Macroeconomic News Announcements and Corporate Bond Credit Spreads[1]

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Abstract

We investigate the impact of scheduled macroeconomic news announcements on the corporate bond market using daily credit spreads from January 1997 through June 2003. We find that macroeconomic announcements mainly affect high-yield bonds. In particular, the announcement surprises in leading economic indicators and employment reports have significant impact on credit spreads of high-yield bonds. We also find that the conditional volatility of credit spreads on high-yield bonds increases on announcement days for the advance monthly retail sales. Finally, we find that the VIX volatility index, not macroeconomic announcements, has significant impact on jumps in daily credit spreads.

1 Introduction

An important issue related to credit risk is the factors that affect yield spreads of corporate bonds. Explanatory variables considered in the literature so far include equity market variables (e.g. Collin-Dufresne, Goldstein and Martin (2001), Elton, Gruber, Agrawal and Mann (2001), Campbell and Taksler (2002)), the Treasury market variables (e.g. Longstaff and Schwartz (1995)), liquidity (Longstaff, Mithal and Neis (2005)), and macroeconomic variables (e.g. Helwege and Kleiman (1995), Gupton and Stein (2002), Huang and Kong (2003)). The focus of this study is on the impact of macroeconomic news announcements, a set of variables that have not been examined.

As macroeconomic announcements may contain new information regarding the state of the economy, corporate bond market participants expect to react on the news release accordingly and thus move the market. For instance, on November 14 of 2001, the released growth rate in advance retail sales was 7.1%, which was much higher than the market expectation (the median economist forecasts reported by Bloomberg News was 2.5) before the release. All three Merrill Lynch high-yield bond credit spread indices dropped sharply on that day (13.1 basis points for the BB index, 19.6 basis points for the B index, and 35.1 basis points for the CCC-Low index). The decrease in various investment-grade Merrill Lynch credit spread indices was also substantial. This evidence calls for a formal statistical analysis on the volatility pattern of credit spreads on announcement days to precisely access the importance of macroeconomic news releases. To our knowledge, this is the first study that investigates this issue.

Another motivation of this study is based on the empirical evidence that macroeconomic news announcements affect significantly the U.S. Treasury market. Given the Treasury market's benchmark role in pricing corporate bonds, an interesting issue is the reaction of the corporate bond market to macroeconomic announcements.

In this paper, we investigate the impact of scheduled macroeconomic news announcements on the corporate bond market using daily option-adjusted credit spreads from Merrill Lynch from January 1997 through June 2003. (We consider eleven macroeconomic announcements in our analysis, which are selected to represent different aspects of the economy and listed in Table 1.) In particular, we want to examine how much of the response in corporate bond yields is due to the reaction of the credit spread component to announcement surprises, and whether credit spreads exhibit excessive volatility on these announcement days.

The daily prices of corporate bonds used to construct the Merrill Lynch credit spread indices are based on the bid side of the market at 3:00 P.M. New York time and are obtained from the Merrill Lynch trading desk. These market price based daily credit spread series offer an unique opportunity to investigate the direct response of corporate bond credit spreads to announcement shocks of various macroeconomic variables. The Merrill Lynch credit spread indices are initiated on December 31 of 1996. Our analysis is based on nine indices, six investment-grade industrial bond indices (AA-AAA 1-10 Yrs, AA-AAA 10-15 Yrs, AA-AAA 15+ Yrs, BBB-A 1-10 Yrs, BBB-A 10-15 Yrs and BBB-A 15+ Yrs) and three high-yield bond indices (BB, B and CCC-Lower), through June 27 of 2003.

For robustness test, we also examine the impact of these eleven macroeconomic announcements on the two Standard&Poor's (S&P) credit indices. Standard&Poor's constructed two credit indices to track the general level of industrial bond credit spreads in investment-grade markets and speculative-grade markets respectively. The composite market price used to calculate the option-adjusted spread is based on the average bid and ask prices from a number of sources including brokers and dealers. The range of S&P credit indices is from January 4 of 1999 through June 27 of 2003.

The main findings of our studies are as follows. In examining the importance of individual macroeconomic announcements, we find that the following three announcements have a consistent and significant (0.005 level) effect on corporate bond credit spreads: advance retail sales, changes in nonfarm payroll, and the consumer confidence index. Advance retail sales and changes in nonfarm payroll have a significant impact on all three ML high-yield bond indices, while the consumer confidence index significantly impacts the B index and the C index. The employment report is generally viewed as the "king of announcements" by market participants, and is one of the most important variables for Treasury bond markets. It is not surprising to find that the employment report also has a significant impact on corporate bond credit spreads. The monthly release of advance retail sales usually sets the tone for the personal consumption expenditures release and hence offers a snapshot of a good chunk of the GDP. The consumer confidence index is a well perceived leading economic indicator. Given the forward-looking nature of credit spreads, the fact that leading economic indicators announcements have a significant impact on credit spreads is consistent with our expectations.

The investment-grade corporate bond market and the high-yield corporate bond market are generally viewed as two related, but also different segments of the corporate bond market. Accordingly, the risk factors that drive the credit spreads in these two markets

and the relative importance of these factors might also been different. Our evidence shows that macroeconomic announcements primarily affect the credit spreads of high-yield bonds. For the six ML investment-grade bond indices, none of the announcements exhibits consistent and significant impact on credit spreads. It is reasonable to expect that the size of the announcement surprises have to be of some magnitude in order to significantly alter investors' risk perception on investment-grade bond markets while the same announcement surprise might have a significant impact on investors' perception about high-yield bond markets. The evidence we have here suggests that when modelling portfolio credit risk, investment-grade issues and high-yield issues should receive some different treatments.

We also explore the impact of macroeconomic announcements on the conditional volatility of credit spreads while controlling the spectacular jumps and autoregressive conditional heteroskedasticity effects. Among the three announcements that have a significant impact on high-yield credit spreads, only retail sales announcements show some significant conditional volatility impact. For the ML BB index and the ML B index the conditional volatility is higher on announcement days of retail sales. However, unlike their impacts on interest rates, the scheduled macroeconomic announcements do not account for any significant portion of the jump behavior in credit spreads. Our empirical evidence confirms that equity option-implied volatility drives the jump behavior in credit spreads, as shown in Bierens, Huang and Kong (2003). Accordingly, it seems that in general corporate bond dealers and investors should not be jittery about scheduled macroeconomic news announcements.

This study is also related to the literature on the response of the U.S. Treasury market to macroeconomic news announcements. For instance, Ederington and Lee (1993) examine the impact on the Treasury futures volatility, whereas McQueen and Roley (1993) and Jones, Lamon, and Lumsdaine (1998) look at bond market volatility. Fleming and Remolona (1999), and Balduzzi, Elton, and Clifton (2001) study the effects of three announcements on prices and volatility of Treasury securities. Das (2002) and Piazzesi (2003) show that the Federal Open Market Committee (FOMC) release on its target rate can explain the jump behavior of interest rates.

