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by

John Y. Campbell and Glen B. Taksler

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Harvard University
Cambridge, Massachusetts

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John Y. Campbell and Glen B. Taksler[1]

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[1]Campbell: Department of Economics, Littauer Center 213, Harvard University, Cambridge MA 02138, USA, and NBER. Email john_campbell@harvard.edu. Website http://post.economics.harvard.edu/faculty/campbell/campbell.html. Taksler: Department of Economics, Littauer Center, Harvard University, Cambridge, MA 02138. Email taksler@fas.harvard.edu.
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Abstract

This paper explores the effect of equity volatility on corporate bond yields. Panel data for the late 1990's show that idiosyncratic firm-level volatility can explain as much cross-sectional variation in yields as can credit ratings. This finding, together with the upward trend in idiosyncratic equity volatility documented by Campbell, Lettau, Malkiel, and Xu (2001), helps to explain recent increases in corporate bond yields.

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1 Introduction

During the late 1990's, the US equity and corporate bond markets behaved very differently. As displayed in Figure 1, stock prices rose strongly, while at the same time corporate bonds performed poorly. The proximate cause of the low returns on corporate bonds was a tendency for the yields on both seasoned and newly issued corporate bonds to increase relative to the yields of US Treasury securities. These increases in corporate-Treasury yield spreads are striking because they occurred at a time when stock prices were rising; the optimism of stock market investors did not seem to be shared by investors in the corporate bond market.

There are several reasons why the prices of corporate bonds might diverge from the prices of corporate equities. First, stock prices will increase if investors become more optimistic about future corporate profits. Optimistic expectations benefit stock prices much more than bond prices, since stockholders receive all residual profits while corporate bondholders receive no more than the promised payments of principal and interest. This explanation does not account for the behavior of corporate bond yields in the late 1990's, however, because yield spreads on corporate bonds over Treasuries should fall, not rise, if investors become optimistic about corporate profits and thus reduce their expected probabilities of default. Second, there might be a composition effect if corporate bonds are issued by different companies than those that dominate value-weighted equity indexes. Third, the yields on newly issued corporate bonds might vary because of changes in the special features of these bonds, for example, an increase in the value of call provisions. Such an increase would drive down the prices and drive up the yields on newly issued bonds, but it would not have any effect on seasoned bond prices. Finally, volatility has opposite effects on stock and bond prices. Given expected profits, volatility of firm value hurts bondholders because it increases the probability of default; it has a corresponding positive effect for equityholders. Thus volatility should drive up the yields on both new and seasoned corporate bonds.

Merton (1974) initiated the modern analysis of corporate debt by pointing out that the holders of risky corporate bonds can be thought of as owners of riskless bonds who have issued put options to the holders of the firm's equity. When volatility increases, the value of the put options increases, benefiting equityholders at the expense of bondholders. The volatility that is relevant for option value, and thus for corporate debt, is *total* firm volatility, including both idiosyncratic volatility and systematic or market-wide volatility. This is important because idiosyncratic volatility can move

very differently from market-wide volatility. In particular, Campbell, Lettau, Malkiel, and Xu (2001) point out that idiosyncratic volatility has trended upwards since the mid-1970's, while market-wide volatility has undergone temporary fluctuations but no trend increase. The findings of Campbell et al. suggest that increasing idiosyncratic volatility could have depressed corporate bond prices, and supported corporate equity prices, during the past few decades and during the late 1990's in particular.

The relevance of increasing idiosyncratic volatility is illustrated in Figure 2. This figure plots the average yield spread on A-rated corporate bonds, as reported by the credit rating agency Standard and Poor's (S&P), from January 1965 through December 1999. It also plots a six-month moving average of idiosyncratic volatility, calculated from monthly cross-sectional data on individual stock returns by Goyal and Santa-Clara (2001). The two series display a common upward trend and substantial correlation in their movements at intermediate frequencies; the correlation of the levels of the two series is about 0.7. Market volatility, by contrast, has no upward trend and is much less closely related to the S&P yield spread, with a correlation of only about 0.1.[2]

The purpose of this paper is to measure the causes of variation, across companies and over time, in corporate bond yield spreads. Specifically, we evaluate the volatility effect while controlling for composition effects and special features of corporate bonds. We first study corporate bond pricing in a large panel dataset, the Fixed Income Securities Database (FISD) on corporate bond characteristics matched to the National Association of Securities Commissioners (NAIC) database on bond transactions in the period 1995-99. We present new evidence that equity volatility explains as much variation in corporate credit spreads as do credit ratings. Controlling for general factors such as the reference Treasury rate, years to maturity, and time-series dummies, we find that equity volatility and credit ratings each explain about a third of the variation in corporate bond yield spreads. This finding is robust to the use of issuer fixed effects. We also explore the longer-term time-series behavior of corporate bond yields, as summarized by S&P and Moody's yield indexes, and find that movements in idiosyncratic volatility help to explain these movements in average yields over time.

The empirical literature on corporate bonds is limited, perhaps because of a

[2]We note that average yield spreads reported by Moody's have a smaller upward trend and are about equally correlated with idiosyncratic volatility and market volatility. We discuss both the S&P and Moody's data in more detail in sections 2 and 4 below.

scarcity of data. Elton, Gruber, Agrawal, and Mann (2001) present evidence that expected default can account for only a small part of the zero-coupon yield spread for corporate over Treasury bonds, while state taxes (which are payable on corporate bond interest but not on Treasury bond interest) are relatively much more important. Collin-Dufresne, Goldstein, and Martin (2000) argue that corporate bonds are traded in a segmented market and find that a single unobserved factor, common to all corporate bonds, drives most variation in credit spreads. Longstaff and Schwartz (1995) argue that the corporate yield spread should vary inversely with the benchmark Treasury yield, and find evidence to support this prediction. Duffee (1998) shows that yield spreads vary more strongly with benchmark Treasury rates for callable bonds than for noncallable bonds. There has been relatively little interest in the effect of volatility on the cross-sectional variation, long-term time-series behavior, or recent movements of corporate yield spreads. Our paper fills this gap in the academic literature.[3]

The remainder of the paper is organized as follows. Section 2 describes our panel data and the restrictions we impose on it. This section also examines trends in corporate bond spreads between 1995 and 1999. We find that, even after considering bonds without option-like features, credit spreads have been rising. However, this widening is not as large as credit rating agencies suggest. Section 3 links our data with equity and accounting data to investigate the link between equity volatility and corporate yield spreads. We present evidence that rising equity volatility dramatically raises the cost of borrowing. This effect is robust to a choice of a market model to define idiosyncratic volatility, the use of issuer fixed effects, and several other specification choices. Section 4 returns to the time-series data, using an updated version of the idiosyncratic volatility series of Campbell et al., provided to us by Goyal and Santa-Clara (2001). Section 5 concludes.

[3]The financial press has been more sensitive to the relation between equity volatility and corporate bond spreads. For instance, in October 2000, the Financial Times wrote, "The increased volatility in the equity markets is another sign of the rising risks faced by companies, and bond investors are starting to re-price their investments." (Chaffin, Joshua and Van Duyne, Aline, "Corporate bond crisis grows amid credit fears: Industrial groups worst hit as spreads widen in US and Europe," Financial Times: October 12, 2000, p. 25).

2 Data description

Our data come from the Fixed Investment Securities Database (FISD) and National Association of Insurance Commissioners (NAIC) transactions data. The FISD database contains issue- and issuer-specific variables such as callability, credit ratings, and sector, on all U.S. corporate bonds maturing in 1990 or later. The NAIC database consists of all 1995-1999 transactions by life insurance, property and casualty insurance, and Health Maintenance Organization (HMO) companies as distributed by Warga (2000). This database is the replacement for the no longer available Lehman Brothers Fixed Income database used by Blume, Lim, and Mackinlay (1998), Collin-Dufresne, Goldstein, and Spencer (2000), Duffee (1998), Elton, Gruber, Agrawal, and Mann (2000, 2001), and Hecht (2000).

Table 1 provides evidence on the representativeness of our transactions database. According to the Flow of Funds accounts published by the Federal Reserve, life insurance companies hold the largest proportion of corporate debt, between 25 and 30% in recent years. Our transactions database includes both life insurers and other insurers, which means we cover about one-third of the corporate bond market. Other important holders include holdings of U.S. issues by foreign residents (15 to 20%), households (15%), and mutual funds, private pension funds, and retirement funds (each under 10%).

Table 2 summarizes the characteristics of corporate bond issuers as reported in the Flow of Funds accounts. We restrict our sample to fixed-rate US dollar bonds in the industrial, financial, and utility sectors that are non-callable, non-puttable, non-sinking fund, and non-convertible. To ensure that we consider bonds backed solely by the creditworthiness of the issuer, we exclude issues with asset-backed and credit-enhancement features. While this last restriction eliminates at least one-quarter of corporate debt issues as shown in Table 2, the yield spread on asset-backed bonds represents the creditworthiness of the collateral rather than the creditworthiness of the issuer. As such, we must exclude these issues.

Additionally, we only consider bonds whose average Standard and Poor's and Moody's credit rating lies between AA (Aa) and BBB (Baa). For bonds rated by only one of Standard and Poor's or Moody's, we use that agency's credit rating. We eliminate AAA (Aaa) bonds because the NAIC data for these issues appear particularly problematic. For instance, in 1995 our data show the average spread for medium-term (7-15 year) AAA-rated bonds as 109 basis points above the closest

benchmark treasury, which is higher than the 100 basis point spread for A-rated bonds. This problem is even more acute in the financial sector, where in 1995 and 1996 the data suggest that AAA-rated bonds yielded roughly 30 basis points more than BBB-rated bonds. Elton, Gruber, Agrawal, and Mann (2000, 2001) found similar problems with AAA-rated bonds in the Lehman Brothers Fixed Income database distributed by Warga (1998). These authors also remove AAAs from their samples.

We eliminate non-investment grade (high-yield) debt because insurance companies often limit, or altogether prohibit, their purchase of these issues. Additionally, for insurance companies in our sample, the National Association of Insurance Commissioners' Securities Valuation Office requires a modest reserve ratio of 1% for AAA-rated bonds and 2% for BBB or better-rated bonds, but this reserve ratio jumps to 5% for BB (non-investment grade) debt. Since yield spreads are set by the market as a whole, which does not face NAIC reserve requirements, the spread on non-investment grade debt is particularly unattractive to insurance companies. Non-investment grade transactions in our database are likely to be unrepresentative of the general market.

As a final data screen, we eliminate the top and bottom one percent of spreads from our analysis to reduce apparent error in the NAIC data.[4] Removing all bonds with special features (call, put, sinking fund, asset-backed, convertible), floating rate coupons, non-investment grade bonds, and bad data leaves us with approximately 52,000 different bond-month transactions.

2.1 Descriptive statistics

We calculate the yield to maturity on each bond in the sample and its spread over the closest benchmark U.S. treasury in a particular month. For the benchmark Treasuries, we use the CRSP Fixed Term indexes, which provide monthly yield data for notes and bonds of 1, 2, 5, 6, 10, 20, and 30 target years to maturity. Implicitly, we are assuming that each transaction occurs at the end of the month, when the CRSP Fixed Term indexes are published, but this should have little impact on the measured spread.

Table 3 summarizes the mean spread each year for the industrial, financial, and

[4]We explored several alternative cutoffs (0, 2, 5, 10, 20, and 25 percent) before deciding on the one percent screen. The results of the paper are not particularly sensitive to the exact screen used.

utility sectors, and for an aggregate of all three sectors. Following Duffee (1998), we also group the bonds by maturity, classifying them as short-term if they have 2-7 remaining years to maturity, medium-term if they have 7-15 remaining years to maturity, and long-term if they have 15-30 remaining years to maturity. We also report results by credit rating, using Standard and Poor's rating scheme for notational convenience; thus we record a Moody's Aaa rating as AAA, Aa as AA, and Baa as BBB.

Table 3 shows that financials have the highest yield spreads, about 10 basis points higher than all sectors for medium-term bonds and 20 basis points higher for long-term bonds. There is no consistent pattern in the relative spreads on utilities and industrial bonds. Across sectors, A-rated bonds tend to yield about 20 basis points higher than AAs, and BBB-rated bonds yield 30 to 60 basis points higher than As. Yield spreads are considerably higher in 1998 and 1999 than in earlier years.

