On the Cross-sectional and Time-series Relation between Firm Characteristics and Corporate Bond Yield Spreads

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Abstract

This study examines the cross-sectional and time-series relation between firm characteristics and corporate bond yield spreads. Based on the period 1985 to 1998, we find that differences in leverage and stock return volatility are significant determinants of the cross-section of yield spreads. The above cross-sectional relations are more significant for industrial bonds than for financial and utility bonds and stronger for lower-rated bonds. Free cash flow, however, has an insignificant impact on yield spreads. Bond prices reflect these issuer characteristics across rating categories as well as within each rating category. Interestingly, the results suggest that bond sensitivities to equity market systematic factors provide limited explanatory power to the cross-sectional variation in yield spreads beyond firm and issue characteristics. This is in contrast to previous research that shows that these equity market factors can explain a significant portion of the time series variation in yield spreads. We further identify two aggregate bond market factors, debt ratio and asset volatility factors, as important determinants of time series variation in yield spreads. We conclude that time series variation in yield spreads is mostly driven by the overall bond market performance.

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I. Introduction

In financial markets, the return of a financial security should reflect the security's risk, based on the well-known risk and return relationship. For fixed income securities such as notes and bonds, the level of risk should be a function of the characteristics of the issuers and the issues, the level and volatility of interest rates, and the liquidity of the issues. The above relationships should be true in both primary and secondary markets. From both the investors' and issuers' perspective, it is important to understand how the determinants of bond risk are reflected in bond yields. In this paper, we examine the importance of firm characteristics in determining the cross-section and time-series of corporate bond yield spreads.

In the line of research that stems from Merton (1974), structural models of corporate bond yields view corporate liabilities as contingent claims on the value of the underlying firm. Various contingent claims models differ in the modeling of financial distress and/or bankruptcy. For example, Merton (1974) models financial distress as an exogenously fixed absorbing barrier. Others have taken the approach of modeling an endogenous bankruptcy point. Anderson and Sundaresan (1996a) adopt a game-theoretic model of bankruptcy, whereas Mella-Barral and Perraudin (1997) model liquidation as an option. Leland (1994), on the other hand, assumes that bankruptcy is triggered when the market price of equity reaches zero. Regardless of the assumptions on the bankruptcy barrier, these structural models propose that the value of perpetual coupon debt is a function of the coupon rate, risk-free interest rate, principal, probability of default, the recovery rate, cost of bankruptcy, and the default barrier. Subsequently, these models suggest that firm leverage and asset volatility are important factors related to default risk and are determinants of the yields on corporate bonds.

To examine the performance of these structural models, Anderson and Sundaresan (1996b) empirically compare several of these models using aggregate time series data for the US bond market. They find that recent models using an endogenous bankruptcy barrier fit the data better than the Merton (1974) model. Eom, Helwege, and Huang (2001) test another set of structural models using a cross-section of bonds in 1997. They find that the Merton (1974) and Geske (1977) models tend to underestimate corporate bond yields, whereas Longstaff and Schwartz (1995) and Leland and Toft (1996) tend to overestimate yields.

On the empirical side, research on corporate debt markets covers a broad range of topics, including issue and issuer characteristics, and external environment. Blackwell and Kidwell (1988) find no significant relation between issue size and new issue yields in a study of the cost difference between public and private bonds. Booth (1992) suggests that bank loan size has a negative relation with the loan spreads. Bernanke (1983) and Stock and Watson (1989) search for a relation between debt yields and the business cycle and find the two are related. Crabbe and Turner (1995) examine the relation between debt yields and issue size and find no significant difference in bond yield spreads between large and small issues by the same borrower. Duffee (1998) finds evidence to support a relation between term structure variables and corporate bond yields.

In a more recent article, Elton, et al (2001), examine rate spreads between corporate and government bonds and suggest several factors to explain the spread. In particular, they find that rate spreads on corporate bonds can be largely explained by three factors: possible loss from default, tax differential between corporate and government bonds, and systematic risk of the equity market. They suggest that only a small part of the rate spread between corporate and treasury bonds and the difference in spreads on bonds across rating categories are explained by default-related factors. In the case of 10-year corporate bonds, only 17.8% of the rate spread between corporate and treasuries is explained by the expected loss of default, 36.1% by local taxes, and 46.7% by systematic factors. Their evidence suggests that market factors used to explain changes in returns over time in the equity market can explain a significant portion of the rate spreads on bonds. When performing cross-sectional regressions of the average rate spread on bond return sensitivities to the market factors, they find that the market factors can explain about 32% of the cross-sectional differences for industrial bonds and about 58% for financial bonds.

While Elton, et al (2001) focus on explaining the level of rate spreads; Collin-Dufresne, et al (2001) examine the determinants of credit spread changes. Similarly, they find that factors associated with default risk explain only about 25% of the changes in credit spreads. Furthermore, there seems to be a dominant but unidentified systematic factor that accounts for the remaining variation in spreads. When aggregate market factors such as the level and volatility of interest rates, the volatility of the equity market, and the Fama and French (1993) factors are considered, the results suggest that although the aggregate factors are more important than issuer-specific characteristics in determining credit spread changes, they provide limited additional explanatory power over the default risk factors.

The purpose of this paper is to study the cross-sectional and time-series relation between firm characteristics and corporate bond yield spreads. Specifically, we follow the structural models and examine two issues. First, we examine how firm leverage and asset volatility are related to bond yields beyond what is captured by rating categories in the cross-section. In addition to the above two default factors associated with corporate issuers, we include the free cash flow to test if firm liquidity plays a role in determining cross-sectional differences in credit spreads on debt. Howton, et al (1998) suggest that the market reaction to a straight debt issue is related to the issuing firm's level of free cash flow. This is intuitive since the level and the sign of the free cash flow indicate the liquidity as well as the probability of default of the borrower. An interesting question is whether the liquidity of the borrower is reflected in the cross-section of bond yield spreads. If investors value a firm's level of free cash flow when trading bonds, yield spreads should exhibit a close relation to firms' free cash flows. Second, we explore the extent to which these issuer characteristic can explain the time series variation of bond yield spreads.

The main differences between our study and the previous literature on corporate bond yields are as follows. First, we examine the cross-sectional relation between yield spreads and the characteristics of the issuers at various points in time after issuance. Most of the previous studies employ new issue yields and issuer features to study the cross-sectional relation at issuance only. This study considers that such relationships may change after issuance. Second, we examine if the cross-sectional relation between firm characteristics and yield spreads differ across rating categories. For example, does firm leverage have a bigger impact on yield spreads for BBB-rated bonds than for AA-rated bonds? Third, issuer characteristics are examined to see if they can explain the cross-sectional variation in yield spreads not only across rating categories but also within each rating category. In other words, we investigate if issuer characteristics are accounted for by investors and subsequently reflected in the pricing of bonds beyond what is captured by rating categories.[1] Finally, we consider whether these characteristics are important determinants in the time-series changes in yield spreads.

[1] Elton, et al (2001) examine how default-related factors explain the difference in bond yields across rating categories including AA, A, and BBB, rather than within each rating category. Furthermore, they use the average

We examine monthly yield spreads on a sample of 1,771 corporate bonds over the period from January 1985 to March 1998. The cross-sectional relation between yield spreads and issuer characteristics including firm leverage ratio, free cash flows, and stock return volatility are measured at the end of each quarter during the sample period. Our results suggest the following conclusions. First, in contrast to Elton, et al (2001), we find that firm leverage and equity return volatility are important determinants of the cross-sectional variation in credit spreads on corporate bonds, while bond betas, or sensitivities to aggregate market risks, provide limited explanatory power beyond the default factors. Second, consistent with the predictions of the structural models, the effect of firm leverage on credit spreads is larger for lower-rated bonds. Third, we find that bond yield spreads reflect these important issuer characteristics not only across rating categories but also within rating categories. Lastly, free cash flow is not related to yield spreads.

We also examine the time series variation in yield spreads and identify two important determinants that are specific to the corporate bond markets. Using the portfolio methodology of Fama and French, we define two factor-mimicking portfolios for a debt ratio factor and an asset volatility factor. The debt ratio factor-mimicking portfolio is the difference in return between bonds issued by firms with the highest debt ratios and those issued by firms with the lowest debt ratios. The asset volatility factor-mimicking portfolio, on the other hand, reflects the difference in return between bonds issued by firms with the highest equity return volatility and those issued by firms with the lowest equity return volatility. These two factors reflect aggregate bond market risks that are specific to the corporate bond market. We find that these two factors are important determinants and can explain about 25% to 34% of the time series variation in bond returns. In addition, we find that the overall corporate bond market performance is the dominant

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yield spreads of rating-maturity groups in their cross-sectional analysis, whereas we use individual bond yields.

determinant of yield spreads over time.

The rest of the paper is structured as follows. Section II describes the sample of bonds and yield spreads across rating categories and maturity groups. Section III presents the regression analysis of yield spreads on issuer characteristics using a pooled sample of bonds across rating categories. Section IV presents an alternative analysis of yield spreads on issuer characteristics within each rating category, and Section V presents an analysis of corporate bond yield spreads over time. Section VI concludes the paper.

II. Sample Data

We collect pricing information on all publicly offered bonds with a remaining maturity of two or more years from January 1985 to March 1998. We exclude bonds with nonstandard features such as call and put options, mortgages, floating rates, extensions, step-ups or step-downs, zero coupon, annual adjusting rates, etc. The above selection criteria produces 5,682 bonds.