The remainder of the paper is organized as follows. Following this introductory section, we discuss the macroeconomic news events that might affect credit spreads in section 2. Section 3 describes the credit spread and the economic announcement data, and also provides some preliminary analysis on the announcement impact. In section 4 we present the empirical results, and we summarize the main contributions in section 5.

2 The Link Between Credit Spreads and Macroeconomic Factors

A variety of macroeconomic variables could potentially affect both the credit spreads of corporate bonds and the Treasury yields, and drive the co-movement of these two series. Balduzzi, Elton and Green (2001) have found that 17 public news releases have significant impacts on the price of Treasury instruments of various maturities. Various studies on Treasury markets (Jones, Lamont, and Lumsdaine 1998, Fleming and Remolona 1999, Li and Engle 1998, Das 2002, and Piazzesi 2003) have generally considered employment reports, price index reports, and Federal Open Market Committee (FOMC) meetings as the most important events.

As for the announcement reaction in stock markets, early studies (e.g., Pearce and Roley 1985) generally find that, apart from monetary information such as money supply shocks, there is little evidence to indicate that stock prices respond significantly to macroeconomic shocks. However, McQueen and Roley (1993) later show that after allowing for different stages of the business cycle, the relation between stock prices and macroeconomic shocks is stronger. In particular, they find that when the economy is strong, the stock market responds negatively to shocks about higher real economic activities.

A number of studies have looked at the direct relationship between corporate bond default risks and variations in real economic activities. Helwege and Kleiman (1997) find that GDP growth rate and a recession indicator are important in explaining the aggregate default rates of high-yield bonds. Huang and Kong (2003) find that changes in credit spreads of corporate bond indices are significantly related to changes in Conference Board leading and coincident indicator indices. To gauge the impacts of realized real economic activity shocks on credit spreads, we focus on the release of the industrial production and capacity utilization rate, GDP growth rates, and employment report. The release of real economic activity figures such as production activity, employment and GDP growth in month t is for economic activity that already occurred in month $t-1$. Surprises from realized real economic activity will affect credit spreads if these surprises change expectations about future aggregate economy.

Because of the forward-looking nature of credit spreads, it is natural to expect that credit spreads would be affected more by variations in economic indicators that lead real economic activities (e.g., Huang and Kong 2003). For leading economic indicators, we focus on the release of two indicators that are marked as having high market importance on the

Economic Calendar prepared by *TheStreet.com*[1]: the National Association of Purchasing Manager (NAPM) index and the month-to-month changes in advance retail sales. They are considered as "nearly always moves markets" by analysts of *TheStreet.com*. In addition, because of the wide attention it has generally received as a leading indicator, we also look at the release impact of the consumer confidence index.

The impact of inflation uncertainty on the credit risk premium has recently been studied in a theoretical framework by David (2002), assuming that inflation and earnings growth follow continuous time regime-switching processes. Within this framework, David (2002) shows that periods of increasing inflation expectations could lead to both increasing credit risk premia and Treasury yields, due to the higher risk of an earning slowdown. We consider the impact of inflation announcement surprises as measured by the release of the CPI and PPI.

The meeting of the Federal Open Market Committee (FOMC) is a closely watched event in the financial market. Das (2002) finds that two-day meetings of the FOMC are an important source of jump behavior in the time series of Federal Fund rates. Piazzesi (2003) shows that a model of Treasury yield curve that has policy-related events, such as FOMC meetings and releases of macroeconomic news, modeled as jumps improves bond pricing. Given the documented jump behavior in log credit spreads in Bierens, Huang and Kong (2003), it is natural to investigate whether the FOMC meeting is an important source of jumps in corporate bond credit spreads.

3 The Data

The sample period that is under consideration begins in January 1997 and ends in June 2003. The start of the sample period coincides with the initial availability of the daily option-adjusted credit spread index data from Merrill Lynch and the survey data from Bloomberg.

3.1 Daily Credit Spread Series

We use daily option-adjusted credit spreads of the various Merrill Lynch corporate bond indices to examine the response of corporate bond credit spreads to macroeconomic shocks. Each index is a market value weighted average of the individual corporate bond credit

[1]http://www.thestreet.com

spread in a given maturity, industry, and credit rating category. The index is re-balanced on the last calendar day of each month to maintain certain qualifying criteria[2]. Issues that no longer meet qualifying criteria for a given index are dropped from the index and new issues that meet the qualifying criteria are included for the following month. The credit spread is given in basis points. The daily price of corporate bonds used to calculate the credit spread is based on the bid side of the market at 3:00 P.M. New York time, and is obtained from the Merrill Lynch trading desk. We believe these data should have relatively high quality, since yields on several Merrill Lynch corporate bond indices have started being quoted in the *Wall Street Journal*.

For investment-grade corporate bonds, we obtain US industrial corporate bond credit spread indices for three maturities: 1-10 years, 10-15 years, and 15+ years; and two rating groups: AA-AAA and BBB-A. The indices track the performance of US dollar-denominated investment-grade public debt of industrial sector corporate issuers, issued in the US domestic bond market. For high-yield corporate bonds, Merrill Lynch has credit spread indices for three credit ratings: BB, B and C. We do not know the industry composition of the high-yield credit spread index. This gives us a total of 9 different rating and maturity corporate bond portfolio credit spreads. The original credit spread series we obtained contain data on weekend or holidays. To ensure that the credit spread data we use reflect market information, we restrict our analysis to days when the NYSE market was open. This is done by matching the credit spread data with the $S\&P$ 500 index data over this period. When there is no $S\&P$ 500 index data on a day, we drop that observation from the credit spread series. This results in 1554 daily observations for each index on nonrebalancing days.

For robustness test, we also examine the impact of these eleven macroeconomic announcements on the two Standard&Poor's (S&P) credit indices. Standard&Poor's constructed two credit indices to track the general level of industrial bond credit spreads in investment-grade markets and speculative-grade markets respectively. The composite market price used to calculate the option-adjusted spread is based on the average bid and ask prices from a number of sources including brokers and dealers. The range of S&P credit indices is from January 4 of 1999 through June 27 of 2003. Table 1 provides summary statistics on the changes in credit spreads measured in log-spread changes and basis points respectively.

[2]See Bierens, Huang and Kong (2003) for a detailed description of the Merrill Lynch option-adjusted credit spread indices.