It is important to have a sense of the number of transactions in each category in our sample. We have 22,629 short-term, 14,503 medium-term, and 6,288 long-term transactions. About half the transactions in this sample are on bonds with an A credit rating and 30 to 40 percent on bonds with a BBB credit rating. The financial sector has the most transactions, and the utility sector the least. There are only 42 AA long-term utility transactions in the sample, most likely because utilities often issue bonds with call provisions.

It is interesting to compare our data with the average corporate yield spreads reported by Standard and Poor's and Moody's. To set the stage, in Figures 3 and 4 we plot average spreads reported by the two credit rating agencies over the entire period from January 1965 through December 2000. We plot the series for four different credit ratings: AAA, AA, A, and BBB. The S&P spreads in Figure 3 and the Moody's spreads in Figure 4 move in a similar fashion, with a noticeable tendency to increase when the stock market is weak and/or volatile, as in the mid-1970's, the early 1980's, and the period around the stock market crash of 1987. However S&P reports higher yield spreads than Moody's during the 1990's and therefore S&P spreads show a stronger tendency to increase over the 1965-2000 period.

In Figure 5, we directly compare the spreads implied by our subset of the NAIC data with the spreads reported by the rating agencies over the period since 1995 covered by the NAIC data. To make the figure easier to follow, we only plot A-rated bond spreads, but the results are similar for other rating categories. Here again we see that the Standard and Poor's index is often higher than the Moody's index, on

the order of 80-100 basis points in late 1995-96 and 30-50 basis points in late 1998-99. Our NAIC spreads are lower overall, which makes sense because the rating agencies include debt with callable features and we do not. Adding transactions for bonds with callable features back into the NAIC data brings our spreads slightly closer to the S&P and Moody's indexes.

It is noteworthy that after the financial turmoil of the late summer of 1998, yield spreads in the NAIC data declined to pre-crisis levels by February 1999, whereas the rating agency spreads did not fall significantly. We do not have a good explanation for this; the exclusion of callable features from our NAIC series seems to account for only a small portion of the discrepancy. We leave further exploration of this topic to future research.

3 Equity volatility and the cross-section of corporate bond yields

We now consider how an issuer's equity volatility influences the yield spread on its debt. In the simple framework of Merton (1974), corporate debt is a risk-free bond less a put option on the value of the firm's assets. The strike price equals the face value of the debt and reflects the limited liability of equityholders in the event of bankruptcy. A firm with more volatile equity is more likely to reach the boundary condition for default. Investors, recognizing this risk, should require additional compensation in the form of a higher yield spread over the riskfree rate. Importantly, this is true even if investors are risk-neutral or default risk is idiosyncratic. The effect of volatility on the spread works through the expected payoffs on corporate debt, not through the expected return or risk premium on the debt.

To explore this effect we use the NYSE, AMEX, and NASDAQ CRSP daily stock files for equity data and the COMPUSTAT annual full-coverage, industrial, and research files for accounting data. To ensure comparability of data, we adjust the COMPUSTAT fiscal year to the relevant calendar year. For each transaction, we consider the equity data for the 180 days prior to (not including) the bond trade and accounting data for the previous calendar year. This procedure ensures that all data is known to the market when a bond purchase or sale takes place. From our initial subset of the NAIC database, approximately 30,000 transactions are from pub-

licly traded companies with available CRSP data in the transaction month. Further restricting to available COMPUSTAT data leaves us with about 22,000 transactions.

We run our regressions both with and without the credit rating on each bond. If both Moody's and Standard and Poor's rated an issue on a given transaction date, we use the average rating. If only Moody's or Standard and Poor's rated an issue, we consider that agency's rating.

We also consider accounting data because the meaning of a bond's credit rating is somewhat unclear. If credit ratings predict yield spreads, this tells us that credit rating agencies use relevant information effectively, but it tells us nothing about what information is relevant because only credit rating agencies know exactly what goes into a rating. If one is interested in the mapping from firm characteristics and market conditions to bond yields, it is more appropriate to consider the objective data that might go into a credit rating, such as financial leverage and other accounting ratios.

Specifically, we consider four accounting variables: pretax interest coverage, operating income to sales, long-term debt to assets, and total debt to capitalization.[5] These are the exact measures used in Blume, Lim, and Mackinlay (1998), and similar to those in Collin-Dufresne, Goldstein, and Martin (2000) and earlier papers (Pinches and Mingo (1973), Pogue and Soldofsky (1969)). High levels of the first two variables indicate financially healthy firms and are likely to produce a low yield spread. High levels of the second two variables indicate highly levered firms and imply a high yield spread.

Rather than measure interest coverage continuously, we break it into four groups. Blume, Lim, and Mackinlay (1998) argue that a change in interest coverage from 4 to 6 (the means for BBB- and A-rated bonds, respectively) may result in a bond upgrade. A similar change from 20 to 22 would likely have no effect since the mean interest coverage for AAA-rated bonds is 13. We therefore anticipate that particularly low pretax interest coverage may convey more information about the risk of an issuer than high interest coverage. To account for this possibility, we create dummy variables to

[5]Following Blume, Lim, and Mackinlay (1998), our accounting variables are as follows, with Compustat item numbers in parentheses. Pretax interest coverage is the ratio of [operating income after depreciation (178) + interest expense (15)] to [interest expense (15)]. Operating income to sales is [operating income before depreciation (13)] to [net sales (12)]. Long-term debt to assets is [total long-term debt (9)] to [total assets (6)]. Total debt to capitalization is [total long-term debt (9) + debt in current liabilities (34) + average short-term borrowings (104)] to [total assets (6)]. Each variable is obtained as of the end of the previous calendar (not fiscal) year.

indicate the group in which an issuer lies. The dummies indicate that pretax interest coverage is less than 5, between 5 and 10, between 10 and 20, and greater than 20.

To summarize firm-level risk and return, we compute the mean and standard deviation of daily excess returns, relative to the CRSP value-weighted index, for each firm's equity over the 180 days preceding (not including) the bond transaction date. Thus we avoid estimating betas for individual firms on the market index, effectively imposing a beta of one (and an alpha of zero) in the market model. Campbell, Lo, and MacKinlay (1997, p. 156) call this a "market-adjusted-return" model. We also include the mean and standard deviation of daily market returns, where the market is defined as the CRSP value-weighted index over the same 180 days. We expect the standard deviation of daily excess returns to have a positive effect on yield spreads; the standard deviation of daily index returns may also have a positive effect to the extent that it influences the total standard deviation of firm returns. We expect average returns over the past 180 days to have a negative effect on yield spreads.

We use the closest benchmark Treasury rate and the difference between the 10- and 2-year Treasury rates to describe the level and slope of the term structure, respectively. Longstaff and Schwartz (1995) argue that the expected sign on the level of the Treasury rate is negative because a higher interest rate increases the drift of the risk-neutral process for the value of the firm. In turn, this lowers the risk-neutral probability of default and the corporate bond yield spread. Collin-Dufresne, Goldstein, and Martin (2000) reason that the slope of the term structure provides some measure of uncertainty about the economy, as well as an expectation of future short rates. Following Elton, Gruber, Agrawal, and Mann (2000), we include the coupon rate on the bond because bonds with higher coupons are taxed more throughout the life of the bond, making them less desirable than bonds with lower coupons. Finally, we include twelve month dummies (January through December) to capture seasonal effects.

Our regressions proceed as follows. First, we report the results of ordinary least squares (OLS) regressions treating each transaction as an independent observation. Second, we remove pure cross-sectional variation in issuer quality by estimating fixed effects for each bond issuer. Third, we remove the time-series variation in average yields by replacing the twelve month dummies (January through December) with sixty monthly time dummies (January 1995 to December 1999). Once we have demonstrated that equity volatility helps to determine corporate bond yield spreads in each framework, we consider interaction effects and evaluate the robustness of the

results in the next subsection.

Table 4 reports the results of ordinary least squares (OLS) regressions. Odd numbered columns report results without equity volatility; even numbered columns repeat the regressions with equity volatility. Several observations are notable. First, including equity volatility raises the R-squared by 10 to 17 percentage points (even numbered columns minus odd numbered columns). The coefficient on the standard deviation of excess returns is highly significant with a t-statistic of 35-40. Both results suggest that volatility is an important determinant of corporate bond yield spreads.

Second, equity volatility matters at least as much as credit ratings. A regression of yield spreads on equity volatility (column 2) results in an R-squared nearly 3 percentage points higher than a regression of spreads on credit ratings (column 3). This observation makes sense because equity volatility can reflect both continuous information that distinguishes bonds with the same credit rating, and recent information that may not yet be reflected in a bond's credit rating.

Third, equity volatility and credit ratings may be used in tandem to better explain bond spreads. Including both variables in the regression (column 4) results in an R-squared 4 percentage points higher than volatility alone and 7 percentage points higher than credit ratings alone. This result suggests that credit ratings capture some information that is not contained in volatility.

Fourth, credit ratings explain more of the yield spread than accounting data (columns 3-6). This is not surprising because a credit rating is designed to convey information not contained elsewhere. Additionally, our accounting data is updated only at of the close of the previous calendar year, while our credit ratings may be updated at any time. We note that total debt to capitalization always results in the wrong sign (negative).

Fifth, adding accounting variables on top of credit ratings (columns 7-8) does not meaningfully raise the R-squared over credit ratings alone. The accounting variables generally have the expected signs, with the exception of total debt to capitalization.

From an efficient markets standpoint, the comparison between equity volatility and credit ratings makes sense. All data going into a credit rating should be captured in the equity price. Equity markets reflect up-to-date information whereas credit ratings may be revised infrequently and with a lag. In the extreme, Ederington,

Yawitz, and Roberts (1987) argue that investors fully anticipate rating changes and rating changes almost never affect bond returns. Since one might view equity as junior debt, where a dividend is paid only when the firm does not default, equity investors should take into account default probabilities, recovery rates, and relevant accounting ratios. From this standpoint, the only thing surprising about the link between equity volatility and bond spreads is that it has attracted so little attention from empirical researchers.

At this point we have shown that yield spreads vary inversely with equity volatility across companies. If General Motors' (GM) equity is less volatile than Ford's, then GM faces a lower yield spread than Ford. We now consider the pattern within a single company. Within GM, is the yield spread on GM debt lower when GM's equity is less volatile?

The answer is yes, as reported in Table 5. Applying fixed effects to each of our 581 bond issuers, we find similar results to the basic OLS regressions. The coefficient on the standard deviation of daily excess returns is almost unchanged. The t-statistic is smaller but still highly significant. Also noteworthy is that equity volatility (column 2) continues to explain more of the yield spread than do credit ratings alone (column 3). The combination of equity volatility and credit ratings (column 4) raises the R-squared to 40%.

One potential objection is that the regressions may simply be picking up time-series variation in the data. To address this concern, Table 6 considers the same regressions but replaces the seasonal dummies (February to December) with monthly time dummies between February 1995 and December 1999. Once again, the results are substantially similar. In this table we include issuer fixed effects, but we find similar results if we exclude them.

The monthly time dummies represent unexplained time-series variation in average corporate yield spreads. Figure 5 plots the monthly time dummies from a regression of yield spreads on credit ratings and accounting variables (Table 6, column 7). Adding equity volatility to these variables (Table 6, column 8) generates monthly time dummies with a mean closer to zero and a smaller standard deviation. This shows that equity volatility captures some of the time-series variation that otherwise would be left to dummy variables.

3.1 Interaction effects and robustness checks

We have demonstrated that equity volatility helps to determine corporate bond yield spreads in the cross-section. There remains the question of how the firm's capital structure interacts with other determinants of the yield spread. We consider two interactions: long-term debt to assets with equity volatility, and long-term debt to assets with the closest benchmark Treasury rate.

The ratio of long-term debt to assets may influence the strength of the volatility effect because investors may regard a company with almost no long-term debt as unlikely to default even when the issuer's equity is highly volatile. Simply put, a firm is unlikely to go bankrupt over a small amount of debt. On the other hand, a company with relatively high long-term debt and particularly volatile equity is at particularly high risk of bankruptcy, and this risk should be reflected in a higher yield spread.

