercept	-3.476	***	(-4.647)	-1.866	***	(-3.219)	-3.490	***	(-4.673)
CR	0.371	***	(6.232)	0.351	***	(5.731)	0.375	***	(6.325)
ISSUE	0.346	***	(4.530)				0.342	***	(4.494)
CAP				0.150	***	(3.063)			
DBT1	-0.012		(-1.541)	-0.012		(-1.286)	-0.010		(-1.361)
DBT2	-0.222		(-0.777)	-0.043		(-0.144)			
Adj. R^2		0.247			0.195			0.249	
F-statistics		13.868			10.520			18.336	

Note: Estimated coefficients and t-statistics in parenthesis. ***, **, and * for significance at the 1%, 5%, and 10% level.

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Table 6. Estimation Results with Market-level Variables

	Regression (1)			Regression (2)			Regression (3)			Regression (4)			Regression (5)		
Intercept	-19.920	***	(-3.154)	-18.964		(-3.183)	-19.181		(-3.231)	-21.424	***	(-3.903)	-19.585	***	(-3.312)
UNCOL	0.139		(1.391)	0.160	*	(1.798)	0.180	***	(2.152)	0.214	***	(2.823)	0.172	***	(2.072)
FIN	0.049		(0.467)												
RATING	0.055		(0.717)	0.047		(0.634)									
TRANCHE	-0.091		(-0.970)	-0.084		(-0.909)	-0.091		(-0.993)				-0.103		(-1.136)
CGR	0.086		(1.458)	0.094	*	(1.667)	0.090		(1.620)	0.089		(1.602)	0.108	**	(1.999)
GBO	1.602	***	(3.194)	1.526	***	(3.228)	1.544	**	(3.280)	1.719	***	(3.936)	1.576	***	(3.360)
TRN180	-0.002		(-1.426)	-0.002		(-1.366)	-0.002		(-1.342)	-0.002		(-1.438)			
ERN180	0.003		(1.124)	0.002		(1.057)	0.002		(1.020)	0.003		(1.122)			
Adj. R^2	0.146			0.151			0.154			0.154			0.155		
F-statistics	4.364			4.983			5.769			6.726			8.192		

Note: Estimated coefficients and t-statistics in parenthesis. ***, **, and * for significance at the 1%, 5%, and 10% level.

Table 7. Estimation Results with Country-level Variables

	Regression (1)			Regression (2)			Regression (3)			Regression (4)			Regression (5)		
Intercept	0.713		(-5.543)	0.830	***	(5.220)	0.908	***	(6.095)	0.999	***	(6.658)	0.995	***	(6.648)
ON	-0.309	***													
ON_CHG	-3.095		(-1.209)	-4.180		(-1.635)	-2.879		(-1.185)	-2.999		(-1.260)	-2.988		(-1.258)
CP30			(-0.392)	-5.323	***	(-5.323)									
CP30_CHG	-0.556		(-0.919)	-0.770		(-1.275)	-0.485		(-0.844)	-0.619		(-1.105)	-0.636		(-1.139)
YTM5							-0.399	***	(-7.061)						
YTM10										-0.457	***	(-7.604)	-0.451	***	(-7.594)
YTM10-YTM2	-0.483	***	(-4.819)	-0.581	***	(-5.220)	-0.308	***	(-3.595)	-0.150	*	(-1.778)	-0.155	*	(-1.848)
MRN180	0.389		(1.436)	0.288		(1.056)	0.343		(1.331)	0.340		(1.346)	0.304		(1.230)
MVL180	0.232	**	(2.220)	0.334	***	(2.997)	0.234	**	(2.372)	0.247	**	(2.556)	0.247	**	(2.553)
ER	0.214		(0.417)	-0.150		(-0.293)	0.380		(0.775)	0.341		(0.711)			
Adj. R^2	0.242			0.232			0.314			0.341			0.343		
F-statistics	8.153			7.762			11.284			12.587			14.649		

Note: Estimated coefficients and t-statistics in parenthesis. ***, **, and * for significance at the 1%, 5%, and 10% level.

Table 8. Correlation Analysis of Variables at All Levels

	CR	*ISSUE*	*DBT1*	*UNCOL*	*TRANCHE*	*CBG*	*GBO*	*ON_CHG*	*CP30_CHG*	*YTM10*	*YTM10_YTM2*	*MRN180*
CR												
ISSUE	**-0.178**											
DBT1	**0.187**	**-0.238**										
UNCOL	0.115	**0.436**	**0.157**									
TRANCHE	-0.059	-0.133	**0.198**	**-0.431**								
CBG	**0.184**	-0.033	**0.265**	0.078	0.008							
GBO	**-0.495**	**0.476**	**-0.406**	0.131	-0.399	-0.123						
ON_CHG	-0.126	-0.114	0.129	-0.018	0.017	-0.117	0.017					
CP30_CHG	-0.098	-0.055	0.127	0.004	0.079	**-0.184**	0.062	**0.370**				
YTM10	**0.557**	**-0.447**	**0.270**	-0.154	**0.238**	0.077	**-0.794**	0.113	-0.010			
YTM10_YTM2	**-0.303**	**-0.244**	0.086	**-0.166**	**0.202**	-0.020	**-0.189**	**0.203**	-0.150	0.145		
MRN180	**-0.239**	-0.149	0.130	-0.024	0.074	**-0.210**	-0.048	**0.394**	**0.275**	-0.008	**0.443**	
MVL180	**0.280**	0.149	-0.147	0.038	**-0.158**	**0.225**	-0.017	**-0.353**	**-0.634**	**0.157**	0.014	**-0.528**

Note: Correlation coefficients between variables (see Table 1); coefficients in bold for significance at the 5% level.