Information on issue date, type of debt (debenture, senior/junior note, convertibility, medium note, amortization, and security), coupon rate, maturity, issue amount, Moody's ratings, and monthly bond yields is collected from the Lehman Brothers Fixed Income Database. Information on issuer characteristics including leverage ratios, free cash flows, return on equity, fixed assets, and sales is collected from COMPUSTAT. Further, bonds with less than 12 monthly yield observations during the sample period are excluded. The final sample consists of 1,771 bond issues from 358 issuers.

Table 1 reports descriptive statistics for the 1,771 bond issues in our sample. 975 bonds are issued by industrial firms, 621 bonds by financial firms, and 175 bonds by utility companies. The maturity of the bonds ranges from 2 to 40 years. All bonds in the sample were rated investment grade or higher at issuance. It is not surprising that industrial firms have the largest number of issues in the sample. On average, industrial bonds also have the longest maturity and largest issue size relative to financial and utility bonds.

Table 2 shows the yield spreads on corporate bonds across rating categories and maturity groups. The yield spread on a given bond is defined as the difference in yield between a corporate bond and a Treasury issue with the same maturity. All yields are measured on a 30-day month and 360-day year basis. Since bond yield observations with less than 2 years to maturity are excluded, we divide the bonds into 10 maturity groups from 2 years to 10 years and above. Three rating categories are examined: AA, A, and BBB. AAA-rated bonds as well as speculative-grade bonds are excluded from the sample due to inadequate time series of yield spreads after matching the bond sample with the issuer characteristics. The sample includes 70,782 monthly yield spread observations collected over the period from January 1985 to March 1998. Consistent with prior research and expectations, yield spreads increase with maturity and decrease with rating. The pattern is evident across all three industry sectors. Furthermore, yield spreads on industrial bonds are the largest among all three industry sectors whereas utility bonds seem to have the smallest yield spreads. This is consistent with the generally higher risk of industrial firms relative to utility firms.

III. Cross-Sectional Regression of Bond Yield Spreads on Issuer Characteristics – Pooled Sample Analysis

To investigate the cross-sectional relation between bond yield spreads and issuer characteristics, we first examine the sample of bonds across rating categories at the end of each quarter during the sample period. We include several issuer characteristics including firm leverage, free cash flow, stock return volatility, return on equity, and the fixed assets over total assets ratio. In the analysis, observations across bonds (and issuers) and rating categories are pooled together at a given point in time (i.e., at the end of a quarter) for a cross-sectional examination. Based on a sample of 70,782 monthly yield spread observations, we match the yield spreads with the quarterly data on leverage ratios, free cash flows, return on equity, the fixed assets over total assets ratio, and sales. Most of the quarterly data are recorded at the end of March, June, September, and December. However, there are some exceptions in which firms report quarterly data at the end of other months. For each monthly yield spread observation, we find a matching set of quarterly data reported in the preceding month. If there is no quarterly data available in the preceding month, the monthly yield spread observation is excluded from the sample. The final sample includes 24,985 quarterly yield spreads, with each yield spread observation being associated with a set of quarterly data reported in the preceding month. Out of the 24,985 quarterly observations, 14,666 observations are from the industrial bond sample, 8,061 are from the financial bond sample, and 2,258 are from the utility bond sample.

The free cash flow of an issuer is defined as the cash flow available to all suppliers of capital after the firm has funded all required investments and paid all taxes and interest expenses. For each issuer in every quarter of the sample period, free cash flow is calculated as revenue minus all expenses (including interest expense), taxes, working capital investments, and fixed assets investments plus depreciation. Similarly, quarterly observations of leverage ratios are obtained for all issuers. Leverage ratio is calculated as the total debt divided by the total market value of the firm, where total debt includes long term debt plus debt due in one year and total firm value equals total debt plus market value of equity. Stock return volatility is calculated over the preceding 12-month period for each end-of-quarter observation. Return on equity and the fixed assets to total assets ratio are used as control variables for the issuer. We also include bond duration and minor rating category variables to control for the effects of these variables on yield spreads.

Elton, et al (2001) suggest that market risk or systematic factors that are major determinants of equity returns are also important factors for bond yield spreads. Thus, we also test to see if the exposure to the Fama and French factors have significant impacts on credit spreads in the cross-section. For each bond, we obtain its bond beta at a given point in time by regressing bond returns on the market risk premium, Small-Minus-Large, and High-Minus-Low factors over the preceding 12-month period. Consistent with the finding of Elton, et al (2001), the bond betas against the three aggregate factors are generally positive and significant. Bond betas vary significantly across bonds at a given point time and exhibit significant variation over time as well.[2]

Table 3 reports the average parameter estimates of the cross-sectional regressions for the full sample, industrial, financial, and utility bonds, respectively. Two models are tested: model 1 does not include bond betas to market factors while model 2 does. The results suggest that firm leverage has a strong and positive effect on yield spreads. The parameter estimate on the debt ratio is positive and significant in all sample groups. For example, the coefficient on the debt ratio in model 1 of the full sample regression is 0.213, which is significant at the 5% level. Stock return volatility is an important determinant of yield spreads in all samples except for utility bonds. The coefficient on stock volatility for utility bonds is not significantly different from zero in both model 1 and 2. This finding is consistent with the fact that utility firms are highly regulated and the volatility of these firms is usually smaller than for industrial and financial firms. Therefore, it is not surprising that stock return volatility does not have a significant impact on yield spreads for utility bonds. On the other hand, free cash flow is insignificantly related to yield spreads across all sample groups and models. The coefficient estimate on free cash flow, although negative in all samples, is significant in only one regression. Since we are examining the yield spreads over time rather than at issuance, the evidence suggests that bond traders might take into consideration the level of free cash flow at issuance but do not believe it to be important after issuance when trading in the secondary markets.

Interestingly, bond betas to equity market risk factors are not major determinants of yield spreads cross-sectionally. This is somewhat surprising given the results of Elton, et al (2001). The results show that only the Small-Minus-Big or size factor has a weak but positive impact on yield spreads in the full and industrial bond samples. The coefficient on the size factor is 0.795 in the full sample (significant at the 5% level) and 1.008 in the industrial sample (significant at the 10% level). The parameter estimates on the two control variables, duration and minor rating category, suggest that bonds with longer duration and lower rating are likely to have larger yield spreads. This is consistent with bond pricing theory. One thing to note is that the effect of minor rating category is much smaller for the utility bond sample than for the industrial and financial bond samples. For instance, the coefficient on RATING ranges from 0.028 to 0.029 for utility bonds, 0.074 to 0.094 for industrial bonds, and 0.083 to 0.093 for financial bonds. This may be due to the narrow range of rating categories that utility bonds fall into.

Lastly, the fixed assets to total assets ratio is negatively and significantly related to yield spreads for financial bonds, but positively and significantly related to yield spreads for industrial bonds. We would expect a negative relation since a higher fixed assets to total assets ratio usually implies larger collateral value or liquidation value in case of insolvency. As we will show in the next section, the positive and significant relation between the fixed assets to total

[2] Results on bond betas are available upon request.

assets ratio and yield spreads for industrial bonds disappears when we examine the cross-sectional regressions within each rating category. Return on equity does not seem to have a significant impact on bond yield spreads and is insignificant in all but one regression.

To test the robustness of the results, we include additional issue characteristics in the regressions to see if the effects of firm leverage and stock return volatility on yield spreads change. We include coupon rate, bond issue size, age of the bond, and firm size measured by sales. Table 4 reports the average parameter estimates of the cross-sectional regressions with these additional regressors. The results indicate several noticeable differences from those in Table 3. First, debt ratio and stock return volatility continue to be important determinants of yield spreads for the full sample and the industrial bonds, but not for the financial and utility bonds. For example, the parameter estimate on debt ratio is 0.395 (significant at the 5% level) for industrial bonds and 0.080 (insignificant at the 10% level) for financial bonds. The coefficient on stock volatility is 1.570 (significant at the 1% level) for industrial bonds and 0.459 (insignificant at the 10% level) for financial bonds. Second, coupon rate and bond issue size help explain the cross-sectional variation in yield spreads. Coupon has a positive impact on yield spreads whereas bond issue size has a negative effect on yield spreads. Bond issue size may be a proxy for liquidity: the larger the bond issue, the more liquid it is, and therefore the lower the yield spread. Third, age has a strong and positive impact on yield spreads in all sample groups. Consistent with Sarig and Warga (1989), the older the bond, the larger the yield spread to compensate for the decrease in liquidity. Lastly, it is interesting to note that the firm size measured by sales has little impact on the yield spreads.

Overall, the results indicate that firm leverage and stock return volatility are significant cross-sectional determinants of yield spreads and this relation persists over time following issuance. On the other hand, free cash flow and return on equity have insignificant effect on yield spreads. One surprising finding is that bond betas on aggregate equity market risk factors provide limited explanatory power beyond firm characteristics in a cross-sectional framework.