The benchmark Treasury rate is also relevant for a firm with long-term debt. A higher Treasury rate increases the return on potential investments, but the interest cost of long-term borrowing stays the same because the firm already has issued bonds at a fixed rate of interest. Equivalently, a higher Treasury rate reduces the market value of liabilities more than the market value of assets. From either perspective, an increase in the Treasury rate should reduce the probability of default for a firm with high long-term debt. The effect of the Treasury rate should be weaker for a firm with medium- and short-term liabilities, since a higher Treasury rate raises the cost of rolling over short-term debt and therefore has little effect on the market value of the firm's liabilities.

Table 7 explores these interaction effects. We break long-term debt-to-assets into approximate quartiles: less than 10%, 10 to 25%, 25% percent to one-third, and greater than one-third. While the relationship is not monotonic, it does appear that equity volatility is more important for firms with high long-term debt to assets. Similarly, the impact of the Treasury rate is stronger on firms with high ratios of long-term debt to assets. Even with interaction effects, equity volatility continues to be an important determinant of bond yield spreads, as evidenced by higher R^2 statistics in the even numbered regressions. These results are not sensitive to the inclusion of issuer fixed effects or time dummies.

We now address the robustness of our findings. To do so, we consider changes

in the definition of idiosyncratic volatility and the number of days used to calculate it. For each bond transaction, we run the Capital Asset Pricing Model (CAPM) on the preceding 180 calendar days of the issuer's equity. From this, we multiply the daily index return by beta (dropping the implicit assumption of the earlier market-adjusted-return model that beta equals one) and calculate the idiosyncratic return and its standard deviation. We re-run this procedure using 90, 270, and 360 calendar days of the issuer's equity.

Table 8 shows that our results are robust to these changes. While we report the results for equity volatility, credit ratings, and accounting data together (analogous to column 8 of Tables 4, 5, and 6), we find similar results for the various combinations presented in earlier tables. Idiosyncratic risk takes on a t-statistic of 35-40 in the OLS regressions, 25-30 in the issuer fixed-effects regressions, and about 10 in the issuer fixed-effects regressions with monthly time dummies. The coefficient on equity volatility using 180 or more days of data exceeds that of 90 days, suggesting that a fairly long time window is needed to measure the volatility that is relevant to corporate bond investors.

As a final test of the results, we consider the argument of Elton, Gruber, Agrawal, and Mann (2001) that the yield spread should be defined as the difference between the yield to maturity on a zero-coupon corporate bond and the yield to maturity on a zero-coupon government bond of the same maturity. These authors suggest that, because arbitrage arguments hold with spot rates, it makes sense to model zero-coupon yields from a coupon-paying corporate bond and the corresponding Treasury. This modeling procedure involves separating out bonds by month, sector, and credit rating to fit 540 yield curves (60 months x 3 sectors x 3 credit ratings), according to the procedure of Nelson and Siegel (1987). Appendix A outlines the estimation method.

For each month, we estimate the Nelson-Siegel yield spreads and take the actual yield spread minus the estimated yield spread. Following Elton et al., we eliminate bonds with errors of $5 or more, assuming a potential data error. Within each sector and credit rating, we then regress the difference on equity volatility, plus or minus credit ratings, and state variables. The expected sign on a plus (minus) credit rating is negative (positive). For example, a financial sector A+ bond should have a lower yield spread than the spread that is fitted to all financial bonds with A+, A, and A- ratings.

Panel A of Table 9 presents the results. The drastic reduction in R-squared is

not particularly surprising since we have subtracted out all variation in the sector, credit rating, and monthly time-series via the estimation procedure. Idiosyncratic volatility is most significant for A- and BBB-rated industrials, but also holds well for A-rated financial bonds. The regressions for these bonds (columns 2, 3, and 5) also have the best fit overall as indicated by their F-statistics.

To see how much difference the Nelson-Siegel procedure makes, Panel B of Table 9 regresses actual bond spreads for each sector and credit rating against the variables in Panel A. We also include sixty monthly time dummies to account for the subtraction of time-series variation in the Nelson-Siegel estimation procedure. Our results are similar. The t-statistics on equity volatility are most significant in columns 2, 3, and 5, as are the F-statistics for the entire regression. This leaves us with two additional results. First, the equity volatility effect is robust to the estimation of a zero-coupon corporate bond yield curve. Second, it is not clear that an analysis of corporate bond yield spreads must measure spreads in relation to a zero-coupon curve. We obtain very similar results whether we use the Nelson-Siegel methodology or not.

To summarize, our analysis suggests that equity volatility is an important determinant of corporate bond yield spreads. In the cross-section, volatility can explain as much of the yield spread as can credit ratings. This finding continues to hold when we include fixed effects for each bond issuer and when we control for monthly time-series variation. Equity volatility is particularly important for firms with a high ratio of long-term debt to assets. These results are robust to the use of a market model with an estimated beta, the use of a longer or shorter time window to estimate volatility, and the use of the Nelson-Siegel method to adjust for the slope of the term structure.

4 Equity volatility and the time-series of corporate bond yields

We now explore the longer-term time-series behavior of corporate bond yield spreads, as summarized by the Standard and Poor's and Moody's yield indexes. We find that movements in idiosyncratic volatility help to explain these movements in average yields over time. Using an updated version of the idiosyncratic volatility series of Campbell, Lettau, Malkiel, and Xu (2001), provided to us by Goyal and Santa-Clara

(2001), we calculate a six-month moving average of market and idiosyncratic risk between January 1963 and December 1999. This moving average proxies for the 180 days of firm-level equity data used in the previous section.

Our motivation is straightforward. First, our cross-sectional data set is limited in that it restricts our analysis to the years 1995-99. The importance of equity volatility may be an aberration of the late 1990s that does not apply to earlier years. Second, Campbell et al. point out that idiosyncratic volatility has trended upwards since the mid-1970's, while market-wide volatility has undergone temporary fluctuations but no trend increase. These findings suggest that increasing idiosyncratic volatility could have depressed corporate bond prices yet supported equity prices during the late 1990's. A longer time-series of data allows us to analyze this hypothesis in greater depth.

Table 10 reports regressions of the Standard and Poor's and Moody's yield spread indexes against equity volatility and macroeconomic variables. Panel A considers A-rated corporate bonds, while Panel B considers an equal weighted index of AAA, AA, A, and BBB-rated bonds. The coefficient on idiosyncratic risk is smaller in the time series than in our earlier cross-sectional regressions, but it is significant for both indexes in both panels, with a t-statistic of about 18 for S&P and 4 for Moody's. Recalling the upward trend of S&P data in Figure 3, it is interesting to note that the R-squared on the regression without equity volatility is about 30 percentage points higher for S&P (column 1) than for Moody's (column 3). With equity volatility, the R-squared for S&P (column 2) is 50 percentage points higher than for Moody's (column 4).

Figure 6 puts the results in graphical perspective for A-rated S&P corporate bonds. An in-sample prediction of equity volatility captures the broad trends of actual yield spreads, performing particularly well in the 1970s and early 1980s. Over our 37-year horizon, the root mean squared error with equity volatility is about 12 basis points lower than without equity volatility (33 versus 45 basis points). Neither series performs particularly well in the late 1990s, although the in-sample prediction with equity volatility performs better than the prediction without volatility.

In Figure 7, we repeat the regression of S&P A-rated yield spreads, this time for 1963-94. We then predict out-of-sample yield spreads for 1995-99 with and without equity volatility, plotting them against actual A-rated yield spreads. The prediction of yield spreads with equity volatility is uniformly higher than the prediction without volatility, resulting in half the root mean squared error. Although the series

without volatility performs better for the one year between mid-1996 and mid-1997, the series with volatility captures the upswing in credit spreads beginning August 1998 and remains high through the end of 1999. Overall these results suggest that equity volatility is an important factor in understanding the movements in aggregate corporate bond yield spreads, both over the last few decades and in the late 1990s.

5 Conclusion

In this paper we have documented a link between rising idiosyncratic equity risk and increasing yields on corporate bonds relative to Treasury bonds. These two phenomena have been noted before, but there has been little research on the empirical connection between them.

Our analysis has proceeded as follows. First, we have compared the average yield spreads reported by Standard and Poor's and Moody's with a panel dataset on corporate bond transactions between 1995 and 1999. We have found that credit spreads widened in the late 1990s, although less in the panel dataset than in the spread indexes reported by the rating agencies.

Second, we have provided evidence that idiosyncratic equity volatility is directly related to the cost of borrowing for corporate issuers. Our data suggest that volatility can explain as much cross-sectional variation in yields as can credit ratings, and that volatility contributes explanatory power even in the presence of credit ratings. These findings are robust to the inclusion of fixed effects for each bond issuer, the inclusion of monthly time dummies, the market model used to define idiosyncratic returns, the time window used to measure volatility, and the estimation of a zero-coupon term structure to control for maturity effects.

Third, using Standard and Poor's and Moody's corporate bond yield indexes between 1963 and 1999, we have shown that aggregate corporate yield spreads widen during periods of higher idiosyncratic risk. Thus equity volatility helps to explain not only recent movements in corporate yield spreads, but also their longer-term upward trend.

This paper has used a reduced-form econometric model to explore the effect of equity volatility on the cost of corporate borrowing. A promising extension of the research would be to estimate a structural model of this relationship.

6 Appendix A. Estimating the zero-coupon yield curve

Following Elton, Gruber, Agrawal, and Mann (2001), we adopt the procedure of Nelson and Siegel (1987) to estimate the zero-coupon yield curve. For each month, we fit the following equations to all bonds in a sector-credit rating combination:

$$D(t) = \exp\{-r(t) \cdot t\}$$
$$r(t) = \beta_0 + (\beta_1 + \beta_2)\left(\frac{1 - \exp\{-\beta_3 t\}}{\beta_3 t}\right) - \beta_2 \exp\{-\beta_3 t\}$$

where $D(t)$ is the present value of a payment to be received t periods in the future, $r(t)$ is the spot rate, and β_0, β_1, β_2, and β_3 are parameters of the model.

We estimate 540 corporate zero-coupon yield curves (60 months x 3 sectors x 3 credit ratings) and 60 Treasury zero-coupon curves over the period January 1995 through December 1999. We define the zero-coupon yield spread as the difference between the corporate and Treasury spot rates. As described in the text, we regress the difference between the actual yield spread and the estimated yield spread on the variables in Table 10.

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Table 1. Holders of corporate debt, 1955-2000

Year	Total assets (Billion USD)	Life insurance companies	Holdings of U.S. issues by foreign residents	Household sector	Mutual funds	Private pension funds	State and local govt. retirement funds	Commercial banking	Other insurance companies	Money market mutual funds
1955	60.8	61.1%	0.7%	8.2%	0.8%	12.9%	4.4%	3.5%	1.9%	0.0%
1960	91.8	52.5%	0.7%	11.6%	1.4%	17.1%	7.8%	1.5%	1.8%	0.0%
1965	123.1	49.6%	0.7%	7.5%	2.1%	18.4%	14.0%	1.0%	2.4%	0.0%
1970	204.3	36.3%	1.3%	14.4%	1.7%	14.4%	17.2%	1.5%	4.2%	0.0%
1975	336.4	31.4%	1.4%	18.7%	1.7%	12.5%	18.1%	2.8%	3.6%	0.0%
1980	507.6	35.2%	7.3%	5.9%	1.7%	15.3%	18.2%	2.1%	4.6%	0.1%
1985	883.1	31.8%	14.3%	8.8%	2.5%	11.0%	12.2%	3.5%	3.8%	0.1%
1990	1705.7	33.2%	12.7%	12.8%	3.5%	9.2%	8.3%	5.2%	5.2%	0.1%
1991	1886.4	31.5%	12.4%	14.5%	4.6%	9.5%	7.7%	5.1%	5.2%	0.2%
1992	2065.6	31.7%	12.2%	13.1%	5.7%	10.0%	7.6%	4.6%	4.7%	0.3%
1993	2346.8	30.7%	11.6%	12.5%	7.2%	10.0%	7.6%	4.2%	4.4%	0.5%
1994	2504.0	31.1%	12.4%	13.2%	6.9%	9.1%	7.2%	4.1%	4.4%	0.6%
1995	2848.1	30.5%	13.0%	14.8%	6.9%	8.5%	6.6%	3.9%	4.3%	0.8%
1996	3205.1	29.6%	14.1%	15.5%	7.2%	7.6%	6.6%	3.5%	4.4%	0.7%
1997	3594.5	29.1%	15.0%	14.9%	7.6%	7.8%	6.8%	4.0%	4.4%	1.0%
1998	4144.9	27.3%	15.9%	15.3%	8.2%	7.1%	6.7%	4.4%	4.3%	2.0%
1999	4600.1	25.5%	17.8%	14.5%	8.0%	6.6%	6.7%	4.8%	4.1%	2.7%
2000	5003.9	24.5%	20.1%	13.4%	7.3%	6.4%	6.4%	5.5%	3.7%	3.2%

Source: Federal Reserve Statistical Release, Flow of Funds Accounts of the United States, Table L.212, Z.1 Historical Data, June 8, 2001.