Table 9. Estimation Results with Variables at All Levels

	Regression (1)			Regression (2)			Regression (3)			Regression (4)		
Intercept	-3.612	***	(-4.077)	-3.078	***	(-4.347)	27.120	***	(2.919)	1.966	**	(2.193)
CR	0.403	***	(5.980)	0.358	***	(6.076)						
ISSUE	0.372	***	(4.033)	0.330	***	(4.538)	-0.059		(-0.627)	-0.116		(-1.245)
DBT1	-0.007		(-0.768)				0.001		(0.129)	0.006		(0.683)
UNCOL	-0.025		(-0.275)				0.120		(1.374)	0.166	*	(1.887)
TRANCHE	-0.254	***	(-3.041)	-0.231	***	(-3.353)	-0.120		(-1.378)	-0.039		(-0.463)
CBG	0.051		(0.968)				0.050		(1.003)	0.054		(1.058)
GBO							-2.014	***	(-2.720)			
ON_CHG	-5.709	**	(-2.383)	-4.889	**	(-2.160)	-1.688		(-0.713)	-3.198		(-1.361)
CP30_CHG	-1.205	**	(-2.137)	-1.422	**	(-2.593)	-0.255		(-0.462)	-0.568		(-1.031)
YTM10							-0.694	***	(-6.688)	-0.483	***	(-6.859)
YTM10_YTM2	0.124		(1.286)				-0.146	*	(-1.720)	-0.137		(-1.582)
MRN180	0.048		(0.186)				0.280		(1.157)	0.280		(1.134)
MVL180	-0.215	**	(-2.048)	-0.187	**	(-2.104)	0.303	***	(2.968)	0.248	**	(2.425)
Adj. R^2		0.329			0.335			0.395			0.368	
F-statistics		7.991			14.170			9.527			9.312	

Note: Estimated coefficients and t-statistics in parenthesis. ***, **, and * for significance at the 1%, 5%, and 10% level.

Table 10. Estimation Results for Robustness Check

	Regression (1)			Regression (2)			Regression (3)			Regression (4)			Regression (5)		
Intercept	-1.030		(-1.391)	29.032	***	(4.060)	7.120	*	(1.806)	-0.950		(-1.264)	10.454		(1.495)
CR	0.214	***	(3.739)							0.275	***	(4.586)			
ISSUE	0.086		(1.111)	-0.117		(-1.631)	-0.255		(-0.624)	0.079		(0.989)	-0.066		(-0.988)
DBT1	0.022	***	(2.694)	0.025	***	(3.463)	0.010		(0.460)	-0.005		(-0.597)	0.017		(0.466)
UNCOL	0.098		(1.332)	0.192	***	(2.875)	0.144		(0.607)	-0.005		(-0.052)	0.133	*	(1.742)
TRANCHE	-0.156	**	(-2.285)	-0.116	*	(-1.701)	0.171		(0.564)	-0.089		(-0.827)	-0.118	*	(-1.766)
CBG	-0.015		(-0.375)	-0.015		(-0.402)	0.728	**	(2.597)	-0.038		(-0.954)	-0.011		(-0.257)
GBO				-2.163	***	(-3.802)							-0.735		(-1.329)
ON_CHG	-3.592	*	(-1.918)	-1.102		(-0.610)	-3.364		(-0.522)	-4.810	**	(-2.541)	-1.899		(-1.247)
CP30_CHG	-0.615		(-1.401)	0.269		(0.651)	-3.828	*	(-1.965)	-1.206	***	(-2.733)	0.070		(0.183)
YTM10				-0.508	***	(-6.130)	-2.579	**	(-2.376)				-0.420	***	(-5.414)
YTM10_YTM2	0.230	***	(2.794)	0.031		(0.437)	1.766		(1.535)	0.560	***	(6.367)	-0.128	**	(-2.040)
MRN180	-0.097		(-0.478)	0.109		(0.578)	-5.010	**	(-2.789)	-0.685	***	(-3.435)	0.404	**	(2.441)
MVL180	0.071		(0.847)	0.372	***	(4.962)	-1.120		(-1.531)	-0.104		(-1.242)	0.429	***	(6.101)
Adj. R^2	0.378			0.467			0.600			0.424			0.579		
F-statistics	8.627			11.065			5.372			9.240			15.335		

Note: Estimated coefficients and t-statistics in parenthesis. ***, **, and * for significance at the 1%, 5%, and 10% level.