IV. Cross-Sectional Regression of Bond Yield Spreads on Issuer Characteristics – By Rating Category

The regressions based on the pooled sample of bonds across rating categories in Section III have the advantage of including all cross-sectional observations in one model. However, the above analysis does not help distinguish how the relation between yield spreads and issuer characteristics differ from one rating category to another. To examine this, we perform one regression analysis for each rating category at the end of each quarter. Table 5 reports the average parameter estimates for the full sample, AA-rated, A-rated, and BBB-rated bonds, respectively. Similarly, model 1 is the model without the bond betas to market factors and model 2 is the model that contains these betas. The findings suggest that AA-rated bonds behave differently from the A-rated and BBB-rated bonds. Debt ratio and stock return volatility remain positive and significant factors of yield spreads for A-rated and BBB-rated bonds. However, for AA-rated bonds, the average parameter estimate on the debt ratio is positive yet insignificant and the average parameter estimate on stock return volatility is negative and significant. Interestingly, free cash flow has a positive and significant effect on yield spreads for AA-rated bonds but an insignificant effect on yield spreads for A-rated and BBB-rated bonds. This suggests that the relation between yield spreads and issuer characteristics differ by rating categories. More specifically, the impact of the debt ratio and stock volatility on corporate yield spreads is larger for lower-rated bonds. For example, the coefficient on debt ratio is 0.654

(significant at the 1% level) for BBB-rated bonds and 0.143 (significant at the 5% level) for A-rated bonds. The parameter estimate on stock volatility is 3.096 (significant at the 1% level) for BBB-rated bonds and 1.236 (significant at the 1% level) for A-rated bonds. Furthermore, within the A and BBB rating category, firm leverage and stock return volatility continue to have significant impacts on yield spreads, indicating that bond yields or prices reflect these firm characteristics on a constant basis within rating categories. Third, unlike the results in Table 3 and 4, the bond beta for the equity market risk premium has a significant and positive effect on bond yields for all rating categories. For instance, the coefficient on the equity market risk premium is 2.293 in model 2 of the full sample, which is significant at the 1-% level. Fourth, in contrast to the findings in Tables 3 and 4, return on equity has a significant and negative impact on yield spreads in all regressions. This is consistent with the expectation that the better a firm performs, the smaller the risk of default, and therefore the smaller the yield spread. Finally, the coefficient on the fixed asset to total asset ratio is negative and significant in both the full and AA-rated bond samples, but is not significant in the A-rated and BBB-rated bond samples.

We extend the regression model to include additional bond issue features as in Section III. The results are reported in Table 6. The results on firm leverage and stock volatility are similar to those in Table 5. Debt ratio and stock volatility have positive and significant impacts on yield spreads in all samples except for the AA-rated bonds. Similarly, free cash flow seems to have a positive impact on yield spreads for AA-rated bonds. The findings for return on equity and the fixed assets to total assets ratio are similar to those in Table 5. As for the issue characteristics, we find that age and coupon has a significant and positive effect on yield spreads, whereas bond issue size generally has a negative effect on yield spreads. These findings are consistent with the pooled sample regressions in Table 4.

We also perform the same set of analyses as in Tables 5 and 6 on the industrial, financial, and utility bond samples, respectively. The results for the industrial bond sample are similar to those in Tables 5 and 6. There were not enough observations to produce valid cross-sectional regressions for financial or utility bonds when we break the sample down into rating categories. Therefore, no valid average parameter estimates are obtained for these two samples.

It is important to note that the models in Tables 5 and 6 have relatively high explanatory power with the average adjusted R Squares ranging from 69% to 72% when market factors are not included, and 75% to 77% when market factors are. This indicates that the cross-sectional variation in yield spreads is mainly driven by differences in firm characteristics rather than equity market systematic factors.

In sum, the results suggest that debt ratio and stock return volatility are significant factors in explaining the cross-sectional variation of yield spreads, while free cash flow does not have a significant impact on yield spreads. Furthermore, the effects of debt ratio and stock volatility are larger and highly significant within the A-rated and BBB-rated bond sample, but smaller and insignificant in the AA-rated bond sample. This is consistent with AA-rated bonds having lower default risk to begin with, so the cross-sectional variation in default risk is likely to be small. In other words, the AA-rated issues seem to be more homogeneous with respect to default risk. Regardless, the relation between issuer characteristics and yield spreads differs by rating category. Furthermore, sensitivities to equity market factors provide little additional explanatory power beyond the issuer and issue characteristics. Finally, yields on bonds within the same rating category reflect the differences in default risk as measured by firm leverage and equity return volatility.

V. Determinants of Bond Returns over Time

The above results are consistent with the implications of the structural models in that cross-sectional differences in firm leverage and equity return volatility are important determinants of yield spread differences across corporate bonds. In this section we examine how yield spreads change over time. To see the how cross-sectional differences and time-series variation in yield spreads are related to each other, we use a simple example to illustrate. Let us define the yield to maturity (or total yield) on a risky bond calculated based on promised coupon and principal payments as the "promised yield to maturity". As long as there is any possibility of default or delayed payments, the expected yield on a bond will be lower than the promised yield. Of course, this means the greater the risk of default, the greater the gap between the two yields. Therefore, we can decompose the total (or promised) yield to maturity of a risky bond into three components: (1) the default-free yield to maturity, which is the yield to maturity on a Treasury bond of similar maturity and coupon rate; (2) the risk premium, which is the difference between the expected yield to maturity on risky debt and the default-free yield to maturity; and (3) the default premium, which is the difference between the promised yield to maturity and the expected yield to maturity.

The first component, the default-free yield to maturity, is the benchmark we subtract to calculate the yield spread. The second component, the risk premium, reflects the portion of the total (or promised) yield to maturity attributable to systematic, or nondiversifiable, risk since any security's expected return should be related only to its systematic risk. This risk premium should be related to nondiversifiable factors that cause bond returns to be correlated. For example, returns on all bonds are affected by the general economic condition, interest rate environment, and stock and bond market performance, etc. These macro factors contribute to the systematic risk component of a bond's return. The last component, the default premium, measures the difference between the promised yield and the expected yield. This component is firm-specific and can be diversified away if investors hold well-diversified portfolios. The firm-specific component risk could include firm characteristics or events such as leverage, asset volatility, and CEO replacements.

The analysis in Section IV suggests that, the cross-sectional differences in yield spreads (which is the sum of the risk and default premiums) are mostly driven by differences in default premiums. We find that issuer characteristics such as leverage ratio and stock return volatility are significant factors determining yield spreads across bonds. An interesting question that follows is what drives the time series variation in yield spread for a given bond? Is it mostly the change in firm-specific characteristics, as might be suggested by the cross-sectional analysis? Collin-Dufresne, Goldstein, and Martin (2001) examine changes in credit spreads and find that default risk and aggregate market factors such as interest rate, slope, and stock market volatility account for less than 50% of the variation in yield spreads over time. They suggest that monthly changes in credit spreads are mainly driven by systematic factors that are not associated with the equity or Treasury markets. By using principal component analysis of the residuals, they find that over 75% of the remaining variation is due to a component that resembles an equally-weighted portfolio of the bonds, and another 6% is due to a component that resembles a portfolio that is long in low-debt bonds and short in high-debt bonds. In this section, we examine the issue of what drives the time series variation of yield spreads by identifying and examining possible systematic factors in the bond market and comparing them to changes in firm's leverage ratios and equity return volatility.

Following the same methodology behind the Fama and French (1993) factors in the equity market, we construct factor-mimicking portfolios that correspond to bond characteristics and the overall corporate bond market. The first and obvious factor, based on our cross-sectional analysis above, is one based on a premium to bonds with higher debt ratios. We call this factor the "debt ratio factor", and it is "mimicked" by a long-short portfolio that is long bonds issued by firms that have debt ratios in the top 30% across all rating and maturity classes and short bonds issued by firms in the bottom 30%. The second systematic factor suggested by our cross-sectional analysis is one based on a premium to bonds with higher equity return volatility. We call this factor the "asset volatility factor" and use a factor-mimicking portfolio that is long bonds issued by firms that have equity return volatility in the top 30% across all rating and maturity classes and the bonds issued by firms in the bottom 30%. Both debt ratio and asset volatility factors are measured monthly.

For each bond, we include the debt ratio and asset volatility factors in time series regressions. The dependent variable is monthly bond return spread, which is the difference between the raw return on a corporate bond and the return on a Treasury security with the same maturity.[3] Three models are estimated for each bond: the first model includes only the debt ratio factor (DEBTFTR) and asset volatility factor (VOLFTR); the second model includes the Fama and French (1993) equity market factors (MKT, SMB, and HML) as additional explanatory variables; and the last model adds the return spread (defined as the difference between the raw return and the return on a Treasury security with the same maturity) on the Lehman Brothers Corporate Bond Index (BONDINDX) to represent the market factor.

We group the bonds by rating and maturity classes and report the average parameter

[3] Elton, et al (2001) show that changes in the yield spread on a bond have a direct mathematical relationship with the difference in return between a corporate bond and a government bond (return spread). In the time series analysis, we follow the same approach and examine the time series variation in return spreads rather than changes in yield spreads.

estimate and adjusted R-square for each rating-maturity group in Table 7. Four rating classes including AAA, AA, A, and BBB are included in the sample. Bonds with 10 years or more remaining maturity are classified as "Long Maturities" and bonds with less than 10 years remaining maturity are classified as "Intermediate Maturities".

Panel A of Table 7 reports the results for long maturities. In the model 1 regressions, the results suggest that, on average, the debt ratio and asset volatility factors explain about 21.55% of the variation in the return spreads for BBB bonds and 35.20% for AAA bonds. The parameter coefficient on the asset volatility factor is significant and positive in all four rating groups, whereas the parameter coefficient on the debt ratio factor is positive in all four rating groups but significant in only AA and A-rated bond groups. This suggests that the return spread (or change in yield spread) over time is driven not only by a bond market risk factor associated with leverage, but also by a bond market risk factor associated with the asset volatility of the issuers. Note that both factors represent systematic default risk rather than firm-specific default probabilities.