Table 2. Issuers of corporate debt, 1955-2000

Year	Total liabilities	Nonfiancial corporate business	Holdings of foreign issues by U.S. residents	Financial sectors	Financial sectors	
					Non-ABS issuers	ABS issuers
1955	60.8	89.8%	5.1%	5.2%	5.2%	0.0%
1960	91.8	83.0%	6.3%	10.7%	10.7%	0.0%
1965	123.1	79.0%	7.4%	13.6%	13.6%	0.0%
1970	204.3	81.6%	6.9%	11.5%	11.5%	0.0%
1975	336.4	75.4%	7.9%	16.7%	16.7%	0.0%
1980	507.6	72.0%	9.7%	18.3%	18.3%	0.0%
1985	883.1	65.5%	8.1%	26.4%	22.5%	3.9%
1990	1705.7	59.1%	6.8%	34.1%	20.1%	14.1%
1991	1886.4	57.6%	6.9%	35.5%	19.5%	16.0%
1992	2065.6	55.9%	7.1%	37.0%	19.5%	17.5%
1993	2346.8	52.4%	9.8%	37.8%	19.0%	18.8%
1994	2504.0	50.0%	9.7%	40.3%	20.1%	20.2%
1995	2848.1	47.2%	10.5%	42.3%	20.8%	21.5%
1996	3205.1	45.6%	11.4%	43.0%	20.6%	22.4%
1997	3594.5	44.8%	11.9%	43.3%	20.5%	22.8%
1998	4144.9	44.1%	11.2%	44.7%	20.2%	24.5%
1999	4600.1	44.8%	10.4%	44.9%	20.9%	23.9%
2000	5003.9	44.7%	10.0%	45.3%	21.8%	23.6%

Source: Federal Reserve Statistical Release, Flow of Funds Accounts of the United States, Table L.212, Z.1 Historical Data, June 8, 2001.

Table 3. Corporate bond yield spreads

This table presents corporate bond spreads over the closest benchmark Treasury by credit rating and years to maturity (bps). All bonds are in US Dollars and have no callable features (call, put, sinking fund, convertibility).

Panel A: Short-term bonds (2-7 years)

	All sectors				Industrial sector			
	AA	A	BBB	Total	AA	A	BBB	Total
1995-1999	61.27	81.03	126.60	92.33	59.38	76.88	131.24	98.99
1995	60.80	81.11	119.64	89.02	57.05	78.73	124.07	91.78
1996	52.46	59.51	84.43	65.61	49.30	55.80	87.56	66.69
1997	50.42	60.49	88.65	67.13	48.13	54.01	84.83	65.69
1998	66.72	99.60	147.15	109.58	72.20	93.59	148.62	118.19
1999	74.22	100.81	165.39	120.43	72.58	98.40	166.96	131.70

Panel B: Medium-term bonds (7-15 years)

	All sectors				Industrial sector			
	AA	A	BBB	Total	AA	A	BBB	Total
1995-1999	75.77	98.50	144.73	112.19	68.73	94.75	145.41	117.33
1995	77.39	99.82	133.07	106.75	73.26	95.21	136.93	108.42
1996	56.73	74.20	102.16	80.21	52.09	71.09	103.40	82.54
1997	68.05	80.88	102.97	86.78	64.24	80.96	102.28	90.15
1998	93.58	118.35	178.04	139.34	78.05	112.23	178.12	146.58
1999	95.96	117.74	181.87	141.65	84.66	108.47	177.27	143.37

Panel C: Long-term bonds (15-30 years)

	All sectors				Industrial sector			
	AA	A	BBB	Total	AA	A	BBB	Total
1995-1999	94.45	118.29	163.40	134.79	79.72	114.00	157.79	132.76
1995	96.40	112.36	159.79	127.65	82.54	109.21	159.20	125.64
1996	67.64	83.15	127.53	97.42	59.67	76.85	126.84	96.76
1997	69.44	93.39	115.97	100.03	58.96	88.91	115.92	99.35
1998	110.25	142.22	188.03	160.12	100.37	139.96	177.24	157.34
1999	117.62	138.73	186.04	157.99	99.69	132.10	178.83	154.50

Panel D: All maturities 2-30 years

	All sectors				Industrial sector			
	AA	A	BBB	Total	AA	A	BBB	Total
1995-1999	69.81	91.56	139.53	105.10	65.77	90.79	142.23	112.49
1995	71.43	92.15	130.99	100.92	67.81	91.12	136.20	104.89
1996	55.65	67.17	97.10	74.61	51.80	64.80	101.54	78.02
1997	58.34	70.74	98.23	77.91	54.94	69.46	98.23	80.99
1998	79.65	111.34	166.55	127.33	79.18	110.05	166.10	136.78
1999	85.45	111.82	174.62	133.18	80.13	110.11	172.97	140.69

Table 3 (continued). Corporate bond yield spreads

Panel A: Short-term bonds (2-7 years)

	Financial sector				Utility sector			
	AA	A	BBB	Total	AA	A	BBB	Total
1995-1999	63.43	83.96	131.07	88.80	55.42	75.76	101.68	84.56
1995	64.43	84.28	124.82	88.43	63.98	69.12	99.72	82.41
1996	55.34	61.94	81.65	64.51	51.11	56.49	80.93	66.76
1997	57.64	64.04	96.90	68.76	20.09	58.01	85.31	64.59
1998	63.08	103.26	160.48	104.63	75.31	94.05	114.97	100.01
1999	74.07	102.54	180.46	112.36	83.33	98.06	128.35	110.01

Panel B: Medium-term bonds (7-15 years)

	Financial sector				Utility sector			
	AA	A	BBB	Total	AA	A	BBB	Total
1995-1999	83.83	102.22	152.35	108.74	70.59	91.79	126.17	102.02
1995	86.58	103.38	134.54	106.83	77.03	94.59	117.40	100.93
1996	62.43	77.88	102.72	79.51	53.96	66.63	95.63	74.51
1997	71.51	83.16	110.10	85.65	60.60	64.99	91.89	74.56
1998	105.48	122.10	184.98	132.13	80.91	120.57	158.60	131.23
1999	110.12	125.76	208.60	141.43	92.45	116.95	165.53	133.61

Panel C: Long-term bonds (15-30 years)

	Financial sector				Utility sector			
	AA	A	BBB	Total	AA	A	BBB	Total
1995-1999	114.05	128.28	213.63	143.50	92.03	117.44	153.16	129.86
1995	146.51	119.01	194.66	135.51	110.84	117.26	146.15	129.15
1996	84.41	91.16	136.84	98.41	55.59	95.22	122.12	99.39
1997	88.46	100.69	132.37	103.99	65.93	96.08	102.29	96.15
1998	122.90	154.39	259.98	174.70	86.20	122.09	180.05	143.11
1999	126.23	151.56	242.27	166.75	145.73	148.93	180.14	163.05

Panel D: All maturities 2-30 years

	Financial sector				Utility sector			
	AA	A	BBB	Total	AA	A	BBB	Total
1995-1999	74.07	92.85	145.40	99.26	64.19	87.40	115.95	96.45
1995	76.60	93.94	131.77	98.13	74.00	86.36	112.32	95.92
1996	60.14	68.96	91.91	71.62	52.64	65.97	88.81	73.21
1997	64.64	72.51	103.33	76.53	36.40	65.14	89.15	71.28
1998	80.18	112.92	182.21	119.34	77.66	106.66	137.72	115.80
1999	87.70	113.09	195.53	125.40	94.24	112.22	147.91	125.92

Table 4. Regression results

All equity data is for the 180 days preceding each bond trade. Twelve month dummies were included in the regressions but are omitted from this table. T-statistics appear in parentheses.

Regression	1	2	3	4	5	6	7	8
Equity volatility								
Std. Dev. of daily excess return (%) over preceding 180 days		224.71 (40.03)		192.05 (35.12)		243.99 (41.26)		207.07 (35.52)
Std. Dev. of daily index return (%)		3.48 (0.18)		20.83 (1.14)		-24.07 (-1.28)		4.20 (0.23)
Mean daily excess return (%)		-33.30 (-15.73)		-35.43 (-17.37)		-31.32 (-14.87)		-34.39 (-16.80)
Mean daily index return (%)		-129.44 (-19.37)		-126.95 (-19.72)		-131.89 (-19.90)		-128.73 (-20.01)
Market capitalization relative to CRSP-value wghtd. index (%)		-29.61 (-22.24)		-9.74 (-7.05)		-23.91 (-17.24)		-9.39 (-6.62)
Credit ratings								
A or worse (relative to AA)			17.68 (17.98)	13.34 (13.94)			17.19 (17.24)	12.41 (12.79)
BBB or worse (relative to AA)			33.11 (43.60)	26.61 (35.43)			31.48 (39.15)	25.27 (32.17)
Accounting data								
Pretax interest coverage < 5					19.91 (13.08)	6.33 (4.39)	11.58 (7.91)	3.10 (2.21)
5 <= Pretax interest coverage < 10					3.63 (2.38)	-3.12 (-2.20)	6.41 (4.41)	0.22 (0.16)
10 <= Pretax interest coverage < 20					1.25 (0.74)	-5.95 (-3.73)	6.80 (4.17)	-1.50 (-0.97)
Pretax interest coverage >= 20					1.81 (0.67)	-12.34 (-4.90)	5.62 (2.19)	-7.56 (-3.09)

Table 4 (continued). Regression results

Operating income to sales					9.05 (3.18)	-7.63 (-2.85)	5.67 (2.09)	-7.97 (-3.07)
Long-term debt to assets					55.30 (13.98)	38.07 (10.85)	8.43 (2.16)	6.29 (1.69)
Total debt to capitalization					-35.50 (-12.39)	-34.61 (-12.94)	-7.83 (-2.80)	-14.00 (-5.26)
Macroeconomic and other variables								
Closest benchmark Treas. rate (%)	-33.06 (-41.17)	-25.19 (-31.37)	-33.91 (-44.89)	-26.12 (-33.75)	-33.03 (-41.72)	-25.59 (-32.13)	-33.74 (-44.68)	-26.29 (-33.99)
10 yr. - 2 yr. Treasury (%)	-26.52 (-11.17)	-6.84 (-2.66)	-17.59 (-7.85)	-2.85 (-1.15)	-21.29 (-9.05)	-6.29 (-2.47)	-15.83 (-7.05)	-3.24 (-1.31)
Years to maturity	2.39 (48.13)	2.14 (46.06)	2.34 (50.12)	2.16 (48.13)	2.32 (47.23)	2.09 (45.16)	2.33 (49.66)	2.13 (47.39)
Coupon rate (%)	7.44 (22.65)	8.71 (28.47)	5.34 (17.10)	7.07 (23.75)	6.83 (20.89)	7.99 (26.17)	5.42 (17.28)	6.85 (22.97)
Industrial (relative to Utility)	-8.92 (-5.40)	-10.64 (-6.85)	-9.46 (-6.08)	-13.32 (-8.86)	0.13 (0.08)	-7.43 (-4.72)	-7.03 (-4.39)	-12.82 (-8.33)
Financial (relative to Utility)	-8.14 (-4.73)	-10.11 (-6.32)	-1.20 (-0.74)	-4.88 (-3.15)	11.04 (5.40)	1.77 (0.93)	4.31 (2.20)	-1.13 (-0.61)
Constant	228.95 (47.44)	147.39 (24.38)	217.87 (47.67)	143.00 (24.46)	208.33 (40.59)	152.86 (24.67)	205.11 (41.66)	149.30 (24.72)
N	21568	21568	21568	21568	21568	21568	21568	21568
R^2	0.249	0.361	0.336	0.407	0.273	0.373	0.339	0.409
F	420.110	553.690	573.030	616.340	336.170	442.390	424.360	481.590

Table 5. Regression results with issuer fixed effects

We include fixed effects for each bond issuer. There is a minimum of one transaction per issuer, a mean of 37.1 transactions, and a maximum of 608 transactions per issuer. All equity data is for the 180 days preceding each bond trade. Twelve month dummies were included in the regressions but are omitted from this table. T-statistics appear in parentheses.