3.2 Economic Announcements and Survey Data

The data on economic releases and the market's expectations are from the economic releases on Bloomberg Professional. The Bloomberg News (BN) survey includes an average of the pre-announcement estimates of the release figure by economists, and the actual release figures. The number of responses on which the average of the release estimates is based varies each time, depending on the number of forecasts available from participating firms, which include most large Wall Street financial firms. For example, economists from 40 different firms provided their estimates of the percentage changes in US Industrial Production Index that was going to be released on June 15th of 2001 at 9:15 A.M. The timing and the actual releases are further confirmed through the various original sources of release.

The Federal Open Market Committee (FOMC) holds eight regular meetings every year and makes decisions regarding the conduct of open market operations. The date of these meetings are pre-announced. Except for the meetings before the February and July testimony by the chairman of the Board of Governors before Congress, the meeting starts on Tuesday at 9:00 A.M. and breaks up around 2:15 P.M. Immediately after the meeting, a public announcement is made about the outcome of the meeting, which includes any changes in the Federal fund rates and discount rate, and an assessment of the relative risk of higher inflation and recession in the near future. The meetings before the February and July chairman's testimony before Congress start in the afternoon on Tuesday and go over to Wednesday, with the usual announcement around 2:15 P.M. These two-day meetings consider the longer-term economic outlook as well as the current conduct of open market operations. Das (2002) finds that the jump probability of the Federal fund rate is significantly higher on the first day of two-day meetings of the FOMC. Our sample consists of 37 one-day meeting and 8 two-day meetings. The Bloomberg News survey includes an estimate of the Federal fund target rate by the analysts before scheduled FOMC meetings. However, there was no surprise on the Federal fund target rate over the sample period.

Data on industrial production (IP) and capacity utilization (CU) are originally released by the Federal Reserve, from the Federal Reserve statistical release G.17. The figures are seasonally adjusted monthly percentage changes in the Industrial Production Index and Total Industry Capacity Utilization rates. These two announcement are both made at 9:15 A.M., typically in the middle of the month.

While the GDP is a quarterly statistic, the Bureau of Economic Analysis of the Commerce Department releases preliminary, final estimates and actual figures in successive months. The first-pass estimate of the GDP is called the advanced report and is released

on the last business day of January, April, July, and October (data for the prior quarter). The second-pass estimate is called the preliminary report and is released a month later, and the third-pass is called the final report and is released yet another month later. All figures on the GDP are released at 8:30 A.M.

The seasonally adjusted unemployment rate (UNEM) and changes in non-farm payroll employment (NFP) numbers from the employment report from the Labor Department are the most widely watched numbers gauging the employment situation. During our sample period, both the employment rate and payroll employment announcements are made at 8:30 A.M., typically the first Friday in the month.

The data on inflation are seasonally adjusted monthly percentage changes in the Consumer Price Index (CPI) of all urban consumers and Producer Price Index (PPI) of finished goods as announced by the Bureau of Labor Statistic. Both price indices are released at 8:30 A.M. on various days near the middle of each month, but the PPI announcement is made a few days earlier than the CPI announcements.

The Consumer Confidence (CC) Index is announced by the Conference Board, usually on the last Tuesday of the month at 10:00 A.M. The data are for the current month and are usually used as a gauge of consumer moods. The NAPM index is announced by the Institute for Supply Management (National Association of Purchasing Management before 2002) on the first business day of the month at 10:00 A.M. (data for the prior month). This national manufacturing index signals expansion when it is above 50 and contraction when below. The advance monthly retail sales (ARS) is released by the Census Bureau around the 12th of the month at 8:30 A.M. This is a measure of sales at retail establishments and does not include spending on services. The monthly release of retail sales usually sets the tone for the personal consumption expenditures release and hence offers a snapshot of a good chunk of the GDP.

For unknown reasons, the Bloomberg survey is not available in some months for some economic news over the sample period under consideration.[3] When the survey data are available, we subject the survey data to unbiasedness, efficiency and accuracy tests for the entire sample period (e.g., Pearce and Roley 1985). First, the unbiasedness of the forecast is examined based on the following equation:

$$A_{i,t} = f_{i,0} + f_{i,1} \cdot F_{i,t} + u_{i,t}, \tag{1}$$

[3]The BN surveys were not available for: IP in May 1998; CU in June 1998, August 2002; UNEM in September 1997, June 1998; NFP in September 1997, March 2002; CPI in January 2000, August 2002; PPI in January-November 1997; CC in January 1997; NAPM in January 1997; ARS in February 1997.

where $A_{i,t}$ is the announcement value of macroeconomic variable i for month t, and $F_{i,t}$ is the analyst forecast of macroeconomic variable i for month t. We test for each macro variable whether $f_{i,0} = 0$ and $f_{i,1} = 1$. The overall results of these tests are encouraging. Among the ten macro variables that have release surprises, unbiasedness is only rejected at the 1% level for advance monthly retail sales, and at the 5% level for GDP growth rates. For efficiency of the forecast, we test for each variable whether $c_{i,1} = c_{i,2} = c_{i,3} = 0$ when fitting

$$A_{i,t} - F_{i,t} = c_{i,0} + c_{i,1} \cdot A_{i,t-1} + c_{i,2} \cdot A_{i,t-2} + c_{i,3} \cdot A_{i,t-3} + u_{i,t}. \tag{2}$$

All forecasts pass the efficiency test at the 1% level. And finally, we check for the accuracy of the forecast by comparing the forecasting root-mean-squared errors (RMSE) from the best autoregressive model with those of the survey data. Again, we find that the survey data have smaller root-mean-squared errors than autoregressive models. For brevity, these test results are not reported here. Table 2 tabulates the relevant information about each news release that is considered.

3.3 Preliminary Analysis

In this subsection we first perform a few preliminary analysis to further assess the quality of our surprise measures and obtain a rough picture of the impact of announcements on the volatility of credit spreads.

Most previous studies in Treasury bond markets and stock markets have used the survey data provided by Money Market Services (MMS) as the market expectation, and have only covered the period before 1997. To facilitate the comparison with previous studies in Treasury bond markets and stock markets, and to assess the quality of our measure of surprises, we first examine the impact of macroeconomic announcement surprises on the stock market index and the risk-free interest rates over the 1997-2003 period.