Model 2 shows that both bond and equity systematic factors can explain 48.89% of the variation in bond returns over time for BBB bonds and 65.35% for AAA bonds. Therefore, the aggregate equity and bond market factors can account for half (or more) of the changes in yield spreads on corporate bonds. Parameter coefficients on all common risk factors are significant at the 1% level for AA and A rated bonds and mostly significant at the 1% level for AAA and BBB bonds.

Lastly, model 3 shows that with the Lehman Brothers Corporate Bond Index return spread, we can explain 78.80% of the time series variation for BBB bonds and 94.60% for AAA bonds. The results also suggest that bond index return spread subsumes most of the effects from the other explanatory variables. This indicates that the contribution of the bond and equity systematic factors to the determination of the yield spread, namely DEBTFTR, VOLFTR, MKT, SMB, and HML, may be embedded in the overall bond market index.

Panel B of Table 7 reports the regressions for intermediate maturities. The results are similar to those for long maturities. The debt ratio and asset volatility factors can explain about a quarter of the variation in yield spreads over time and the bond and equity systematic factors combined can explain about 40 to 50% of the variation. Similarly, model 3 regressions indicate that bond index return spread dominates all other systematic factors except for the debt ratio factor and the model can explain over 80% of the time series variation in yield spreads.

The model 3 regressions in Table 7 suggest that there might be high correlation among explanatory variables in the model. To examine this issue, we estimate a time series regression of the original bond index returns (BONDINDX) on the bond and equity market factors,

$$\begin{aligned} \text{BONDINDX} = \underset{(5.65)}{0.6280} &+ \underset{(4.83)}{1.2259}\ \text{DEBTFTR} + \underset{(0.11)}{0.0321}\ \text{VOLFTR} + \underset{(5.46)}{0.1604}\ \text{MKT} \\ &- \underset{(-\ 2.08)}{0.0999}\ \text{SMB} + \underset{(2.65)}{0.1373}\ \text{HML} + e. \end{aligned} \tag{1}$$

The t-statistics are in parentheses below the slopes; the adjusted R^2 is 0.48. This regression shows that the bond market index return reflects all the bond and equity market risk factors, except for the asset volatility factor (VOLFTR).

To correct for the bias due to high collinearity among explanatory variables, we use the residual in (1) which is an orthogonalized bond market factor that captures common variation in returns beyond that in DEBTFTR, VOLFTR, MKT, SMB, and HML and define it as the orthogonalized return spread on the Lehman Brothers Bond Index (BONDINDX_O). Table 8 reports the model 3 regressions with the orthogonalized index return spread for long maturities (Panel A) and intermediate maturities (Panel B). The results show that most of the time series variation in individual bond returns is captured by the debt and equity market systematic factors as well as the bond market factor. The adjusted R-square of model 3 is 75.69% for BBB bonds and 86.31% for AAA bonds. The results suggest that bond return spreads or changes in yield spreads are mostly driven by systematic risk factors in the bond market, besides the common risk factors in the equity market as suggested by Elton et al (2001) and Collin-Dufresne, Goldstein, and Martin (2001). More specifically, we have identified three major factors that are unique in the corporate bond market: the debt ratio factor, asset volatility factor, and the bond market index that reflects the local demand and supply condition in the corporate bond market..

The results in Table 8 suggest that the systematic risk is important in driving the time series variation in yield spreads. A further test is to examine if changes in firm-specific characteristics is a driver of the variation in yield (or return) spread. Following the results of the cross-sectional analysis in Section IV and the regressions in Collin-Defresne, Goldstein, and Martin (2001), we included two additional variables that reflect the change in firm-specific characteristics: change in the firm's leverage ratio (DEBTRATI_CG) and change in the firm's stock return volatility (VOL_CG). Table 9 reports the regressions for the long maturities (Panel A) and intermediate maturities (Panel B). The results suggest that, changes in the firm's leverage ratio and stock return volatility are not significant drivers of the variation in return spreads over time. In 20 out of 24 regressions, the parameter coefficient on change in leverage ratio is insignificantly different from zero; and similarly in 20 out of 24 regressions, the parameter coefficient on change in stock return volatility is insignificant.

In sum, the time series analysis suggests that time series variation in yield spreads on corporate bonds are mainly driven by systematic factors rather than firm-specific characteristics. We identify the debt ratio factor and asset volatility factor in the corporate bond market as important aggregate risk factors that are analogous to the Fama and French equity market risk factors. We also find that the corporate bond market index is a significant determinant of the time series variation of yield spreads and may incorporate the two bond market risk factors as well as the equity market risk factors. The importance of the aggregate bond market confirms Collin-Dufresne, Goldstein, and Martin's (2001) finding that supply and demand conditions in the corporate bond markets themselves appear to be an important factor driving bond returns (or changes in yields).

It is interesting to note that the analysis in Sections III and IV suggests that cross-sectional differences in yield spreads at a given point in time are largely due to differences in the default premium portion of the yield spread. These cross-sectional differences in default premium appear to be driven by firm-specific characteristics such as debt ratio, equity return volatility, return on equity, and fixed assets to total assets ratio and issue-specific features including coupon, duration, bond size, and age. On the other hand, time-variation in yield spreads is largely due to differences in the risk premium portion of the yield spread. These are driven by systematic factors such as the overall bond market performance, debt ratio and asset volatility factors, and the Fama-French equity factors.

VI. Conclusion

This study examines the cross-sectional and time-series relation between firm characteristics and corporate bond yield spreads. Issuer characteristics including leverage, free cash flow, and stock return volatility are examined to see if they are significant determinants of bond yields in a cross-sectional setting at various points in time. We further explore if bond yields or prices reflect the issuer characteristics within each rating category and if the relation between yield spreads and issuer characteristics vary across rating categories.

A sample of 1,771 bonds issued by 358 U.S. corporations over the period from January 1985 to March 1998 is examined. Cross-sectional regressions at the end of each quarter in the sample period are examined. For a given quarter, we analyze the cross-sectional regression of yield spreads on various issuer characteristics based on a pooled sample of bonds across rating categories as well as separate subsamples of bonds by rating category. The results suggest that firm leverage and stock return volatility are significant factors determining yield spreads. The cross-sectional relation between yield spreads and the two significant determinants is persistent over time, more significant for industrial bonds than for financial and utility bonds, and stronger for lower-rated bonds. Free cash flow, on the other hand, has very small and insignificant impact on yield spreads across all samples. One interesting finding is that bond betas on aggregate market factors such as the equity market risk premium, Small-Minus-Big, and High-Minus-Low factors do not seem to be major factors in determining the cross-sectional variation in yield spreads. This contrasts with previous research showing that these market factors can explain a significant portion of the time series variation in yield spreads.

We also explore the time series variation in yield spreads and use our cross-sectional results to define two systematic factors associated with the corporate bond market. The results suggest that the debt ratio and asset volatility factors can explain about a quarter to a half of the variation in bond returns. After combining the two premiums with the Fama and French equity market factors and Lehman Brothers Bond Indices, we find these systematic factors can explain more than 75% of the time series variation in yield spreads.

Our results indicate that investors in the corporate bond market consider various default factors associated with the issuers when selecting bonds. Subsequently, bond prices or yields reflect the differences in default probabilities of issuers not only across rating categories but also within each rating category. On the other hand, the time series variation in bond yields is mostly driven by systematic factors. The significant explanatory power of the overall bond index beyond the bond and equity market factors indicates the importance of local supply and demand conditions in the bond market. This is consistent with the fact that the major investors in the corporate bond market are institutions such as mutual funds, pension funds, and insurance companies who prefer to form portfolios that mimic the overall performance of the bond market and therefore diversify away individual firm risks. If the majority of the bond investors index their portfolios, it may not be surprising that the changes in yield spreads over time are driven by spreads in the overall bond market. Unfortunately, the issue of what factors drive the supply and demand conditions in the bond market over time remains a puzzle.

This study has several implications. First, although free cash flow is viewed as a good proxy for firm liquidity, yield spreads do not seem to reflect the level of free cash flows in a cross-sectional framework. On the other hand, the leverage position of an issuer and volatility of the firm's value as proxied by the volatility of its equity returns are usually captured by rating agencies such as Standard and Poor's and Moody's and reflected in the rating upgrade/downgrade announcements (if the change in leverage, according to the rating agencies, justifies a change in rating) and thus in the bond yields. Our results indicate that rating is not a sufficient statistic for the impact of leverage and the volatility of firm value on bond yields. These variables are important determinants of the cross-section of yields beyond what the rating on the bond may reveal. Furthermore, bond sensitivities to market factors are not significant determinants of the cross-sectional variation in yield spreads.

Finally, our analysis suggests that cross-sectional differences in yield spreads at a given point in time are largely due to differences in the default premium portion of the yield spread. These cross-sectional differences in default premium appear to be driven by firm-specific characteristics such as debt ratio, equity return volatility, return on equity, and fixed assets to total assets ratio and issue-specific features including coupon, duration, bond size, and age. On the other hand, time-variation in yield spreads is largely due to differences in the risk premium portion of the yield spread. These are driven by systematic factors such as the overall bond market performance, debt ratio and asset volatility factors, and the Fama-French equity factors.

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Table 1

Sample Statistics for Corporate Bonds, January 1985 to March 1998

The sample consists of 1,771 corporate bonds in three industry sectors: industrial, financial, and utility. All bonds are noncallable, public, and fixed-rate, with a remaining maturity of two years or more. Debt with floating rate, options, step-ups or step-downs, extensions, or other option-like features are excluded. Zero-coupon bonds are excluded.