Regression	1	2	3	4	5	6	7	8
Equity volatility								
Std. Dev. of daily excess return (%) over preceding 180 days		222.09 (30.41)		214.69 (29.39)		211.33 (28.72)		206.14 (28.02)
Std. Dev. of daily index return (%)		-35.77 (-1.92)		-36.72 (-1.97)		-33.55 (-1.80)		-34.66 (-1.86)
Mean daily excess return (%)		-19.31 (-8.92)		-20.08 (-9.31)		-521.41 (-9.85)		-21.90 (-10.09)
Mean daily index return (%)		-135.11 (-22.10)		-135.41 (-22.22)		-136.39 (-22.37)		-136.52 (-22.45)
Market capitalization relative to CRSP-value wghtd. index (%)		-14.51 (-3.38)		-12.14 (-2.84)		-9.26 (-2.14)		-7.81 (-1.81)
Credit ratings								
A or worse (relative to AA)			12.57 (5.85)	8.50 (4.12)			11.15 (5.18)	7.52 (3.49)
BBB or worse (relative to AA)			23.64 (13.42)	18.96 (11.19)			20.22 (11.42)	16.83 (9.88)
Accounting data								
Pretax interest coverage < 5					-0.74 (-0.08)	-3.52 (-0.38)	-1.68 (-0.17)	-4.15 (-0.45)
5 <= Pretax interest coverage < 10					-10.89 (-1.12)	-11.23 (-1.20)	-10.84 (-1.12)	-11.17 (-1.20)
10 <= Pretax interest coverage < 20					-11.86 (-1.20)	-13.32 (-1.41)	-10.97 (-1.12)	-12.64 (-1.34)
Pretax interest coverage >= 20					-8.18 (-0.80)	-13.33 (-1.35)	-7.89 (-0.77)	-13.22 (-1.34)

Table 5 (continued). Regression results with issuer fixed effects

Operating income to sales					-37.97 (-3.52)	-48.24 (-4.65)	-33.08 (-3.07)	-44.41 (-4.29)
Long-term debt to assets					77.02 (6.76)	27.06 (2.45)	72.63 (6.38)	23.91 (2.17)
Total debt to capitalization					5.59 (0.56)	17.32 (1.80)	-0.01 (0.00)	13.33 (1.38)
Macroeconomic and other variables								
Closest benchmark Treas. rate (%)	-34.70 (-48.31)	-27.51 (-36.91)	-34.67 (-48.52)	-27.66 (-37.23)	-34.74 (-48.59)	-27.79 (-37.36)	-34.69 (-48.71)	-27.89 (-37.59)
10 yr. - 2 yr. Treasury (%)	-10.29 (-4.77)	-2.48 (-1.04)	-9.33 (-4.34)	-2.21 (-0.94)	-7.08 (-3.27)	-1.01 (-0.43)	-6.50 (-3.02)	-0.89 (-0.38)
Years to maturity	2.43 (48.06)	2.29 (46.93)	2.44 (48.38)	2.29 (47.22)	2.45 (48.68)	2.30 (47.43)	2.45 (48.87)	2.31 (47.62)
Coupon rate (%)	5.11 (14.32)	6.06 (17.70)	5.05 (14.22)	5.98 (17.53)	5.25 (14.77)	6.10 (17.86)	5.18 (14.64)	6.02 (17.68)
Constant	238.91 (54.22)	167.85 (29.34)	220.80 (46.06)	157.03 (26.45)	232.93 (22.85)	176.46 (16.93)	219.19 (21.25)	168.24 (16.00)
Number of transactions	21568	21568	21568	21568	21568	21568	21568	21568
Number of issuers	581	581	581	581	581	581	581	581
R^2 within	0.258	0.323	0.266	0.328	0.267	0.328	0.272	0.331
R^2 between	0.165	0.350	0.414	0.493	0.174	0.338	0.333	0.450
R^2 overall	0.245	0.350	0.326	0.396	0.242	0.346	0.293	0.382
F	485.40	499.71	445.93	464.11	346.70	378.10	327.02	357.78

Table 6. Regression results with issuer fixed effects and monthly time dummies

We include fixed effects for each bond issuer. There is a minimum of one transaction per issuer, a mean of 37.1 transactions, and a maximum of 608 transactions per issuer. All equity data is for the 180 days preceding each bond trade. Sixty monthly time dummies were included in the regressions but are omitted from this table. T-statistics appear in parentheses.

Regression	1	2	3	4	5	6	7	8
Equity volatility								
Std. Dev. of daily excess return (%) over preceding 180 days		100.87 (12.46)		96.04 (11.86)		96.95 (11.96)		92.94 (11.46)
Mean daily excess return (%)		-16.95 (-8.03)		-17.86 (-8.48)		-18.44 (-8.67)		-19.11 (-9.01)
Market capitalization relative to CRSP-value wghtd. index (%)		-20.14 (-4.90)		-18.28 (-4.45)		-16.69 (-4.01)		-15.53 (-3.74)
Credit ratings								
A or worse (relative to AA)			2.01 (1.01)	2.49 (1.25)			1.06 (0.53)	1.55 (0.77)
BBB or worse (relative to AA)			18.79 (11.55)	17.76 (10.96)			17.24 (10.52)	16.44 (10.08)
Accounting data								
Pretax interest coverage < 5					-0.79 (-0.09)	-2.45 (-0.27)	-1.37 (-0.15)	-3.00 (-0.34)
5 <= Pretax interest coverage < 10					-6.33 (-0.70)	-7.24 (-0.81)	-6.17 (-0.69)	-7.14 (-0.80)
10 <= Pretax interest coverage < 20					-9.01 (-0.99)	-10.05 (-1.11)	-8.54 (-0.94)	-9.64 (-1.07)
Pretax interest coverage >= 20					2.30 (0.24)	-3.26 (-0.34)	2.11 (0.22)	-3.48 (-0.37)
Operating income to sales					-41.57 (-4.17)	-46.29 (-4.66)	-37.78 (-3.80)	-42.84 (-4.32)
Long-term debt to assets					2.84 (0.27)	1.86 (0.18)	-1.32 (-0.12)	-2.04 (-0.19)

Table 6 (continued). Regression results with issuer fixed effects and monthly time dummies

Total debt to capitalization					24.14 (2.61)	20.16 (2.18)	21.67 (2.34)	17.90 (1.94)
Macroeconomic and other variables								
Closest benchmark Treas. rate (%)	-23.92 (-12.52)	-24.86 (-13.10)	-24.04 (-12.62)	-24.92 (-13.16)	-23.96 (-12.57)	-24.86 (-13.11)	-24.08 (-12.65)	-24.92 (-13.18)
Years to maturity	2.19 (34.80)	2.22 (35.42)	2.20 (35.02)	2.23 (35.61)	2.20 (35.02)	2.23 (35.61)	2.21 (35.19)	2.23 (35.76)
Coupon rate (%)	6.36 (19.19)	6.33 (19.23)	6.27 (18.97)	6.24 (19.03)	6.34 (19.18)	6.32 (19.23)	6.26 (18.97)	6.24 (19.02)
Constant	199.04 (13.27)	194.98 (13.04)	192.59 (12.75)	188.37 (12.50)	202.85 (11.84)	202.60 (11.86)	198.79 (11.55)	198.35 (11.56)
Number of transactions	21568	21568	21568	21568	21568	21568	21568	21568
Number of issuers	581	581	581	581	581	581	581	581
R^2 within	0.375	0.384	0.379	0.387	0.377	0.386	0.381	0.389
R^2 between	0.257	0.381	0.450	0.535	0.258	0.362	0.415	0.493
R^2 overall	0.345	0.395	0.403	0.437	0.343	0.387	0.392	0.424
F	205.42	203.18	202.32	200.02	186.42	184.94	183.64	182.15

Table 7. Interaction effects

In each regression, there are 21,568 bond transactions among 581 issuers. There is a minimum of one transaction per issuer, a mean of 37.1 transactions, and a maximum of 608 transactions per issuer. The results presented below are for the 180 days preceding each bond transaction. T-statistics appear in parentheses.

	OLS		Issuer fixed effects		Issuer fixed effects with monthly time dummies	
Regression	1	2	3	4	5	6
Equity volatility						
Std. Dev. of daily excess return (%) over preceding 180 days		107.67 (8.78)		162.21 (10.47)		46.39 (3.01)
Std. Dev. of daily index return (%)		18.75 (1.02)		-36.68 (-1.96)		-135.03 (-1.43)
Mean daily excess return (%)		-34.22 (-16.64)		-22.42 (-10.29)		-19.33 (-9.08)
Mean daily index return (%)		-128.42 (-19.93)		-137.65 (-22.65)		-65.87 (-4.36)
Market capitalization relative to CRSP-value wghtd. index (%)		-13.35 (-9.66)		-6.33 (-1.46)		-13.99 (-3.37)
Interaction effects						
Std. Dev. excess return * (1/10 <= Long-term debt to total assets < 1/4)		95.04 (6.80)		31.71 (1.87)		41.14 (2.53)
Std. Dev. excess return * (1/4 <= Long-term debt to total assets < 1/3)		98.73 (6.28)		78.21 (4.10)		81.78 (4.47)
Std. Dev. excess return * (Long-term debt to total assets >= 1/3)		122.48 (7.88)		72.17 (3.70)		69.65 (3.73)
Treasury rate * (1/10 <= Long-term debt to total assets < 1/4)	-5.82 (-3.93)	-1.88 (-1.26)	-5.64 (-3.91)	-4.11 (-2.79)	-5.01 (-3.75)	-4.15 (-2.94)
Treasury rate * (1/4 <= Long-term debt to total assets < 1/3)	-3.44 (-2.12)	0.69 (0.42)	-2.65 (-1.67)	-0.95 (-0.59)	-3.78 (-2.56)	-2.25 (-1.45)
Treasury rate * (Long-term debt to total assets >= 1/3)	-5.94 (-3.39)	-2.99 (-1.73)	-6.06 (-3.53)	-5.79 (-3.34)	-8.22 (-5.14)	-7.18 (-4.30)

Table 7 (continued). Interaction effects

Credit ratings						
A or worse (relative to AA)	17.39	12.23	11.46	7.22	0.79	1.54
	(17.42)	(12.57)	(5.30)	(3.46)	(0.39)	(0.77)
BBB or worse (relative to AA)	30.92	24.67	20.45	16.07	16.60	15.42
	(38.81)	(31.71)	(11.52)	(9.39)	(10.11)	(9.42)
Accounting data						
1/10 <= LT debt to assets < 1/4	36.53	-6.18	40.19	17.84	27.27	13.99
	(4.24)	(-0.63)	(4.73)	(1.77)	(3.46)	(1.45)
1/4 <= LT debt to assets < 1/3	16.34	-26.21	26.43	-5.51	22.66	-2.09
	(1.73)	(-2.43)	(2.77)	(-0.49)	(2.56)	(-0.19)
LT debt to assets >= 1/3	34.42	-7.62	49.73	24.99	46.93	27.59
	(3.38)	(-0.68)	(4.80)	(2.11)	(4.88)	(2.42)
Pretax interest coverage < 5	6.39	1.11	1.60	-4.92	-2.21	-4.89
	(4.87)	(0.87)	(0.16)	(-0.53)	(-0.25)	(-0.55)
5 <= Pretax interest coverage < 10	-1.26	-3.94	-8.38	-11.94	-6.73	-8.68
	(-1.00)	(-3.18)	(-0.86)	(-1.28)	(-0.75)	(-0.97)
10 <= Pretax interest coverage < 20	-2.01	-6.06	-8.76	-14.10	-9.18	-11.78
	(-1.41)	(-4.28)	(-0.89)	(-1.49)	(-1.01)	(-1.30)
Pretax interest coverage >= 20	-2.30	-11.22	-6.24	-15.92	0.04	-6.93
	(-0.95)	(-4.75)	(-0.61)	(-1.61)	(0.00)	(-0.73)
Operating income to sales	12.85	-0.90	-28.63	-34.87	-36.20	-34.68
	(5.01)	(-0.36)	(-2.66)	(-3.34)	(-3.63)	(-3.47)
Total debt to capitalization	-4.19	-9.12	27.76	14.23	17.65	10.45
	(-1.60)	(-3.65)	(3.35)	(1.78)	(2.31)	(1.36)
Macroeconomic and other variables						
Closest benchmark Treas. rate (%)	-29.79	-25.44	-30.97	-25.20	-20.22	-22.02
	(-23.26)	(-19.81)	(-25.30)	(-20.08)	(-9.70)	(-10.48)
10 yr. - 2 yr. Treasury (%)	-15.48	-2.90	-6.37	-1.91		
	(-6.88)	(-1.17)	(-2.94)	(-0.80)		
Years to maturity	2.31	2.09	2.45	2.31	2.22	2.24
	(49.27)	(46.44)	(48.88)	(47.54)	(35.36)	(35.86)
Coupon rate (%)	5.30	6.69	5.23	6.04	6.28	6.27
	(16.89)	(22.40)	(14.77)	(17.74)	(19.02)	(19.16)
Constant	184.01	156.30	191.34	162.61	178.85	202.06
	(24.12)	(17.72)	(15.86)	(12.68)	(9.95)	(10.58)
Number of transactions	21568	21568	21568	21568	21568	21568
Number of issuers			581	581	581	581
R^2 within			0.273	0.333	0.382	0.391
R^2 between			0.348	0.459	0.414	0.499
R^2 overall	0.338	0.409	0.307	0.388	0.391	0.428
F	378.84	401.94	271.00	282.29	172.08	161.80

Table 8. Robustness checks

All equity data is for the number of days specified below preceding each bond trade. For OLS and Issuer fixed effects, month dummies were included in the regressions but are omitted from this table. T-statistics appear in parentheses.