For comparison purposes, we follow the typical procedure used in past studies (e.g., Balduzzi, Elton, and Green 2001) and standardize the announcement surprise by its sample standard deviation.

$$E_{i,t} = \frac{A_{i,t} - F_{i,t}}{\sigma_i}. \tag{3}$$

The following specification is used to estimate the response of stock prices and interest rates to macroeconomic announcement surprises:

$$\Delta P_t = \alpha_{0,i} + \beta_{1,i} \cdot E_{i,t} + \sum \alpha_{k+1,i} \cdot E_{i_k,t} + \epsilon_{i,t}, \tag{4}$$

where ΔP_t is the percentage change in the stock index or the changes in interest rates (measured in basis points) from the closing of business day $t-1$ to the closing of business day t, $E_{i,t}$ is the standardized surprise of macroeconomic announcement i and $E_{i_k,t}$ is the surprises of the kth announcement that is released on the same day as announcement i. [4] Over the sample period, IP and CU figures are always released on the same day. As are UNEM and NFP figures. The stock market indices we use are the S&P 500 index and the Russell 2000 index. The interest rate variables we consider include changes in the CMT 10-year rate and changes in the slope (term spread) of Treasury yield curve as measured by the difference of yields on the Merrill Lynch 15+ year Treasury index and the Merrill Lynch 1-3-year Treasury index. The regression in Eq. (4) is estimated for each macroeconomic news event, using only days on which the particular announcement occurs (IP and CU are in one regression and UNEP and NFP are in one regression). The White (1980) heteroskedasticity-consistent standard errors are used to calculate the t-statistic. [5]

Consistent with previous literature, we find that interest rates respond significantly to a number of macroeconomic shocks. Among the 10 announcements under consideration, surprises from capacity utilization rate, changes in non-farm payroll employment, consumer confidence, NAPM index and retail sales all have significant impacts on the level of interest rates. The slope of the Treasury yield curve responds significantly to announcement surprises about GDP, employment reports and advance monthly retail sales. The basic picture revealed here is that better than expected employment conditions (e.g. nonfarm payroll employment) and economic activities (e.g. retail sales) increase the level of the interest rates and lower the slope of the Treasury yield curve.

As for stock prices, we find that higher inflation rates, as reflected in CPI figures, are clearly bad news for stock markets. Both the S&P 500 index and the Russell 2000 index react negatively to higher than expected surprises from CPI. Another thing that is worth of notice is that both the S&P 500 index and the Russell 2000 index react negatively to positive surprises from non-farm payroll employment. Given the strong economy for most of our sample period, this counter-intuitive result is consistent with the findings of McQueen and Roley (1993) that in a strong economy the stock market responds negatively to news about higher real economic activity. They credit this negative relation to the larger increase in discount rates relative to expected cash flows.

[4] The announcement from FOMC meetings is not considered here since there was no surprises on the Fed Fund rate target over the sample period.

[5] The Durbin-Watson test of serial correlation reveals no evidence of significant serial correlation in the residuals.

Overall, we find that the impact of announcement surprises documented in previous studies is still well established when using recent years data and survey from Bloomberg. Finally, for CPI, housing start, industrial production index, nonfarm payroll number and advanced retail sales, we also used survey data provided by Money Market Services (MMS) as robustness test, and obtained similar results. To save space, these results are not reported here.

As shown in Table 2, Many announcements we consider are released on Tuesday and Friday. Accordingly, it is interesting to first examine whether there is evidence showing day-of-the-week effect in volatility or any increase in volatility on days of some types of macroeconomic news announcements. Those exercises would provide us a rough picture of the volatility impact of macroeconomic news announcements on the dynamics of credit spreads.

In Table 3, we report the volatility of credit spread changes over days of the week. The Brown-Forsythe-modified Levene test is performed to test on the equality of the variance over days of the week. Although for most indices the volatility of credit spread changes is the highest on Monday, it is not statistically different from the other days of the week.

In Table 4, the volatility of credit spread changes on announcement days of each macroeconomic news is calculated and compared to the volatility on non-announcement days. The announcement day volatility is higher than the non-announcement day volatility for a number of macroeconomic news. Specifically, the volatility of spread changes of six indices is higher on days of NAPM index announcements, and the volatility of spread changes of four indices is higher on days of FOMC meeting minutes releases. This evidence suggests that some of the unusual movements in credit spreads might be due to the macroeconomic news announcement effect.

In summary, it appears that the quality of our announcement surprise measures is comparable to those used in previous studies, and the unconditional volatility of credit spread changes is significantly higher on some announcement days than on non-announcement days. The question is whether the excessive volatility on those days is due to announcement surprises.

4 Empirical Results

In this section, we first investigate the reaction of various credit spread indices to announcement shocks and identify macroeconomic variables that matter most for corporate

bond credit spreads. We then incorporate the knowledge of the timing of these important announcements into the ARX-ARCH-Jump model of Bierens, Huang and Kong (2003). Recent studies by Das (2002) and Piazzesi (2003) attribute much of the jump behavior in short-term interest rates to macroeconomic announcement surprises. The question we would like to answer is these macroeconomic announcements also account for some of the jump behavior in credit spreads.

4.1 The Response of Credit Spreads to Macroeconomic Shocks

To explore the impact of macroeconomic announcements on the corporate bond credit spread, we first perform univariate regression analysis to isolate the impact of each announcement separately. Specifically, for each credit spread index and for each announcement type i, we run the following regression using only announcement day observations of announcement type i,

$$\Delta S_t = \beta_0 + \beta_{1,i} E_{i,t} + \epsilon_{i,t}, \tag{5}$$

where ΔS_t is the changes in log-credit spreads ($\times 100$) from day $t-1$ to announcement day t, and $E_{i,t}$ is the standardized surprise for announcement type i. The slope coefficient $\beta_{1,i}$, the associated t-statistics, and the adjusted R^2 of each regression are reported in Panel A through Panel D of Table 5.

Macroeconomic announcement surprises affect investment-grade and high-yield corporate bond credit spreads in quite different degrees. The various macroeconomic announcement surprises barely have any significant relationship with the contemporaneous changes in the six investment-grade credit spread indices. The only supporting evidence is that surprises of the GDP growth rate are significantly negatively correlated with spread changes of the AA-AAA rated 10-15 year index. Announcement surprises exhibit a greater impact on the S&P investment-grade credit index over the 1999-2003 period. Three announcements, capacity utilization rate, NAPM index, and retail sales, show a significant impact. Restricting the ML credit spread series to the 1999-2003 period in the regression shows that retail sales announcements surprises have a significant relationship with spread changes of some indices. The stronger relationship over this time period may be due to the extreme outlier in announcement surprises on November 14 of 2001 as mentioned in the introduction. In balance, the evidence that macroeconomic announcements affect investment-grade credit spreads is not quite consistent and robust.

In contrast to their impacts on investment-grade corporate bond credit spread, surprises

from macroeconomic announcements have a much broader and statistically more significant impact on the credit spread of high-yield corporate bonds. In particular, all three ML high-yield credit spread indices response significantly to release surprises in the change in nonfarm payroll numbers and the advanced monthly retail sales. The B rated index and the CCC-Lower rated index also react significantly to release surprise in the consumer confidence index. The release of NAPM index shows a significant impact on the BB rated index and the B rated index, but surprisingly, not on the most risky CCC-Lower rated index. The significance of these four announcements on high-yield credit spreads has been further confirmed using the S&P speculative-grade credit index over the 1999-2003 period.