Variable	Mean	Standard Deviation	Minimum	Maximum
Panel A. Full Sample (n = 1771)				
Coupon (percent)	7.98	1.50	4.63	17.50
Issue Size ($ million)	195.80	139.54	10.00	1650.00
Maturity (years)	11.27	7.59	2.00	40.00
Panel B. Industrial Bonds (n = 975)				
Coupon (percent)	7.97	1.33	4.63	14.63
Issue Size ($ million)	215.31	153.77	10.00	1300.00
Maturity (years)	12.76	8.63	2.00	40.00
Panel C. Financial Bonds (n = 621)				
Coupon (percent)	8.05	1.66	4.70	16.38
Issue Size ($ million)	176.76	117.34	25.00	1650.00
Maturity (years)	9.12	5.13	2.00	30.00
Panel D. Utility Bonds (n = 175)				
Coupon (percent)	7.85	1.75	5.05	17.50
Issue Size ($ million)	154.67	107.33	20.00	700.00
Maturity (years)	10.59	6.86	2.00	40.00

Table 2

Average Yield Spreads on Corporate Bonds

The sample consists of 1,771 corporate bonds in three industry sectors: industrial, financial, and utility. All bonds are noncallable, public, fixed-rate, with a remaining maturity of two years or more. Debt with floating rate, options, step-ups or step-downs, extensions, or other option-like features are excluded. Zero-coupon bonds are excluded. The yield spread on a given corporate bond in a given month is defined as the difference in yield between the corporate bond and a Treasury security of the same maturity. Yield spreads are collected over the sample period from January 1985 to March 1998 and reported in percent. The sample contains 70,782 monthly yield spread observations.

	Industrial Bonds			Finance Bonds			Utility Bonds		
Maturity (years)	AA	A	BBB	AA	A	BBB	AA	A	BBB
2	0.5193	0.6792	1.1207	0.7233	0.8663	1.0517	0.4417	0.6222	1.0376
3	0.5209	0.7026	1.1249	0.7258	0.8700	1.0504	0.4587	0.6233	1.0462
4	0.5489	0.7055	1.1667	0.7365	0.8859	1.1393	0.4766	0.6000	1.0727
5	0.5494	0.7051	1.1682	0.7548	0.9466	1.1405	0.4721	0.6274	1.0674
6	0.5695	0.7419	1.1728	0.7619	0.9646	1.1898	0.4983	0.6523	1.0784
7	0.6090	0.7511	1.1730	0.7818	0.9771	1.1941	0.4963	0.6703	1.0783
8	0.6543	0.7954	1.2018	0.7995	0.9783	1.2311	0.5614	0.6927	1.1262
9	0.6779	0.8365	1.2115	0.8582	0.9825	1.2624	0.5735	0.7384	1.1452
10 or above	0.6866	0.8436	1.2231	0.8760	0.9930	1.2712	0.5786	0.8092	1.2162

Table 3

Regression Results of Yield Spreads on Issuer Characteristics – Pooled Sample

For each bond having at least 12 monthly bid prices over the period from January 1985 to March 1998, we estimate the following cross-sectional regression based on a pooled sample of all bonds at a given time t:

$$YLDSPREAD_i = \alpha + \beta_1 MKT + \beta_2 SMB + \beta_3 HML + \beta_4 DEBTRATIO_i + \beta_5 FCF_i + \beta_6 STOCKVOL_i + \beta_7 DURATION_i + \beta_8 RATING_i + \beta_9 ROE_i + \beta_{10} FA_i + \varepsilon_i,$$

where MKT is the bond beta measured against the market risk factor, SMB is the bond beta measured against the "Small-Minus-Big" factor, HML is the bond beta measured against the "High-Minus-Low" factor, $DEBTRATIO_i$ is the ratio of total debt (defined to be the sum of long-term and short-term debt) to total debt plus the market value of equity. FCF_i is the free cash flow defined as operating income + depreciation – common stock dividends – capital expenditure – taxes – interest. $STOCKVOL_i$ is the return volatility of equity over the preceding 12 months, $DURATION_i$ is the duration of the bond, $RATING_{i,t}$ is the Moody's minor ratings categories as integers, where 1, 2, 3,……, 22, and 23 denote Aaa+, Aaa, Aa1, ……, C, and D, respectively. ROE_i is the return on equity, and FA_i is the ratio of fixed assets over total assets. Average OLS parameter estimates are reported. Associated t-statistics for each average are reported immediately below. ***(**)[*] indicates significant at the 1(5)[10]% level.

	Full Sample		Industrial Bonds		Financial Bonds		Utility Bonds	
Variable	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
MKT		-0.164		-0.190		0.464		-0.898
		(-0.39)		(-0.34)		(0.77)		(-1.01)
SMB		0.795		1.008		1.279		-0.033
		(1.99)**		(1.89)*		(1.59)		(-0.06)
HML		0.166		0.431		-0.119		-0.091
		(0.51)		(1.15)		(-0.24)		(-0.11)
DEBTRATIO	0.213	0.297	0.099	0.226	0.158	0.227	0.521	0.756
	(2.00)**	(4.39)***	(1.97)**	(2.14)**	(1.96)**	(2.90)***	(2.90)***	(4.27)***
FCF	-0.764	-0.287	-0.918	-0.150	0.263	1.331	0.744	-1.249
	(-1.52)	(-0.52)	(-1.88)*	(-0.26)	(0.15)	(0.71)	(0.50)	(-0.82)
STOCKVOL	1.644	1.788	1.183	1.257	-0.980	2.079	1.229	-1.193
	(4.35)***	(5.18)***	(3.49)***	(4.11)***	(-0.91)	(2.13)**	(0.57)	(-0.62)
DURATION	0.032	0.055	0.029	0.050	0.051	0.064	0.042	0.068
	(7.95)***	(18.80)***	(7.51)***	(18.28)***	(9.89)***	(12.10)***	(16.09)***	(14.55)***
RATING	0.085	0.066	0.094	0.074	0.093	0.083	0.028	0.029
	(10.18)***	(8.47)***	(10.47)***	(7.67)***	(8.60)***	(8.15)***	(2.63)***	(2.34)**
ROE	-0.003	-0.004	-0.002	-0.001	0.003	0.005	-0.007	-0.005
	(-1.26)	(-1.99)**	(-0.74)	(-0.59)	(0.64)	(0.75)	(-1.38)	(-0.85)
FA	0.191	0.180	0.209	0.189	-3.002	-2.419	0.056	0.175
	(2.64)***	(2.53)***	(2.87)***	(2.46)***	(-4.54)***	(-4.33)***	(0.89)	(1.56)
N	52	51	51	49	7	9	9	9

Table 4
Regression Results of Yield Spreads on Issuer and Bond Characteristics – Pooled Sample

For each bond having at least 12 monthly bid prices over the period from January 1985 to March 1998, we estimate the following cross-sectional regression based on a pooled sample of all bonds at a given time t:

$$YLDSPREAD_i = \alpha + \beta_1 MKT + \beta_2 SMB + \beta_3 HML + \beta_4 DEBTRATIO_i + \beta_5 FCF_i + \beta_6 STOCKVOL_i + \beta_7 DURATION_i + \beta_8 RATING_i + \beta_9 ROE_i + \beta_{10} FA_i + \beta_{11} COUPON_i + \beta_{12} BONDSIZE_i + \beta_{13} AGE_i + \beta_{14} FIRMSIZE_i + \varepsilon_i,$$

where MKT is the bond beta measured against the market risk factor, SMB is the bond beta measured against the "Small-Minus-Big" factor, HML is the bond beta measured against the "High-Minus-Low" factor, $DEBTRATIO_i$ is the ratio of total debt (defined to be the sum of long-term and short-term debt) to total debt plus the market value of equity. FCF_i is the free cash flow defined as operating income + depreciation – common stock dividends – capital expenditure – taxes – interest. $STOCKVOL_i$ is the return volatility of equity over the preceding 12 months, $DURATION_i$ is the duration of the bond, $RATING_{i,t}$ is the Moody's minor rating categories as integers, where 1, 2, 3,……., 22, and 23 denote Aaa+, Aaa, Aa1, ……, C, and D, respectively. ROE_i is the return on equity, and FA_i is the ratio of fixed assets over total assets. COUPON is the coupon rate on the bond. BONDSIZE is the amount of the bond outstanding in billion of dollars. AGE is the age of the bond in years. FIRMSIZE is the end-of-quarter firm sales in billion of dollars. Average OLS parameter estimates are reported. Associated t-statistics for each average are reported immediately below. ***(**)[*] indicates significant at the 1(5)[10]% level.