	OLS			Issuer fixed effects			Issuer fixed effects with monthly time dummies		
No. of days of preceding each bond trade	90	180	360	90	180	360	90	180	360
Regression	1	2	3	4	5	6	7	8	9
Equity volatility									
Beta * Std. Dev. of daily index return	-28.41 (-4.12)	-63.91 (-7.89)	-77.11 (-7.75)	14.17 (1.89)	-10.64 (-1.12)	-10.58 (-0.81)	24.70 (2.95)	19.42 (1.85)	3.20 (0.23)
Idiosyncratic risk	177.45 (33.81)	231.77 (39.16)	281.97 (39.88)	152.73 (25.92)	218.88 (31.26)	285.14 (30.65)	60.88 (9.44)	92.65 (11.10)	113.11 (9.25)
Market capitalization relative to CRSP-value wghtd. index (%)	-12.96 (-8.82)	-10.49 (-7.13)	-9.36 (-6.30)	-20.73 (-4.80)	-18.02 (-4.18)	-14.41 (-3.31)	-27.45 (-6.75)	-26.50 (-6.47)	-24.30 (-5.83)
Credit ratings									
A or worse (relative to AA)	12.47 (12.53)	11.82 (11.97)	11.12 (11.31)	9.68 (4.57)	8.23 (3.92)	6.70 (3.20)	1.60 (0.80)	1.75 (0.87)	1.58 (0.79)
BBB or worse (relative to AA)	25.81 (32.09)	25.06 (31.39)	24.15 (30.33)	16.86 (9.68)	15.95 (9.22)	15.02 (8.71)	16.07 (9.83)	15.84 (9.69)	15.85 (9.68)
Accounting data									
Pretax interest coverage < 5	5.55 (3.87)	4.09 (2.87)	2.93 (2.06)	-5.06 (-0.53)	-7.10 (-0.75)	-10.46 (-1.11)	-2.39 (-0.27)	-3.11 (-0.35)	-4.47 (-0.50)
5 <= Pretax interest coverage < 10	2.51 (1.77)	1.53 (1.09)	0.54 (0.39)	-11.88 (-1.25)	-13.07 (-1.38)	-15.82 (-1.68)	-6.21 (-0.69)	-6.82 (-0.76)	-8.25 (-0.92)
10 <= Pretax interest coverage < 20	1.22 (0.77)	-0.85 (-0.54)	-3.02 (-1.91)	-12.53 (-1.30)	-14.07 (-1.47)	-17.97 (-1.88)	-8.40 (-0.93)	-9.12 (-1.01)	-11.01 (-1.21)
Pretax interest coverage >= 20	-3.54 (-1.41)	-6.21 (-2.50)	-8.80 (-3.54)	-10.41 (-1.03)	-12.69 (-1.27)	-16.53 (-1.66)	1.68 (0.18)	0.27 (0.03)	-1.75 (-0.18)
Operating income to sales	-3.14 (-1.18)	-3.91 (-1.47)	-7.15 (-2.70)	-39.75 (-3.76)	-31.88 (-3.03)	-28.86 (-2.75)	-41.46 (-4.18)	-38.57 (-3.89)	-36.21 (-3.64)

Table 8 (continued). Robustness checks

Long-term debt to assets	7.26 (1.87)	3.60 (0.93)	4.11 (1.06)	52.75 (4.69)	39.13 (3.48)	16.50 (1.46)	0.99 (0.09)	-0.40 (-0.04)	-2.17 (-0.20)
Total debt to capitalization	-12.46 (-4.54)	-13.79 (-5.05)	-15.70 (-5.77)	1.15 (0.12)	2.31 (0.23)	13.04 (1.31)	17.75 (1.89)	17.68 (1.87)	17.57 (1.85)
Macroeconomic and other variables									
Closest benchmark Treas. rate (%)	-29.50 (-38.92)	-30.42 (-40.55)	-33.20 (-44.72)	-29.96 (-40.80)	-30.28 (-41.41)	-32.86 (-45.31)	-24.65 (-13.00)	-24.85 (-13.11)	-24.65 (-13.00)
10 yr. - 2 yr. Treasury (%)	-8.66 (-3.93)	-5.27 (-2.38)	-1.84 (-0.83)	-1.05 (-0.49)	3.36 (1.55)	7.51 (3.44)			
Years to maturity	2.21 (48.16)	2.24 (49.39)	2.32 (51.35)	2.35 (47.56)	2.38 (48.37)	2.45 (50.08)	2.22 (35.53)	2.23 (35.69)	2.23 (35.60)
Coupon rate (%)	6.35 (20.80)	6.56 (21.68)	6.88 (22.80)	5.68 (16.33)	5.83 (16.87)	6.17 (17.90)	6.25 (19.02)	6.24 (18.99)	6.27 (19.06)
Industrial (relative to Utility)	-12.37 (-7.81)	-13.78 (-8.75)	-15.11 (-9.63)						
Financial (relative to Utility)	-0.35 (-0.18)	-0.95 (-0.50)	-1.41 (-0.74)						
Constant	166.83 (32.71)	166.57 (32.77)	175.74 (35.29)	174.23 (16.70)	166.45 (15.97)	170.82 (16.54)	199.88 (11.62)	196.98 (11.45)	193.87 (11.24)
Number of transactions	21568	21568	21568	21568	21568	21568	21568	21568	21568
Number of issuers				581	581	581	581	581	581
R^2 within				0.299	0.309	0.315	0.385	0.386	0.385
R^2 between				0.410	0.435	0.453	0.466	0.480	0.495
R^2 overall	0.377	0.388	0.394	0.345	0.364	0.373	0.416	0.421	0.424
F	449.58	470.28	482.26	330.64	346.32	356.43	179.65	180.37	179.41

Table 9. Regressions with Nelson-Siegel yield errors

Panel A: We model the price of each bond following Nelson and Siegel (1987) and compute the corresponding yield spread. Regressions below use the actual yield spread minus the estimated yield spread. All equity data is for the 180 days preceding each bond trade. T-statistics appear in parentheses.

	Industrials			Financials			Utilities		
	AA	A	BBB	AA	A	BBB	AA	A	BBB
Regression	1	2	3	4	5	6	7	8	9
Equity volatility									
Std. Dev. of daily excess return (%)	23.26	67.83	73.74	39.39	65.80	21.71	70.82	-53.12	108.40
	(1.09)	(8.34)	(9.92)	(2.00)	(9.34)	(1.26)	(0.99)	(-0.83)	(3.57)
Std. Dev. of daily index return (%)	-32.84	-63.23	-110.10	-59.90	-39.63	-193.24	25.22	-26.84	100.17
	(-1.18)	(-4.11)	(-5.60)	(-1.36)	(-2.33)	(-4.61)	(0.31)	(-0.32)	(1.54)
Mean daily excess return (%)	3.75	-11.46	-26.95	-5.56	-11.52	-8.52	4.03	-12.38	-13.75
	(0.69)	(-4.46)	(-9.50)	(-0.74)	(-3.97)	(-1.17)	(0.16)	(-0.65)	(-1.25)
Mean daily index return (%)	3.89	-6.82	-13.62	-6.73	-16.23	-44.26	-0.86	4.43	-24.85
	(0.30)	(-1.01)	(-1.54)	(-0.43)	(-2.30)	(-2.26)	(-0.02)	(0.11)	(-0.83)
Credit ratings									
Plus rating * Years to maturity	0.48	-1.81	-1.26		-1.14	-0.85		-0.65	1.09
	(1.11)	(-10.30)	(-6.16)		(-5.86)	(-2.69)		(-0.93)	(1.73)
Minus rating * Years to maturity	0.50	0.79	1.48	0.30	0.95	2.59	-0.33	-0.26	2.93
	(2.26)	(5.28)	(7.20)	(0.94)	(6.76)	(5.51)	(-0.45)	(-0.28)	(3.39)
S&P stronger than Moody's	-2.29	-1.24	1.32	-3.97	6.82	14.66	-16.98	4.19	15.03
	(-1.44)	(-1.21)	(1.01)	(-1.37)	(6.59)	(4.92)	(-1.58)	(0.77)	(3.15)
Moody's stronger than S&P	5.33	-3.89	-0.58	-4.69	-2.85	-8.45	4.34	-3.97	2.68
	(1.08)	(-3.18)	(-0.36)	(-0.94)	(-2.69)	(-2.61)	(0.94)	(-0.77)	(0.57)
Other variables									
Coupon rate (%)	3.07	3.81	3.31	3.58	2.39	1.56	1.73	4.53	3.85
	(4.65)	(10.49)	(5.94)	(3.93)	(5.76)	(1.45)	(0.86)	(1.80)	(2.30)
Age less than one year	-3.60	-1.29	2.11	-0.89	0.84	2.92	0.64	7.45	-0.99
	(-1.82)	(-1.35)	(1.77)	(-0.52)	(0.87)	(1.22)	(0.09)	(1.52)	(-0.27)
Constant	-27.67	-34.54	-36.29	-25.52	-23.10	-5.00	-17.76	-22.29	-63.22
	(-4.42)	(-9.83)	(-6.96)	(-2.99)	(-6.15)	(-0.50)	(-1.07)	(-1.11)	(-3.98)
N	784	3338	2844	460	2596	752	83	140	231
R^2	0.055	0.124	0.120	0.094	0.132	0.184	0.081	0.090	0.234
F	4.53	47.05	38.63	5.17	39.35	16.72	0.72	1.27	6.73

Table 9 (continued). Regressions with Nelson-Siegel yield errors

Panel B: We regress actual bond spreads against the variables in Panel A and sixty monthly time dummies. All equity data is for the 180 days preceding each bond trade. T-statistics appear in parentheses.