The univariate analysis performed above helps assess the importance of each announcement separately. To examine the overall explanatory power of these announcements in explaining credit spread changes, we take a regression analysis that is slightly different from Eq. (5). Specifically, we include surprises from all economic variables, where the sample for the regression includes both announcement days and non-announcement days, in one regression:

$$\Delta S_t = \beta_0 + \sum_{i=1}^{10} \beta_{1,i} M_{i,t} + \epsilon_t, \tag{6}$$

where ΔS_t is the change in the logarithm of the Merrill Lynch corporate bond credit spread indices from the closing of business day $t-1$ to the closing of business day t, and $M_{i,t}$ is equal to zero if day t is not an announcement day of type i , and is equal to the standardized announcement surprises of announcement type i if day t is an announcement day of type i. With this specification, the regression coefficient will capture any significant difference between announcement day credit spread movements and non-announcement day credit spread movements, even if within announcement days there is no significant relationship between the size of announcement surprises and the corresponding credit spread movements. For hypothesis testing on the OLS parameter estimates, we use the Newey-West heteroskedasticity and autocorrelation-consistent covariance estimator.

We report the results of Eq. (6) with ML credit spread indices and S&P credit spread indices in Table 6 and Table 7 respectively, where the estimation result for each credit spread series is reported in the corresponding column. There are two things that deserve more discussions here. First, announcement surprises under consideration explain only a very small portion of the daily variation in credit spreads. Second, advanced retail sales, changes in nonfarm payroll number, and the consumer confidence index still exhibit significant impact on the credit spreads of high-yield bonds. The employment report is

generally viewed as the "king of announcements" by market participants, and is one of the most important variables for Treasury bond markets. It is not surprising to find that the employment report also has a significant impact on corporate bond credit spreads. The monthly release of advance retail sales usually sets the tone for the personal consumption expenditures release and hence offers a snapshot of a good chunk of the GDP. The consumer confidence index is a well perceived leading economic indicator. Given the forward-looking nature of credit spreads, the fact that leading economic indicators announcements have a significant impact on credit spreads is consistent with our expectations.

To address the concern that our results are sensitive to the manner in which we measure changes in credit spreads, we also carry out the above regression analysis using basis point changes in credit spreads. The results are qualitatively unchanged. To conserve space, those results are not reported here.

In summary, the regression analysis reveals that shocks in the employment report figures, the advance monthly retail sales and the consumer confidence index have the most important impact on the credit spread of corporate bonds over the sample period under consideration. Consistent with intuition, unfavorable shocks in the employment situation , the advance retail sales, and the consumer confidence index, all push up high-yield bond credit spreads significantly. Surprises in inflation rates exhibit no significant impacts on credit spreads.

Comparing the results we have here with the impact of announcements on interest rates, one can see that shocks about the non-farm payroll employment, the advance monthly retail sales and the consumer confidence index all drive both the Treasury term structure and corporate bond credit spreads. This indicates that the typical negative relation between credit spread changes and Treasury yield changes, as documented in Duffee (1998), could well be driven by these common underlying macro factors. On the other hand, higher employment figures have been shown to bring a negative reaction in stock prices over the sample period, which happens to be a very strong economic period. Apparently, the typical negative relation between credit spread changes and stock returns could not be attributed to the common reaction to macroeconomic shocks.

4.2 Macroeconomic Shocks and Conditional Volatility of Credit Spread Changes

In this section we explore the implications of incorporating the knowledge of macroeconomic announcements into investors' conditional expectation of credit spread volatility. If surprises from these macroeconomic releases are important underlying factors that cause the jump behavior in credit spreads as identified in Bierens, Huang and Kong (2003), after incorporating these information into the conditional volatility specification, we would expect that equity option-implied volatility would play a much less significant role in driving credit spread jumps. Based on the evidence from the linear regression, we restrict our analysis here to scheduled announcements of the non-farm payroll employment, the advance monthly retail sales and the consumer confidence index. Even though there is no surprise in the Federal Fund rate target from the FOMC meeting over the sample, previous research on short-term interest rates has considered the FOMC meeting as a major source of jumps in short-term interest rates, and there may be other important information released from the FOMC meeting that significantly affects the corporate bond market. Consequently, we also incorporate the release day of FOMC meetings into our specification.

The econometric model for ratings based corporate bond credit spread indices in Bierens, Huang and Kong (2003) takes the following form:

$$\begin{aligned} \ln(S_t) &= \ln(S_{t-1}) + \mu_0 + \phi_1 (1 - D_{1,t-1}) \ln(S_{t-1}/S_{t-2}) \\ &\quad + \beta_1 ret_{rus,t-1} + \beta_2 slope_{t-1} + \beta_3 \Delta r_{t-1} + \lambda_t \mu_J + \epsilon_t, \end{aligned} \tag{7}$$

where $D_{1,t}$ is a dummy variable that takes on the value one when day t is an index rebalancing day and zero otherwise, ret_{rus} is the return on the Russell 2000 index, $\Delta slope$ is the lagged change in the slope of the yield curve as measured by the difference in the Merrill Lynch 15+ year Treasury index yield and the Merrill Lynch 1-3-year Treasury index yield, and Δr is the lagged change in interest rates as measured by the yield on the Merrill Lynch Treasury master index. The disturbance ϵ_t has expectation zero and is a mixture of two normal distributions: with probability $(1 - \lambda_t)$, when jumps do not occur, it is distributed as $N(-\lambda_t \mu_J, h_t^2)$; with probability λ_t, it is distributed as $N((1 - \lambda_t)\mu_J, h_t^2 + \sigma_J^2)$. h_t^2 is the conditional variance of ϵ_t in the no-jump state and is specified as a ARCH(1) process:

$$h_t^2 = \delta_0 + b_1 (1 - D_{1,t-1}) \epsilon_{t-1}^2. \tag{8}$$

The jump probability λ is

$$\lambda_t = \exp(p_0 + p_1 * VIX_{t-1}) / (1 + \exp(p_0 + p_1 * VIX_{t-1})), \tag{9}$$

where VIX is the level of CBOE VIX index.