	Full Sample		Industrial Bonds		Finance Bonds		Utility Bonds	
Variable	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
MKT		-0.305		0.257		0.229		-0.605
		(-0.63)		(0.32)		(0.28)		(-0.46)
SMB		1.256		1.984		1.427		-0.546
		(3.29)***		(3.64)***		(1.14)		(-0.61)
HML		-0.050		-0.198		-0.360		-0.595
		(-0.14)		(-0.39)		(-0.70)		(-0.60)
DEBTRATIO	0.358	0.296	0.395	0.205	0.080	0.229	0.134	0.468
	(3.35)***	(3.71)***	(2.54)**	(1.80)*	(1.04)	(1.06)	(0.39)	(1.70)*
FCF	-0.483	-0.131	-0.653	0.003	1.871	-1.102	-1.012	2.420
	(-1.07)	(-0.26)	(-1.26)	(0.01)	(0.96)	(-0.58)	(-0.73)	(1.48)
STOCKVOL	1.671	1.446	1.570	1.218	0.459	2.101	0.212	1.590
	(5.03)***	(4.67)***	(4.11)***	(2.15)**	(0.35)	(1.89)*	(0.10)	(0.57)
DURATION	-0.008	0.016	-0.010	0.010	0.032	0.026	0.005	0.035
	(-0.95)	(2.37)**	(-1.15)	(1.42)	(2.40)**	(1.80)*	(0.65)	(4.72)***
RATING	0.088	0.077	0.097	0.071	0.089	0.078	0.043	0.056
	(19.40)***	(16.69)***	(19.44)***	(8.89)***	(6.03)***	(4.14)***	(2.21)**	(2.80)***
ROE	-0.001	-0.003	0.001	-0.003	-0.005	-0.009	-0.000	-0.002
	(-0.45)	(-1.55)	(0.36)	(-1.02)	(1.12)	(-1.50)	(-0.01)	(-0.32)
FA	0.122	0.153	0.136	0.197	-4.332	-3.629	-0.148	0.001
	(1.78)*	(2.57)***	(1.79)*	(2.53)**	(-5.83)***	(-2.49)**	(-1.34)	(0.02)
COUPON	0.010	0.014	0.006	0.008	0.026	0.008	-0.010	0.008
	(2.03)**	(2.72)***	(1.37)	(1.59)	(3.94)***	(0.90)	(-1.08)	(1.06)
BONDSIZE	-0.167	-0.170	-0.173	-0.187	-0.272	0.064	0.120	-0.038
	(-5.21)***	(-5.29)***	(-4.91)***	(-4.85)***	(-3.03)***	(0.39)	(1.06)	(-0.30)
AGE	0.015	0.018	0.015	0.018	0.011	0.024	0.016	0.014
	(6.40)***	(6.85)***	(6.44)***	(6.77)***	(1.69)*	(2.97)***	(5.29)***	(5.15)***
FIRMSIZE	0.000	0.000	-0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(0.34)	(0.87)	(-0.02)	(0.03)	(-0.17)	(-0.39)	(-1.20)	(-0.27)
N	50	50	51	48	7	6	7	7

Table 5

Regression Results of Yield Spreads on Issuer Characteristics – By Rating

For each bond having at least 12 monthly bid prices over the period from January 1985 to March 1998, we estimate the following cross-sectional regression based on bonds in a given major rating category at a given time t:

$$YLDSPREAD_i = \alpha + \beta_1 MKT + \beta_2 SMB + \beta_3 HML + \beta_4 DEBTRATIO_i + \beta_5 FCF_i + \beta_6 STOCKVOL_i + \beta_7 DURATION_i + \beta_8 RATING_i + \beta_9 ROE_i + \beta_{10} FA_i + \varepsilon_i,$$

where MKT is the bond beta measured against the market risk factor, SMB is the bond beta measured against the "Small-Minus-Big" factor, HML is the bond beta measured against the "High-Minus-Low" factor, $DEBTRATIO_i$ is the ratio of total debt (defined to be the sum of long-term and short-term debt) to total debt plus the market value of equity. FCF_i is the free cash flow defined as operating income + depreciation – common stock dividends – capital expenditure – taxes – interest. $STOCKVOL_i$ is the return volatility of equity over the preceding 12 months, $DURATION_i$ is the duration of the bond, $RATING_{i,t}$ is the Moody's minor rating categories as integers, where 1, 2, 3,……., 22, and 23 denote Aaa+, Aaa, Aa1, ……, C, and D, respectively. ROE_i is the return on equity, and FA_i is the ratio of fixed assets over total assets. Average OLS parameter estimates are reported. Associated t-statistics for each average are reported immediately below. ***(**)[*] indicates significant at the 1(5)[10]% level.

	Full Sample		AA Bonds		A Bonds		BBB Bonds	
Variable	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
MKT		2.293		0.749		2.981		3.013
		(4.52)***		(2.00)**		(2.36)**		(4.48)***
SMB		0.228		0.229		-1.861		2.245
		(0.42)		(0.46)		(-1.61)		(2.21)**
HML		1.091		0.164		0.522		2.470
		(2.24)**		(0.47)		(0.45)		(3.35)***
DEBTRATIO	0.289	0.374	0.005	0.183	0.143	0.168	0.654	0.744
	(3.22)***	(5.15)***	(0.03)	(1.39)	(2.90)**	(3.45)***	(3.70)***	(5.19)***
FCF	0.194	0.306	1.206	1.227	-0.474	-0.284	-0.024	0.051
	(0.64)	(1.04)	(1.79)*	(2.01)**	(-1.44)	(-0.83)	(-0.05)	(0.10)
STOCKVOL	1.015	1.263	-1.731	-1.050	1.236	1.227	3.096	3.372
	(2.97)***	(4.33)***	(-4.83)***	(-3.75)***	(4.71)***	(4.16)***	(4.92)***	(6.90)***
DURATION	0.024	0.059	0.018	0.054	0.020	0.062	0.031	0.063
	(8.14)***	(23.69)***	(7.57)***	(10.24)***	(4.60)***	(15.86)***	(4.80)***	(16.06)***
RATING	0.066	0.072	0.004	0.024	0.079	0.076	0.105	0.111
	(8.11)***	(8.77)***	(0.32)	(1.55)	(10.66)***	(9.82)***	(7.81)***	(8.17)***
ROE	-0.002	-0.002	-0.004	-0.004	0.002	0.002	-0.004	-0.004
	(-2.78)***	(-3.11)**	(-4.00)***	(-4.64)***	(3.13)***	(2.97)***	(-2.75)***	(-2.71)***
FA	-0.082	-0.077	-0.198	-0.190	-0.033	-0.014	-0.032	-0.036
	(-3.93)***	(-3.29)***	(-4.08)***	(-3.22)***	(-1.34)	(-0.60)	(-1.18)	(-1.38)
N	83	83	25	26	28	28	30	29

Table 6

Regression Results of Yield Spreads on Issuer and Bond Characteristics – By Rating

For each bond having at least 12 monthly bid prices over the period from January 1985 to March 1998, we estimate the following cross-sectional regression based on bonds in a given rating category at a given time t:

$$YLDSPREAD_i = \alpha + \beta_1 MKT + \beta_2 SMB + \beta_3 HML + \beta_4 DEBTRATIO_i + \beta_5 FCF_i + \beta_6 STOCKVOL_i + \beta_7 DURATION_i + \beta_8 RATING_i + \beta_9 ROE_i + \beta_{10} FA_i + \beta_{11} COUPON_i + \beta_{12} BONDSIZE_i + \beta_{13} AGE_i + \beta_{14} FIRMSIZE_i + \varepsilon_i,$$

where MKT is the bond beta measured against the market risk factor, SMB is the bond beta measured against the "Small-Minus-Big" factor, HML is the bond beta measured against the "High-Minus-Low" factor, $DEBTRATIO_i$ is the ratio of total debt (defined to be the sum of long-term and short-term debt) to total debt plus the market value of equity. FCF_i is the free cash flow defined as operating income + depreciation – common stock dividends – capital expenditure – taxes – interest. $STOCKVOL_i$ is the return volatility of equity over the preceding 12 months, $DURATION_i$ is the duration of the bond, $RATING_{i,t}$ is the Moody's minor rating categories as integers, where 1, 2, 3,……., 22, and 23 denote Aaa+, Aaa, Aa1, ……, C, and D, respectively. ROE_i is the return on equity, and FA_i is the ratio of fixed assets over total assets. COUPON is the coupon rate on the bond. BONDSIZE is the amount of the bond outstanding in billion of dollars. AGE is the age of the bond in years. FIRMSIZE is the end-of-quarter firm sales in billion of dollars. Average OLS parameter estimates are reported. Associated t-statistics for each average are reported immediately below. ***(**)[*] indicates significant at the 1(5)[10]% level.