	Industrials			Financials			Utilities		
	AA	A	BBB	AA	A	BBB	AA	A	BBB
Regression	1	2	3	4	5	6	7	8	9
Equity volatility									
Std. Dev. of daily excess return (%)	60.83 (2.26)	68.32 (7.08)	96.75 (11.13)	105.07 (2.95)	55.35 (6.27)	33.40 (1.57)	345.32 (1.34)	-31.46 (-0.39)	96.41 (1.93)
Std. Dev. of daily index return (%)	-219.52 (-0.84)	-618.21 (-4.42)	-467.79 (-2.71)	-536.30 (-1.90)	-67.25 (-0.44)	-254.68 (-0.64)	-8580.12 (-2.63)	623.11 (0.74)	-91.06 (-0.09)
Mean daily excess return (%)	0.04 (0.01)	-11.51 (-4.03)	-31.68 (-10.13)	-7.02 (-0.58)	-13.70 (-3.76)	-40.34 (-4.08)	41.96 (0.33)	-78.84 (-2.60)	-11.78 (-0.61)
Mean daily index return (%)	-40.01 (-0.91)	-34.08 (-1.64)	-52.07 (-1.88)	-73.92 (-1.54)	-51.40 (-2.11)	-177.09 (-2.73)	-935.32 (-2.57)	126.23 (0.91)	-131.38 (-1.14)
Credit ratings									
Plus rating * Years to maturity	1.15 (2.44)	-1.44 (-7.58)	-0.71 (-3.28)		-0.31 (-1.43)	0.57 (1.61)		0.14 (0.17)	2.98 (3.54)
Minus rating * Years to maturity	0.85 (3.49)	1.12 (6.92)	2.18 (10.00)	3.69 (10.12)	1.62 (10.10)	4.19 (8.10)	0.85 (0.39)	1.33 (1.02)	3.60 (3.21)
S&P stronger than Moody's	-0.27 (-0.16)	-0.04 (-0.04)	3.13 (2.25)	20.48 (5.08)	8.12 (6.93)	16.45 (4.91)	446.60 (2.65)	6.85 (0.94)	23.75 (3.97)
Moody's stronger than S&P	5.90 (1.08)	-3.56 (-2.71)	0.88 (0.51)	22.49 (3.56)	0.23 (0.19)	-3.94 (-1.09)	18.74 (1.45)	3.12 (0.46)	10.12 (1.64)
Other variables									
Coupon rate (%)	1.69 (2.34)	1.86 (4.71)	1.53 (2.57)	3.51 (3.23)	-0.45 (-0.96)	0.57 (0.48)	9.59 (1.73)	5.65 (1.82)	5.33 (2.52)
Age less than one year	-1.19 (-0.54)	0.89 (0.87)	6.02 (4.75)	0.53 (0.27)	2.48 (2.29)	6.25 (2.32)	-4.99 (-0.26)	13.57 (2.19)	2.96 (0.57)
Constant	55.09 (2.67)	103.43 (7.34)	100.78 (7.44)	23.70 (0.87)	104.89 (6.82)	124.46 (4.44)	595.42 (2.61)	-36.56 (-0.38)	10.44 (0.16)
N	784	3338	2844	460	2596	752	83	140	231
R^2	0.501	0.550	0.639	0.744	0.666	0.705	0.861	0.790	0.811
F	10.57	58.80	72.07	17.65	74.10	23.99	3.98	4.67	10.86

Table 10. Standard and Poor's and Moody's spreads

Panel A: We regress the Standard and Poor's and Moody's A-rated corporate bond index on a six-month moving average of market and idiosyncratic risk between January 1963 and December 1999. T-statistics appear in parentheses.

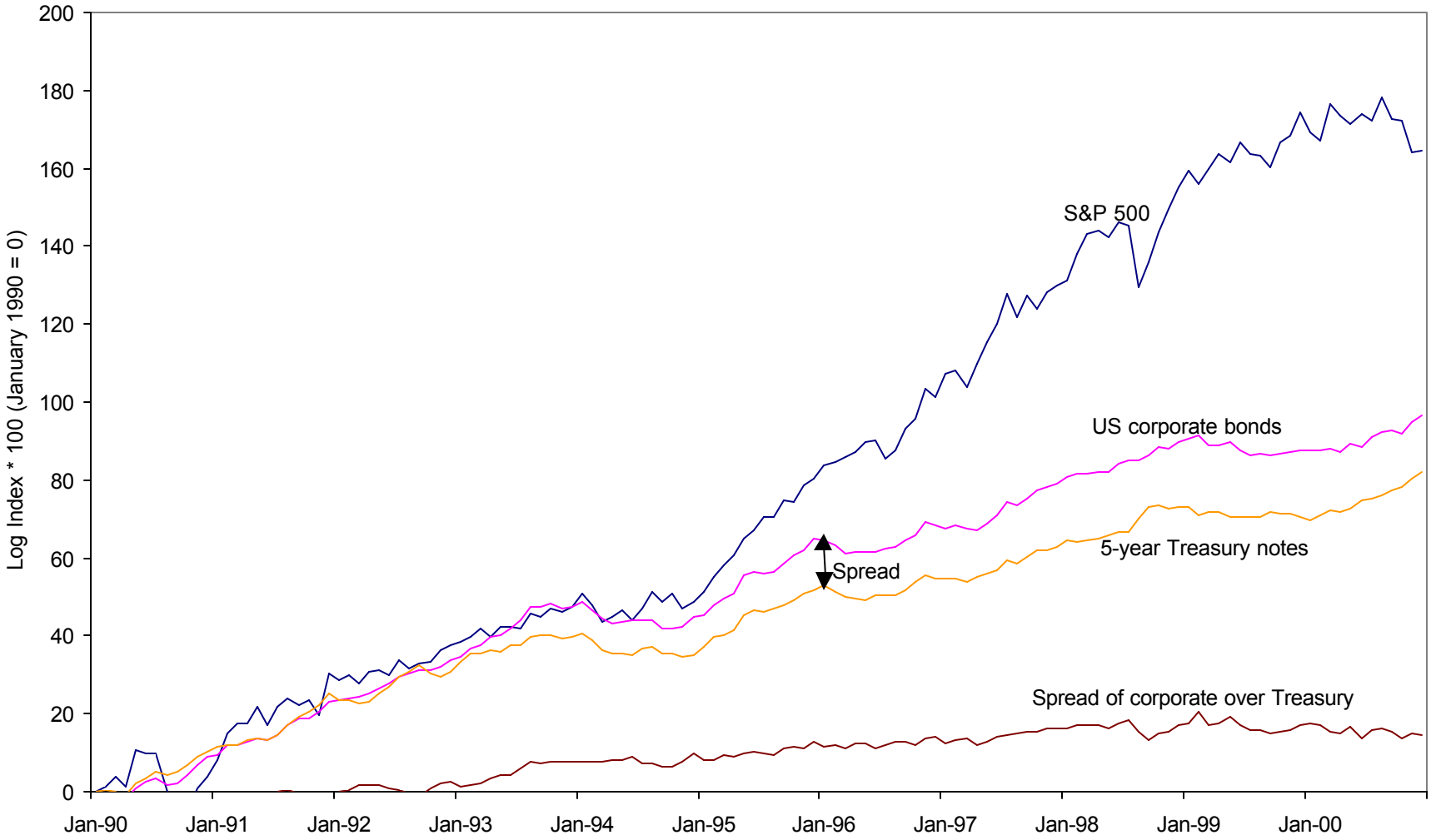
	Standard and Poor's (S&P)		Moody's	
Regression	1	2	3	4
Equity volatility				
Market volatility		14.86 (0.48)		174.10 (3.77)
Idiosyncratic risk		9.15 (19.19)		2.58 (3.66)
Macroeconomic variables				
10-year Treasury rate	0.36 (0.42)	-2.42 (-3.75)	5.51 (5.73)	4.42 (4.63)
10-year minus 2-year Treasury	49.98 (16.20)	29.37 (11.68)	11.41 (3.29)	6.06 (1.63)
Constant	0.81 (11.82)	-0.40 (-5.00)	0.60 (7.83)	0.21 (1.82)
Number of observations	444	444	444	444
R^2	0.373	0.664	0.090	0.152
F	131.23	216.78	21.74	19.74

Table 10 (continued). Standard and Poor's and Moody's spreads

Panel B: We regress an equal-weighted Standard and Poor's and Moody's corporate bond index on a six-month moving average of market and idiosyncratic risk between January 1963 and December 1999. The equal-weighted corporate bond index is defined as the mean of the AAA (Aaa), AA (Aa), A, and BBB (Baa) spreads. T-statistics appear in parentheses.

	Standard and Poor's (S&P)		Moody's	
Regression	1	2	3	4
Equity volatility				
Market volatility		27.57		143.08
		(0.90)		(3.55)
Idiosyncratic risk		8.03		2.77
		(17.16)		(4.50)
Macroeconomic variables				
10-year Treasury rate	-0.24	-2.71	2.59	1.49
	(-0.30)	(-4.28)	(3.07)	(1.79)
10-year minus 2-year Treasury	44.18	26.15	9.45	3.61
	(15.30)	(10.61)	(3.11)	(1.11)
Constant	0.83	-0.24	0.76	0.36
	(12.91)	(-3.02)	(11.27)	(3.47)
Number of observations	444	444	443	443
R^2	0.347	0.616	0.041	0.119
F	117.08	175.71	9.48	14.78

Figure 1. Monthly Index Comparisons, 1990-2000



(Source: Global Financial Data)

Figure 2. S&P A-rated corporate bond spread vs. Six-month moving average of Idiosyncratic Risk

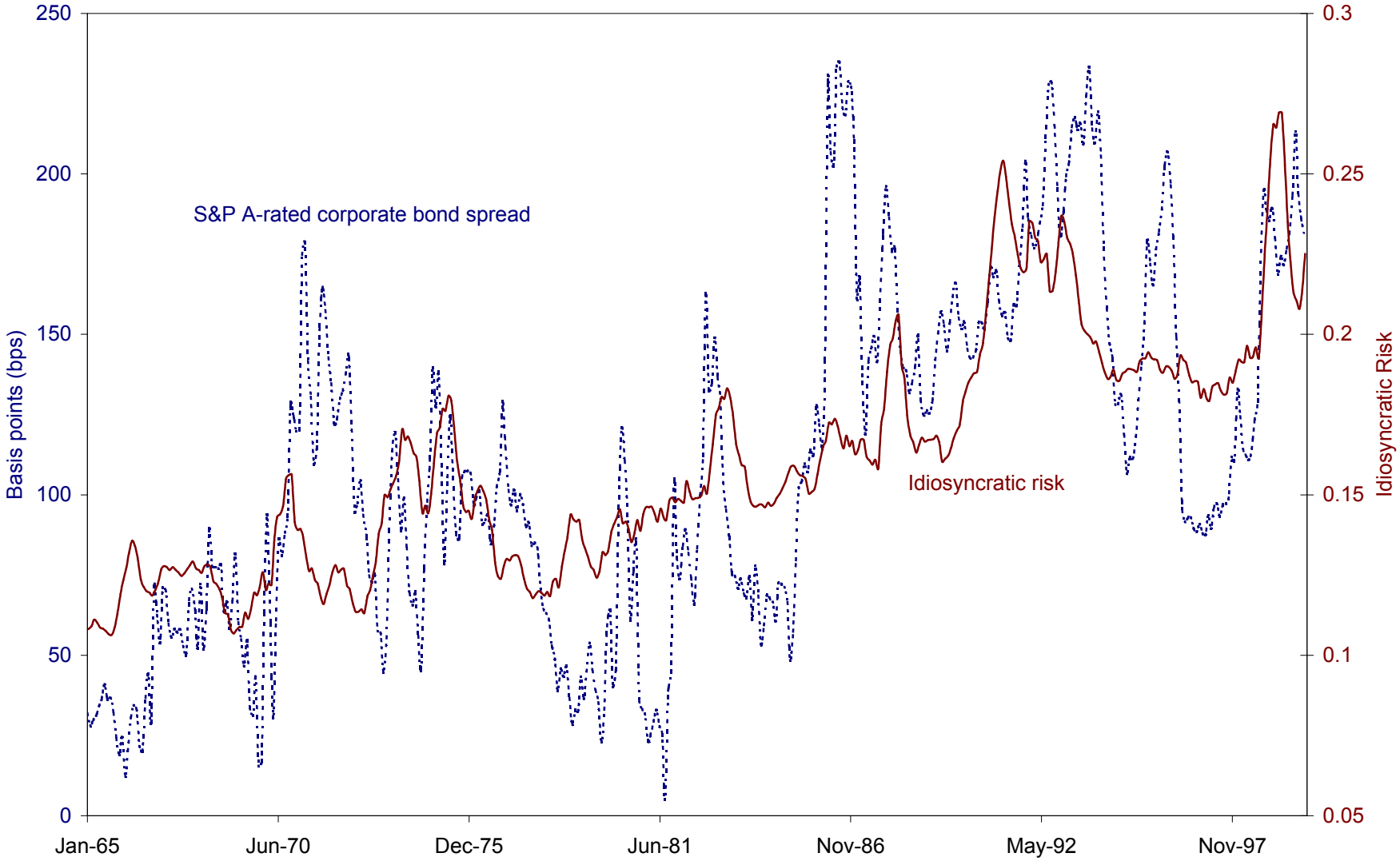


Figure 3. S&P corporate bond spreads, 1965 to 2000 (bps)