It follows that the conditional density of credit spread S_t on non-rebalancing days can be written as the following:

$$\begin{aligned} f\left(S_t|\Omega_{t-1},\theta_{\mathbf{nr}}\right)_{nr} &= (1-\lambda)\, f\left(S_t|\Omega_{t-1},I_{1,t}=0\right)+\lambda f\left(S_t|\Omega_{t-1},I_{1,t}=1\right) \\ &= (1-\lambda_t)\exp\left(\frac{-\left(\ln\left(S_t\right)-\Psi_{t-1}-\mu_0\right)^2}{2h_t^2}\right)\frac{1}{\sqrt{2\pi h_t^2}S_t} \\ &\quad +\lambda_t\exp\left(\frac{-\left(\ln\left(S_t\right)-\Psi_{t-1}-\mu_0-\mu_J\right)^2}{2\left(h_t^2+\sigma_J^2\right)}\right)\frac{1}{\sqrt{2\pi\left(h_t^2+\sigma_J^2\right)}S_t} \end{aligned} \tag{10}$$

where

$$\Psi_{t-1}\equiv\gamma\ln\left(S_{t-1}\right)+\phi_1\left(1-D_{1,t-j}\right)\ln\left(S_{t-j}/S_{t-j-1}\right)+\beta_1 ret_{rus,t-1}+\beta_2 slope_{t-1}+\beta_3\Delta r_{t-1}.$$

Consistent estimates of the parameters could be obtained through (quasi) maximum likelihood method.

To incorporate the knowledge of scheduled macroeconomic announcements into the above model in forming investors' volatility expectation, we replace the specification in Eq. (8) with the following augmented ARCH(1) process when describing the conditional volatility of corporate bond credit spreads:

$$\begin{aligned} h_t^2 &= \exp(\delta_0+\delta_1 I_{FOMC,t-1}+\delta_2 I_{NFP,t-1} \\ &\quad +\delta_3 I_{ARS,t-1}+\delta_4 I_{CC,t-1})+b_1\left(1-D_{1,t-1}\right)\epsilon_{t-1}^2, \end{aligned} \tag{11}$$

where $I_{FOMC,t-1}$ is a dummy variable that takes on the value one if day t is the release day of scheduled FOMC meetings and zero otherwise, $I_{NFP,t-1}$, $I_{ARS,t-1}$, and $I_{CC,t-1}$ are dummy variables indicating announcement days of changes in nonfarm payrolls, advanced retail sales, and the consumer confidence index respectively. The other part of the model is the same as specified above in Eq. (7) and (9). The estimation is done via the (quasi) maximum likelihood method using the GAUSS CML modules. Both the Broyden, Fletcher, Goldfarb, and Shanno (BFGS) algorithm and the Berndt, Hall, Hall, and Hausman (BHHH) algorithm are used in the estimation and give the same results.

The estimated parameters governing the conditional volatility are reported in Table 8 and Table 9 for the three Merrill Lynch high-yield credit spread indices and the two S&P credit indices. The parameters of particular interest are δ_1 through δ_4. The parameter estimates of δ_1 indicate that FOMC meetings are not an important source of volatility in corporate bond credit spreads over the sample period under consideration, even though

they are an important source of jumps in interest rates. The announcements of changes in nonfarm payroll number and the consumer confidence index do not induce significant increase in the conditional volatility. The only evidence that macroeconomic announcements increase the expected conditional volatility is found on release days of advanced retail sales. For the ML BB index and the ML B index the conditional volatility is higher on announcement days of retail sales. None of these announcements significantly affect the conditional volatility of the two S&P credit indices.

Shocks from scheduled macroeconomic releases are not an important source driving jumps observed in the aggregate credit spread dynamics. A comparison with the restricted model where $\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$ shows that incorporating macroeconomic releases into the conditional volatility specification has little effect on the estimated parameter governing the jump intensity and the volatility of jumps. Consequently, the jump behavior in aggregate credit spreads is primarily driven by state factors that are unique to equity markets, as opposed to shocks from observable macroeconomic variables.

In summary, the conditional volatility analysis presented in this section provides further insight into the role of macroeconomic shocks on the dynamics of credit spreads of corporate bonds. Macroeconomic shocks induce contemporaneous movements in corporate bond credit spreads and also affect the conditional volatility, but these shocks are not a primary source of jumps in credit spreads.

5 Conclusion

This paper examines the impact of scheduled macroeconomic news announcements on credit spreads of both investment-grade and high-yield corporate bonds. We use daily option-adjusted credit spread data of corporate bond indices from both Merrill Lynch and S&P. Market survey data from Bloomberg is used to obtain analysts' forecasts of macroeconomic news releases and to calculate the surprise component of these releases. This allows us to directly examine which macroeconomic announcements significantly affect corporate bond credit spreads, and their impacts on the conditional volatility. Our analysis yields some empirical results that have important implications for modelling and managing credit spread risks of corporate bond portfolios.

Shocks from employment reports, advance monthly retail sales and the consumer confidence index are found to have substantial impacts on credit spreads of corporate bonds, and these announcements primarily affect credit spreads of high-yield corporate bonds.

These findings provide some insight into understanding the nature of the co-movement of corporate bond credit spreads and the Treasury term structure. There is evidence that macroeconomic announcements affect the conditional volatility of high-yield credit spreads, but they are not an important source driving the jump behavior in credit spreads. We find that the primary driving forces of the jump behavior in credit spreads are related to equity option-implied volatility.

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Table 1
Summary Statistics on Daily Index Credit Spread Changes

This table reports the summary statistics on daily index credit spread changes. Panel A presents the summary statistics on daily changes in log-credit spreads of Merrill Lynch credit spread indices from 01/02/1997 through 06/27/2003 (non-rebalancing days only; N=1554), and daily changes in log-credit spreads of S&P credit spread indices from 01/04/1999 through 06/27/2003 (N=1119). Panel B presents the summary statistics on daily credit spread changes in basis points over the same periods.

Panel A: Daily Changes in Log-Credit Spreads (×100)

Source	Index	Mean	Median	S.D.	Skewness	Kurtosis	Max.	Min.
ML	AA-AAA 1-10-Yr	-0.05	-0.12	3.58	-1.79	50.44	29.83	-52.43
ML	AA-AAA 10-15-Yr	-0.08	0.02	4.38	-1.12	19.85	32.76	-40.01
ML	AA-AAA 15+ Yr	-0.02	-0.01	2.49	-0.33	19.50	18.99	-21.10
ML	BBB-A 1-10-Yr	0.04	-0.04	1.95	0.05	29.40	15.41	-18.36
ML	BBB-A 10-15-Yr	-0.01	-0.03	2.12	0.54	22.81	22.88	-16.25
ML	BBB-A 10+ Yr	0.00	-0.03	1.46	-0.21	23.69	11.79	-14.59
ML	BB	0.04	-0.03	1.52	2.87	39.25	22.75	-6.24
ML	B	0.05	0.01	1.45	1.62	17.18	17.47	-5.89
ML	CCC-Low	0.03	0.01	1.01	1.04	13.29	10.24	-6.18
S&P	Investment Grade	0.03	0.00	0.99	3.15	42.34	14.62	-3.81
S&P	Speculative Grade	0.07	0.08	1.13	0.03	1.36	5.78	-4.03

Panel B: Daily Changes in Credit Spreads (basis points)