	Full Sample		AA Bonds		A Bonds		BBB Bonds	
Variable	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
MKT		2.118		0.736		1.998		3.474
		(5.02)***		(2.15)**		(2.40)**		(4.38)***
SMB		0.432		0.355		-0.361		1.267
		(0.89)		(0.95)		(-0.45)		(1.15)
HML		0.924		0.259		0.915		1.530
		(2.10)**		(0.79)		(0.93)		(1.95)*
DEBTRATIO	0.245	0.282	-0.219	-0.143	0.110	0.149	0.757	0.791
	(2.40)**	(2.79)***	(-0.84)	(-0.56)	(1.93)**	(2.72)***	(6.02)***	(6.33)***
FCF	0.367	0.413	1.157	1.341	0.004	0.202	0.05	-0.214
	(1.30)	(1.38)	(1.58)	(1.84)*	(0.02)	(0.77)	(0.11)	(-0.46)
STOCKVOL	1.335	1.459	-0.736	-0.040	1.075	1.116	3.303	3.136
	(4.57)***	(4.85)***	(-1.63)	(-0.07)	(3.77)***	(3.67)***	(7.44)***	(6.49)***
DURATION	-0.026	0.010	-0.016	0.016	-0.022	0.020	-0.038	-0.005
	(-0.72)	(1.81)*	(-1.62)	(2.49)**	(-2.04)**	(2.72)***	(-2.65)***	(-0.44)
RATING	0.066	0.063	-0.017	-0.022	0.094	0.089	0.108	0.112
	(7.17)***	(6.23)***	(-1.13)	(-1.20)	(13.42)***	(13.24)***	(8.46)***	(8.39)***
ROE	-0.002	-0.002	-0.004	-0.004	0.001	0.001	-0.003	-0.003
	(-2.40)**	(-2.60)***	(-3.51)***	(-4.05)***	(1.47)	(1.46)	(-2.22)**	(-1.91)*
FA	-0.070	-0.083	-0.145	-0.018	-0.046	-0.037	-0.031	-0.047
	(-3.51)***	(-4.36)***	(-3.37)***	(-3.85)***	(-1.82)*	(-1.63)	(-0.93)	(-1.97)**
COUPON	0.011	0.015	0.016	0.019	0.002	0.015	0.015	0.013
	(2.47)**	(3.60)***	(1.67)*	(1.98)**	(0.29)	(2.45)**	(2.31)**	(1.87)*
BONDSIZE	-0.130	-0.126	-0.110	-0.085	-0.159	-0.182	-0.119	-0.107
	(-2.47)**	(-2.70)***	(-0.97)	(-0.91)	(-4.54)***	(-5.32)***	(-1.11)	(-1.08)
AGE	0.018	0.020	0.012	0.012	0.015	0.017	0.025	0.030
	(9.12)***	(8.88)***	(3.90)***	(3.98)***	(5.76)***	(5.33)***	(6.63)***	(6.80)***
FIRMSIZE	-0.007	-0.007	-0.001	-0.003	0.002	0.004	-0.021	-0.022
	(-1.61)	(-1.86)*	(-0.30)	(-0.76)	(0.87)	(1.75)*	(-1.87)*	(-2.23)**
N	83	83	25	26	28	28	30	29

Table 7

Time Series Regressions of Bond Return Spreads on Bond and Equity Market Risk Factors

For each bond having at least 12 monthly bid prices over the period from January 1985 to March 1998, we estimate a time series regression of the return spreads on several explanatory variables. The table reports the average coefficient estimates and the corresponding t statistics. The dependent variable is the bond return spread in a given month t. Return spread on a bond is defined as the difference between the raw return on a corporate bond and the return on a Treasury security with the same maturity. BONDINDX is the monthly return spread on the Lehman Brother Bond Index in the same rating and maturity class as the bond in month t. DEBTFTR is the difference in monthly return between the portfolio of bonds issued by firms with higher debt ratios and the portfolio of bonds issued by firms with lower debt ratios. At time t, all bonds with valid returns data are divided into two groups based on the issuers' debt ratios: bonds issued by firms with the top 30% debt ratios are assigned to the portfolio of bonds issued by firms with higher debt ratios and the bonds by firms with the bottom 30% debt ratio are assigned to the portfolio of bonds issued by firms with lower debt ratios. VOLFTR is the difference in monthly returns between the portfolio of bonds issued by firms with the top 30% equity return volatility and the portfolio bonds by firms with bottom 30% equity return volatility. MKT, SMB, and HML are the Fama and French (1993) factors that represent the market risk factor, small-minus-big (or size) factor, and high-minus-low market to book ratio factor, respectively. ***(**)[*] indicates significant at the 1(5)[10]% level.

	AAA Bonds			AA Bonds			A Bonds			BBB Bonds		
Variable	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Panel A. Long Maturities												
DEBTFTR	2.2033	4.9623	0.9616	1.2327	2.0196	-0.6550	0.9938	2.8265	-0.5277	0.4887	3.4316	0.4520
	(1.63)	(3.95)***	(3.26)***	(2.25)**	(2.83)***	(-0.73)	(4.05)***	(8.58)***	(-1.30)	(0.88)	(6.67)***	(0.55)
VOLFTR	6.3487	2.6678	0.5999	4.3453	3.7974	0.5752	5.1156	2.3800	-0.1019	3.1042	0.9556	-1.3949
	(2.76)***	(1.33)	(0.49)	(7.65)***	(5.59)***	(0.69)	(11.64)***	(11.39)***	(-0.47)	(4.79)***	(1.80)*	(-1.42)
MKT		0.5435	0.0160		0.4208	0.0219		0.4250	0.0312		0.4391	0.0101
		(6.07)***	(0.29)		(13.49)***	(1.02)		(30.29)***	(2.37)**		(27.17)***	(0.37)
SMB		0.0323	-0.0772		-0.0717	-0.0461		-0.0774	-0.0180		0.0051	0.0279
		(0.50)	(-1.75)*		(-2.87)***	(-1.29)		(-4.15)***	(-1.20)		(0.20)	(0.62)
HML		0.4818	0.0946		0.3175	-0.0055		0.3273	-0.0078		0.4035	0.0319
		(3.83)***	(4.65)***		(8.37)***	(-0.23)		(16.47)***	(-0.39)		(18.70)***	(0.90)
BONDINDX			1.2786			1.1595			1.0731			1.0500
			(13.97)***			(33.89)***			(68.06)***			(32.04)***
Avg. Adj. R Square	0.3520	0.6535	0.9460	0.2546	0.4986	0.8640	0.2535	0.5352	0.8281	0.2155	0.4889	0.7880
Sample Size	6	6	6	65	65	64	272	264	264	211	199	199

Table 7 (Continued)

Time Series Regressions of Bond Return Spreads on Bond and Equity Market Risk Factors

	AAA Bonds			AA Bonds			A Bonds			BBB Bonds		
Variable	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Panel B. Intermediate Maturities												
DEBTFTR	0.4987	1.0904	0.8339	1.1234	1.7807	0.7097	0.7763	1.6555	0.2855	0.3997	1.8060	0.4558
	(1.42)	(3.84)**	(2.68)***	(6.28)***	(12.10)***	(3.17)***	(7.38)***	(16.75)**	(3.68)***	(2.21)**	(10.71)***	(2.53)**
VOLFTR	0.7425	-0.5644	0.1285	1.8623	1.1777	-0.1130	2.2489	1.1505	0.3580	1.9443	0.6053	-0.1199
	(2.30)**	(-1.10)	(0.34)	(7.65)***	(8.14)***	(-0.85)	(15.98)***	(14.24)***	(2.23)**	(8.70)***	(3.06)***	(-0.49)
MKT		0.2086	-0.0206		0.1744	0.0077		0.2160	-0.0036		0.2574	-0.0038
		(2.43)**	(-0.87)		(19.34)***	(0.81)		(39.97)***	(-0.46)		(30.76)***	(-0.53)
SMB		-0.1300	-0.0143		-0.0867	-0.0453		-0.0552	-0.0124		-0.0421	-0.0013
		(-2.56)**	(-0.36)		(-6.35)***	(-2.18)**		(-10.68)***	(-1.28)		(-5.51)***	(-1.40)
HML		0.5797	0.0056		0.1274	0.0290		0.1599	0.0330		0.1925	0.0228
		(3.05)***	(0.23)		(12.62)***	(2.39)**		(25.69)***	(4.44)***		(17.04)***	(1.64)
BONDINDX			1.0454			1.0693			1.0834			1.1591
			(10.64)***			(29.32)***			(49.48)***			(47.08)***
Avg. Adj. R Square	0.2624	0.4243	0.8797	0.3233	0.5109	0.8769	0.2525	0.4740	0.8630	0.2504	0.4849	0.8426
Sample Size	22	21	21	221	202	200	795	750	750	620	578	578

Table 8

Time Series Regressions of Bond Return Spreads on Bond and Equity Market Risk Factors with Orthogonalized Bond Index

For each bond having at least 12 monthly bid prices over the period from January 1985 to March 1998, we estimate a time series regression of the return spreads on several explanatory variables. The table reports the average coefficient estimates and the corresponding t statistics. The dependent variable is the bond return spread in a given month t. Return spread on a bond is defined as the difference between the raw return on a corporate bond and the return on a Treasury security with the same maturity. DEBTFTR is the difference in monthly return between the portfolio of bonds issued by firms with higher debt ratios and the portfolio of bonds issued by firms with lower debt ratios. At time t, all bonds with valid returns data are divided into two groups based on the issuers' debt ratios: bonds issued by firms with the top 30% debt ratios are assigned to the portfolio of bonds issued by firms with higher debt ratios and the bonds by firms with the bottom 30% debt ratio are assigned to the portfolio of bonds issued by firms with lower debt ratios. VOLFTR is the difference in monthly returns between the portfolio of bonds issued by firms with the top 30% equity return volatility and the portfolio bonds by firms with bottom 30% equity return volatility. MKT, SMB, and HML are the Fama and French (1993) factors that represent the market risk factor, small-minus-big (or size) factor, and high-minus-low market to book ratio factor, respectively. BONDINDX, the orthogonalized bond market return spread, is the residual from the regression of the return spread on the Lehman Brother Bond Index on DEBTFTR, VOLFTR, MKT, SMB, and HML. ***(**)[*] indicates significant at the 1(5)[10]% level.