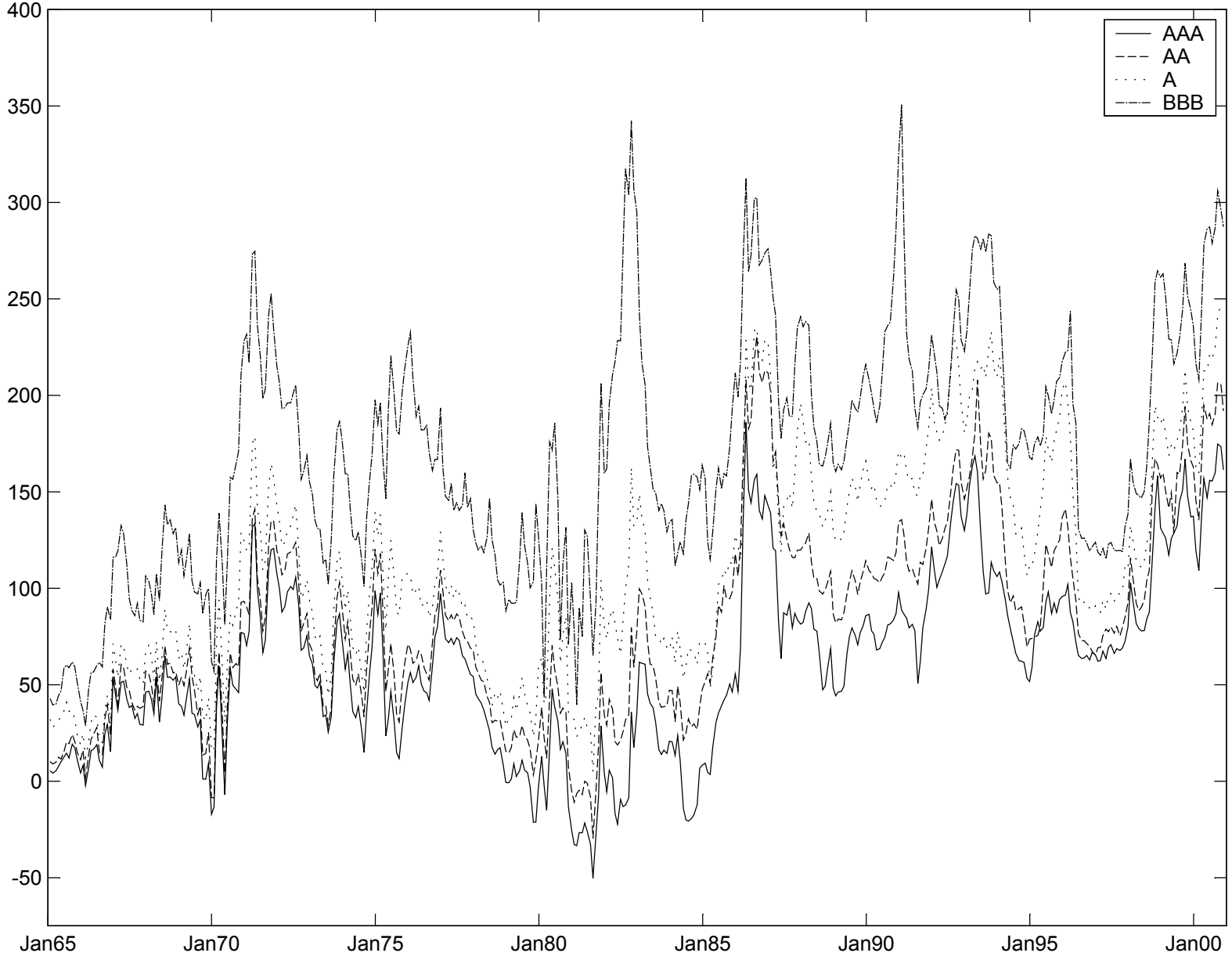


Figure 4. Moodys corporate bond spreads, 1965 to 2000 (bps)

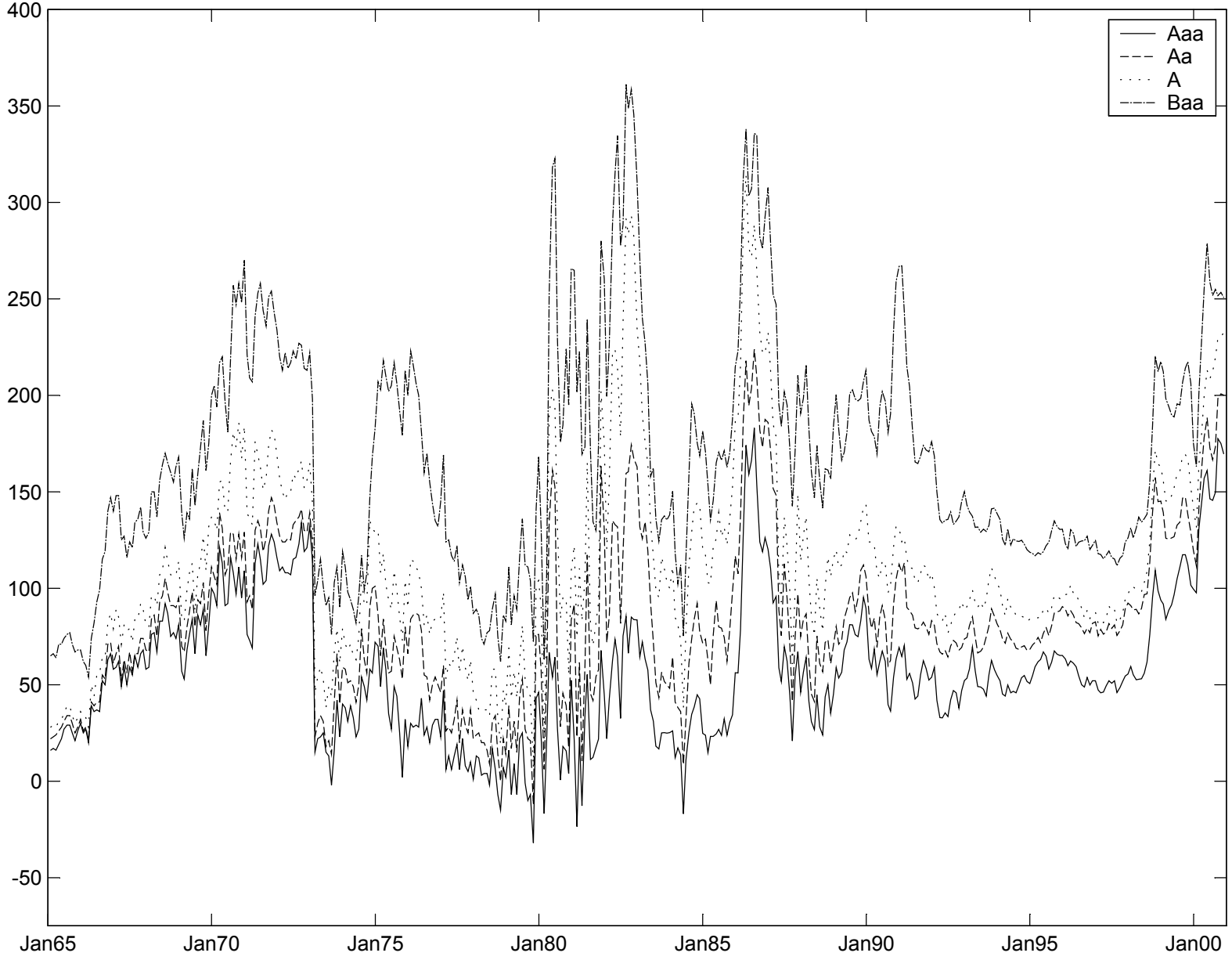
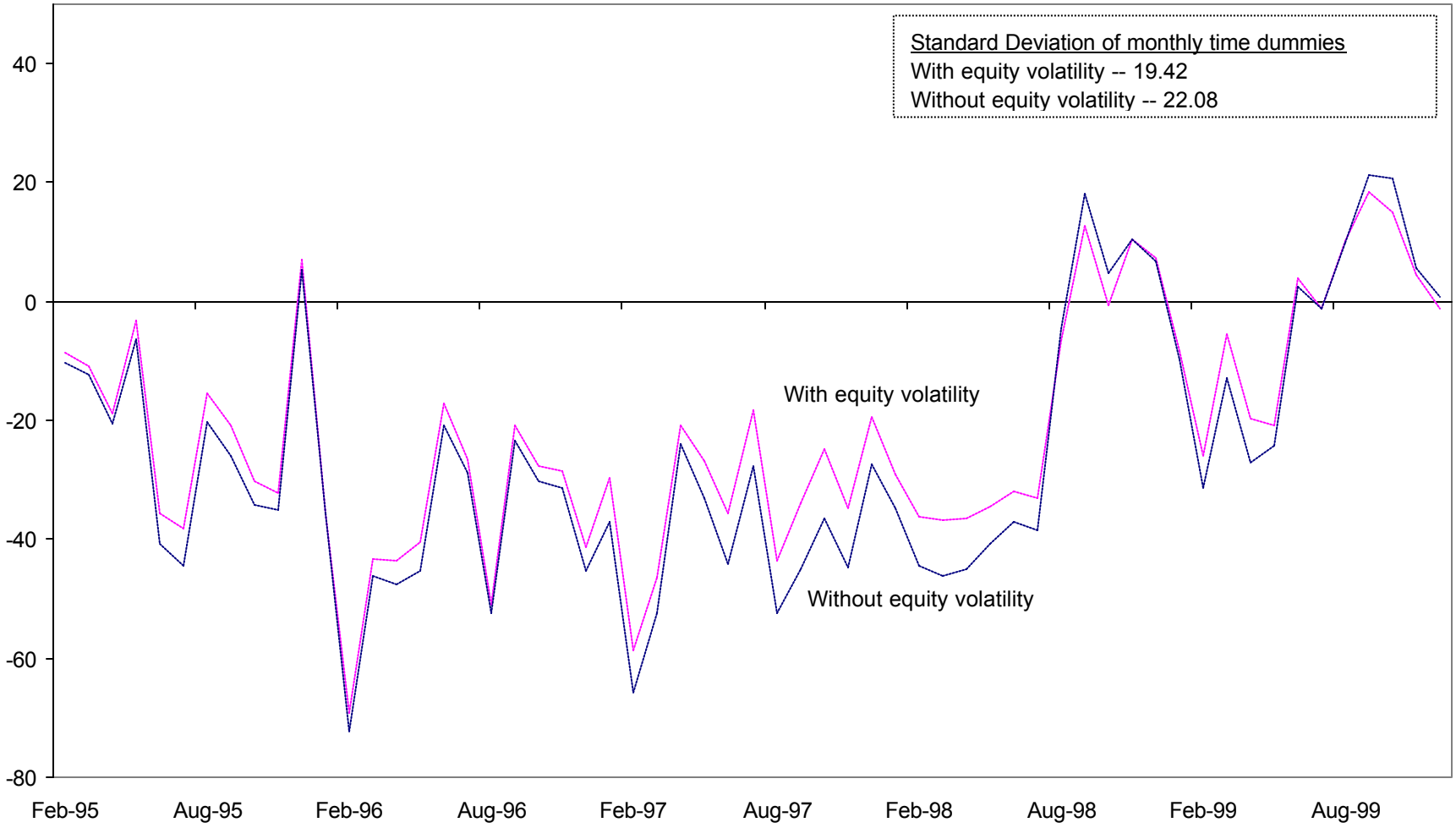


Figure 5. A-rated corporate bond yield spreads over US Treasurys, 1995-1999 (bps)

Figure 6. Monthly time dummies with issuer-fixed effects (relative to January 1995)



Note: 'Without equity volatility' refers to Table 6, Regression 7. 'With equity volatility' refers to Table 6, Regression 8.

Figure 7. S&P actual vs. fitted yield spreads for A-rated corporate bonds (bps)

Figure 8. S&P actual vs. fitted yield spreads for A-rated corporate bonds (bps)