Source	Index	Mean	Median	S.D.	Skewness	Kurtosis	Max.	Min.
ML	AA-AAA 1-10-Yr	-0.02	-0.07	1.69	-0.63	21.28	10.859	-18.704
ML	AA-AAA 10-15-Yr	-0.06	0.02	2.84	-2.07	38.28	20.231	-41.368
ML	AA-AAA 15+ Yr	-0.03	-0.01	1.84	0.25	11.92	14.267	-12.589
ML	BBB-A 1-10-Yr	0.06	-0.04	2.01	1.25	14.85	18.809	-12.428
ML	BBB-A 10-15-Yr	-0.02	-0.05	2.44	0.70	7.58	14.766	-12.605
ML	BBB-A 10+ Yr	-0.01	-0.04	2.02	1.17	15.51	20.93	-12.86
ML	BB	0.19	-0.08	6.22	5.65	93.28	106.67	-24.92
ML	B	0.31	0.05	9.24	2.64	41.94	145.81	-48.84
ML	CCC-Low	0.44	0.17	14.5	0.89	20.97	182.47	-108.95
S&P	Investment Grade	0.04	0.00	2.05	4.25	69.75	34.2	-9.40
S&P	Speculative Grade	0.49	0.7	10.62	-0.17	3.51	59.0	-52.3

Table 2

Macroeconomic Announcements

We measure the surprises in announcement i (E_i) as the difference in the actual release value A_i and the median of the Bloomberg News (BN) forecast survey F_i, i.e., $E_i = A_i - F_i$. Panel A shows the announcements, their abbreviations, the reported units of the variables, the times and dates when the announcements are normally released, the typical sequence of the announcement in a given month, and the distribution of the announcements over the days of the week. Panel B shows the number of valid BN surveys for the variables, the sample mean of the actual release values (M_A), the sample standard deviation of the actual release values ($S.D._A$), the number of times when the release surprise E_i is positive, the sample mean of positive surprises (M_{E^+}), the maximum of positive surprises (Max_{E^+}), the number of times when the release surprise E_i is negative, the sample mean of negative surprises (M_{E^-}), the maximum of positive surprises (Max_{E^-}),. The sample period is January 1997 through June 2003.

Panel A

Announcement	Abbrev.	Unit	Time	Date	Sequence	M	T	W	T	F
FOMC Target	FOMC	% Rate	14:15	NA	NA	0	35	17	0	0
Industrial Production	IP	% Change	9:15	15th	6th	6	20	13	8	30
Capacity Utilization	CU	% Level	9:15	15th	6th	5	19	13	7	32
Gross Domestic Product	GDP	% Change	8:30	month end	8th	0	2	18	30	27
Unemployment Rate	UNEM	% Level	8:30	First Fri	2nd	0	0	0	3	73
Changes in Nonfarm Payroll	NFP	100,000	8:30	First Fri	2nd	0	0	0	3	73
Consumer Price Index	CPI	% Change	8:30	13th	5th	0	27	19	13	18
Producer Price Index	PPI	% Change	8:30	13th	4th	0	0	6	20	41
Consumer Confidence	CC	% Level	10:00	Last Tue	7th	0	75	0	1	1
NAPM Index	NAPM	% Level	10:00	1st	1st	32	15	9	11	10
Advanced Retail Sales	ARS	% Change	8:30	12th	3rd	0	19	12	25	21

Panel B

Announcement	Obs	M_A	$S.D._A$	Pos.	M_{E^+}	$Max._{E^+}$	Neg.	M_{E^-}	$Max._{E^-}$
FOMC	52	4.29	1.85	0	NA	NA	0	NA	NA
IP	77	0.116	0.513	31	0.255	0.7	35	-0.223	-0.5
CU	76	79.77	3.193	34	0.305	0.7	37	-0.249	-0.6
GDP	77	3.17	2.053	43	0.498	1.4	28	-0.368	-1.2
UNEM	76	4.79	0.686	25	0.128	0.3	29	-0.186	-0.3
NFP	76	109,210	189,931	34	67,617	188,000	41	-96,585	-318,000
CPI	77	0.187	0.200	20	0.125	0.30	30	-0.13	-0.3
PPI	67	0.112	0.61	24	0.388	1.20	34	-0.309	-1.2
CC	77	118.35	21.22	40	3.773	12.2	37	-3.692	-13
NAPM	77	51.15	4.564	30	1.837	4.7	46	-1.411	-4.70
ARS	77	0.31	1.13	33	0.497	4.6	37	-0.378	-1.6

Table 3
Volatility of Credit Spread Changes Over the Days of the Week

This table reports the volatility of credit spread changes over the days of the week. Panel A presents the volatility distribution of daily changes in log-credit spreads of Merrill Lynch credit spread indices from 01/02/1997 through 06/27/2003 (non-rebalancing days only; N=1554), and daily changes in log-credit spreads of S&P credit spread indices from 01/04/1999 through 06/27/2003 (N=1119). Panel B presents the volatility distribution of daily credit spread changes in basis points over the same periods. Bold numbers indicate the largest volatility across the days of the week.

Panel A: Volatility of Daily Changes in Log-Credit Spreads (×100)

Source	Index	Mon	Tue	Wed	Th	Fri
ML	AA-AAA 1-10-Yr	**5.049**	3.422	2.65	3.341	3.205
ML	AA-AAA 10-15-Yr	4.669	4.249	3.436	**4.879**	4.407
ML	AA-AAA 15+ Yr	**3.00**	2.623	2.148	2.406	2.286
ML	BBB-A 1-10-Yr	**2.33**	1.899	1.494	1.871	2.108
ML	BBB-A 10-15-Yr	**2.661**	1.912	1.648	2.242	2.090
ML	BBB-A 10+ Yr	**1.666**	1.437	1.237	1.414	1.556
ML	BB	**1.889**	1.331	1.553	1.423	1.384
ML	B	**1.706**	1.321	1.385	1.538	1.400
ML	CCC-Low	**1.182**	1.032	0.922	0.955	0.925
S&P	Investment Grade	**1.385**	0.845	0.911	0.924	0.849
S&P	Speculative Grade	0.96	1.10	1.155	**1.274**	1.14

Panel B: Volatility of Daily Changes in Credit Spreads (basis points)

Source	Index	Mon	Tue	Wed	Th	Fri
ML	AA-AAA 1-10-Yr	**2.095**	1.625	1.448	1.575	1.747
ML	AA-AAA 10-15-Yr	2.871	2.792	2.052	3.029	**3.291**
ML	AA-AAA 15+ Yr	**2.142**	1.837	1.736	1.716	1.780
ML	BBB-A 1-10-Yr	**2.281**	1.966	1.872	1.810	2.120
ML	BBB-A 10-15-Yr	**2.734**	2.406	2.217	2.478	2.394
ML	BBB-A 10+ Yr	**2.381**	2.078	1.792	1.837	1.995
ML	BB	**7.697**	4.904	7.404	5.600	5.155
ML	B	**11.273**	8.331	8.850	9.584	8.140
ML	CCC-Low	**16.663**	15.110	13.159	13.898	13.728
S&P	Investment Grade	**3.00**	1.706	1.906	1.828	1.598
S&P	Speculative Grade	9.462	10.414	11.056	**11.638**	10.390