	AAA Bonds	AA Bonds	A Bonds	BBB Bonds
Variable	Model 3	Model 3	Model 3	Model 3
Panel A. Long Maturities				
DEBTFTR	4.8746	2.1988	2.4999	2.7580
	(6.47)***	(3.23)***	(8.24)***	(3.34)***
VOLFTR	4.1939	1.1367	1.8167	0.2304
	(4.28)***	(1.55)	(6.47)***	(0.30)
MKT	0.3593	0.2818	0.2988	0.2836
	(22.85)***	(15.45)***	(31.52)***	(23.79)***
SMB	-0.0575	-0.2087	-0.1381	-0.1123
	(-1.22)	(-4.90)***	(-9.47)***	(-3.34)***
HML	0.3184	0.2159	0.2378	0.2574
	(9.15)***	(11.25)***	(17.41)***	(10.21)***
BONDINDX	1.0708	1.3771	1.1616	1.1694
	(6.79)***	(10.09)***	(37.02)***	(18.61)***
Avg. Adj. R Square	0.8631	0.8277	0.7887	0.7569
Sample Size	6	64	264	199

Table 8 (Continued)
Time Series Regressions of Bond Return Spreads on Bond and Equity Market Risk Factors with Orthogonalized Bond Index

	AAA Bonds	AA Bonds	A Bonds	BBB Bonds
Variable	Model 3	Model 3	Model 3	Model 3
Panel B. Intermediate Maturities				
DEBTFTR	1.8328	1.3583	1.3254	1.3265
	(5.79)***	(11.55)***	(11.62)***	(6.40)***
VOLFTR	0.0788	0.8955	0.9921	0.3993
	(0.26)	(6.75)***	(11.16)***	(1.60)
MKT	0.1199	0.1372	0.1500	0.1686
	(4.44)***	(22.85)***	(31.81)***	(27.07)***
SMB	-0.1654	-0.1292	-0.1009	-0.1082
	(-7.05)***	(-8.44)***	(-15.97)***	(-14.83)***
HML	0.1223	0.1232	0.1334	0.1621
	(5.79)***	(15.05)***	(31.37)***	(14.47)***
BONDINDX	0.6511	0.6613	0.7319	0.7820
	(6.33)***	(20.95)***	(40.28)***	(31.91)***
Avg. Adj. R Square	0.7788	0.8082	0.7871	0.7853
Sample Size	21	202	750	578

Table 9

Time Series Regressions of Bond Return Spreads on Changes in Debt Ratio and Equity Return Volatility

For each bond having at least 12 monthly bid prices over the period from January 1985 to March 1998, we estimate a time series regression of the return spreads on several explanatory variables. The table reports the average coefficient estimates and the corresponding t statistics. The dependent variable is the bond return spread in a given month t. Return spread on a bond is defined as the difference between the raw return on a corporate bond and the return on a Treasury security with the same maturity. DEBTRATI_CG is the percentage change in debt ratio from month t-1 to t for the issuer of bond. Debt ratio is defined as the sum of short-term debt, long-term debt, and debt due in a year divided by the sum of market value of equity and total debt. VOL_CG is the percentage change in equity return volatility from month t-1 to t for the issuer of bond. At time t, equity return volatility is measured as the volatility of equity returns over the period from month t-12 to month t-1. DEBTFTR is the difference in monthly return between the portfolio of bonds issued by firms with higher debt ratios and the portfolio of bonds issued by firms with lower debt ratios. At time t, all bonds with valid returns data are divided into two groups based on the issuers' debt ratios: bonds issued by firms with the top 30% debt ratios are assigned to the portfolio of bonds issued by firms with higher debt ratios and the bonds by firms with the bottom 30% debt ratio are assigned to the portfolio of bonds issued by firms with lower debt ratios. VOLFTR is the difference in monthly returns between the portfolio of bonds issued by firms with the top 30% equity return volatility and the portfolio bonds by firms with bottom 30% equity return volatility. MKT, SMB, and HML are the Fama and French (1993) factors that represent the market risk factor, small-minus-big (or size) factor, and high-minus-low market to book ratio factor, respectively. BONDINDX, the orthogonalized bond market return spread, is the residual from the regression of the return spread on the Lehman Brother Bond Index on DEBTFTR, VOLFTR, MKT, SMB, and HML. ***(**)[*] indicates significant at the 1(5)[10]% level.

	AAA Bonds			AA Bonds			A Bonds			BBB Bonds		
Variable	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Panel A. Long Maturities												
DEBTRATI_CG	1.0703	0.6204	-0.0493	1.0159	0.4426	0.19643	-0.1329	0.0411	-0.1352	-0.0369	-0.1216	-0.0025
	(1.24)	(0.63)	(-0.06)	(2.35)**	(1.22)	(1.60)	(-1.56)	(0.49)	(-1.39)	(-0.51)	(-1.57)	(-0.05)
VOL_CG	-0.1457	0.2484	0.1277	-0.0799	-0.1389	-0.0470	-0.0323	-0.1367	-0.0076	-0.0818	0.0903	-0.0764
	(-0.24)	(0.39)	(0.29)	(-0.77)	(-1.15)	(-1.21)	(-0.49)	(-2.96)***	(-0.29)	(-1.03)	(1.24)	(-1.19)
DEBTFTR	0.8337	1.6063	0.8343	1.0153	2.4061	2.7470	1.1998	3.4534	2.6685	0.9818	2.8381	2.5486
	(0.28)	(1.10)	(0.49)	(0.86)	(5.04)***	(10.76)***	(3.49)***	(12.66)**	(18.75)***	(1.81)*	(5.45)***	(5.93)***
VOLFTR	7.9266	5.7771	3.2742	5.8618	3.7486	1.1810	5.0072	2.3143	1.6097	2.8490	1.1186	0.7579
	(2.54)**	(2.28)**	(2.84)***	(4.30)***	(6.26)***	(4.90)***	(13.15)***	(8.25)***	(9.88)***	(4.14)***	(2.20)**	(1.75)
MKT		0.5350	0.4478		0.4336	0.2514		0.4602	0.3022		0.5174	0.3223
		(3.90)***	(4.57)***		(9.00)***	(13.04)***		(25.62)***	(40.10)***		(16.80)***	(10.12)***
SMB		0.0411	-0.0727		-0.1296	-0.1260		-0.0782	-0.0976		0.0367	-0.0345
		(0.43)	(-1.45)		(-5.15)***	(-9.53)***		(-5.26***	(-9.52)***		(1.03)	(-1.10)
HML		0.3903	0.3772		0.3213	0.2031		0.3437	0.2412		0.4274	0.2746
		(4.17)***	(4.44)***		(7.95)***	(10.76)**		(17.16)***	(20.83)***		(11.37)***	(8.30)***
BONDINDX			1.2542			1.1907			1.1394			1.1086
			(4.04)***			(25.39)***			(51.10)***			(20.36)***
Avg. Adj. R Square	0.4114	0.7176	0.9218	0.3132	0.4989	0.8709	0.2661	0.5427	0.8716	0.2207	0.4485	0.8096
Sample Size	6	6	6	62	58	55	246	224	216	187	176	169

Table 9 (Continued)
Time Series Regressions of Bond Return Spreads on Changes in Debt Ratio and Equity Return Volatility

	AAA Bonds			AA Bonds			A Bonds			BBB Bonds		
Variable	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Panel B. Intermediate Maturities												
DEBTRATI_CG	-0.9949	0.1277	0.1173	0.4874	0.3792	0.1806	0.0265	-0.0651	-0.2950	-0.0208	0.0453	-0.0310
	(-0.11)	(1.04)	(1.33)	(3.95)***	(3.09)***	(2.34)**	(0.25)	(-0.45)	(0.96)	(-0.68)	(0.68)	(-1.61)
VOL_CG	-0.1308	0.1016	0.0863	-0.0966	-0.0728	0.0034	-0.0270	-0.0795	-0.0239	-0.0801	-0.0306	-0.0399
	(-1.07)	(0.69)	(0.63)	(-1.72)*	(-2.38)**	(0.12)	(-1.24)	(-4.46)***	(-2.15)**	(-1.44)	(-0.68)	(-1.20)
DEBTFTR	0.4190	0.7028	1.5745	0.3759	1.8355	1.2854	0.5987	1.5501	0.9067	0.5742	1.9173	0.7932
	(0.79)	(1.18)	(3.36)***	(0.95)	(10.51)***	(11.15)***	(5.79)***	(13.31)***	(14.82)***	(3.09)***	(3.02)***	(7.05)***
VOLFTR	0.3667	-0.3139	-0.1584	2.8190	1.2895	0.4184	2.5843	1.0489	0.6861	2.1814	0.3887	0.2209
	(0.94)	(-1.10)	(-0.99)	(8.01)***	(7.32)***	(4.68)***	(18.26)***	(10.26)***	(11.26)***	(11.44)***	(1.09)	(2.20)**
MKT		0.1521	0.1502		0.1826	0.1463		0.2270	0.1514		0.2923	0.1529
		(2.16)**	(5.20)***		(16.78)***	(15.58)***		(36.23)***	(41.73)***		(16.64)***	(21.57)***
SMB		-0.0989	-0.1040		-0.0912	-0.0882		-0.0653	-0.0904		-0.0513	-0.0932
		(-1.97)**	(-5.25)***		(-6.01)***	(-6.08)***		(-10.96)***	(-10.97)***		(-3.18)***	(-9.99)***
HML		0.1363	0.1294		0.1347	0.1168		0.1652	0.1193		0.1985	0.1202
		(2.20)	(4.63)***		(10.77)***	(12.29)***		(19.85)***	(22.07)***		(9.27)***	(11.20)***
BONDINDX			0.6043			0.6662			0.6960			0.7206
			(9.18)***			(23.02)***			(61.17)***			(38.34)***
Avg. Adj. R Square	0.2442	0.4524	0.7317	0.3625	0.5361	0.7952	0.2549	0.4539	0.7843	0.2410	0.4982	0.7842
Sample Size	19	19	17	194	179	173	697	633	611	523	469	447