Table 4
Volatility of Credit Spread Changes:
Announcement Days vs. Nonannouncement Days

This table reports the volatility of credit spread changes on announcement days of various macroeconomic news versus the volatility of credit spread changes on nonannouncement days (NA). Panel A presents the volatility distribution of daily changes in log-credit spreads of Merrill Lynch credit spread indices from 01/02/1997 through 06/27/2003 (non-rebalancing days only; N=1554), and daily changes in log-credit spreads of S&P credit spread indices from 01/04/1999 through 06/27/2003 (N=1119). There are 1019 nonannouncement day observations for each Merrill Lynch credit spread series, and Panel B presents the volatility distribution of daily credit spread changes in basis points over the same periods. Bold numbers indicate the .

Panel A: Volatility of Daily Changes in Log-Credit Spreads (×100)

Source	Index	IP	CNP	GDP	CPI	PPI	NAPM	ARS	CC	FOMC	NA
ML	AA-AAA 1-10-Yr	3.81	4.15	3.05	3.13	4.67	4.69	2.38	2.57	**4.41**	3.42
ML	AA-AAA 10-15-Yr	4.89	3.45	6.44	3.93	5.08	4.91	3.61	3.54	4.30	4.19
ML	AA-AAA 15+ Yr	2.93	2.77	2.98	1.76	2.47	3.70	1.36	2.48	2.40	2.39
ML	BBB-A 1-10-Yr	2.33	2.43	1.88	1.78	2.32	**3.27**	1.04	1.59	**2.56**	1.73
ML	BBB-A 10-15-Yr	2.22	2.21	2.30	2.04	2.24	2.82	1.98	1.54	2.10	2.04
ML	BBB-A 15+ Yr	1.77	1.51	**1.78**	1.19	1.58	**2.68**	0.90	1.26	1.64	1.29
ML	BB	1.32	**1.60**	1.53	1.28	**1.62**	**1.65**	**1.54**	1.35	**2.53**	1.30
ML	B	1.43	1.48	1.73	1.38	1.37	**1.76**	**1.57**	1.30	1.48	1.35
ML	CCC-Low	1.02	1.05	1.21	0.90	0.85	**1.25**	0.94	0.82	0.78	0.98
S&P	Investment Grade	0.81	0.79	0.87	0.95	0.75	0.79	0.79	0.71	1.05	0.93
S&P	Speculative Grade	1.20	1.24	1.13	1.26	**1.32**	1.20	**1.36**	0.90	1.34	1.08

Panel B: Volatility of Daily Changes in Credit Spreads (basis points)

Source	Index	IP	CNP	GDP	CPI	PPI	NAPM	ARS	CC	FOMC	NA
ML	AA-AAA 1-10-Yr	1.86	1.92	1.87	1.74	2.01	1.93	1.10	1.38	**2.38**	1.62
ML	AA-AAA 10-15-Yr	3.19	1.98	5.73	2.84	2.83	2.80	2.36	2.62	2.65	2.58
ML	AA-AAA 15+ Yr	2.00	1.87	2.31	1.38	1.69	2.11	1.12	2.03	1.82	1.80
ML	BBB-A 1-10-Yr	2.03	2.19	2.39	1.94	1.88	2.29	1.21	1.90	**3.09**	1.84
ML	BBB-A 10-15-Yr	2.67	2.54	2.79	2.68	2.17	2.56	2.18	1.97	2.78	2.36
ML	BBB-A 10+ Yr	2.04	2.00	**2.71**	1.78	1.89	2.66	1.29	1.99	**2.59**	1.83
ML	BB	5.17	5.27	5.43	4.85	**6.14**	4.99	5.91	4.71	**14.77**	4.88
ML	B	8.52	8.26	10.03	8.01	8.91	**10.54**	**9.55**	7.43	10.87	8.16
ML	CCC-Low	**15.73**	15.79	15.53	13.17	12.14	**20.31**	13.39	12.21	12.87	13.16
S&P	Investment Grade	1.58	1.52	1.80	1.46	1.46	1.55	1.54	1.48	2.02	1.84
S&P	Speculative Grade	10.57	11.77	9.26	11.30	10.02	11.09	12.24	8.94	12.60	10.35

Table 5

The Effect of Announcement Surprises on Credit Spreads: Univariate Analysis

For each credit spread index and for each announcement type i, we run the following regression using only announcement day observations of announcement type i,

$$\Delta S_t = \beta_0 + \beta_{1,i} E_{i,t} + \epsilon_{i,t}, \tag{12}$$

where ΔS_t is the changes in log-credit spreads ($\times 100$) from day $t-1$ to announcement day t, and $E_{i,t}$ is the standardized surprise for announcement type i. The following table reports slope coefficient $\beta_{1,i}$, the associated t-statistics, and the adjusted R^2. For regressions involving Merrill Lynch credit spreads indices, the sample covers 01/02/1997 through 06/27/2003 (non-rebalancing days only). For regressions involving S&P credit spreads indices, the sample covers 01/04/1999 through 06/27/2003. Bold numbers indicate that the coefficients are significant at the 5% level.

Panel A: ML AA-AAA Rated

	ML AA-AAA 1-10-Yr			ML AA-AAA 10-15-Yr			ML AA-AAA 15+Yr		
Announcement	Regression Coefficient	T-value	R^2	Regression Coefficient	T-value	R^2	Regression Coefficient	T-value	R^2
IP	0.639	1.43	0.014	0.167	0.29	-0.012	0.523	1.53	0.018
CU	-0.015	0.03	0.014	-0.139	0.24	0.013	0.146	0.43	-0.011
GDP	-0.019	0.04	-0.017	**-2.05**	2.23	0.062	-0.356	0.82	-0.006
UNEM	0.032	0.07	-0.014	-0.477	1.19	0.005	0.079	0.25	-0.013
NFP	0.043	0.09	-0.013	0.352	0.89	-0.003	-0.048	-0.15	-0.013
CPI	0.739	0.88	-0.003	0.860	0.82	-0.004	0.474	1.01	0.000
PPI	0.226	0.39	-0.013	0.053	0.10	-0.016	0.045	0.14	-0.015
NAPM	0.043	0.07	-0.019	0.317	0.48	-0.015	-0.029	0.06	-0.019
ARS	0.074	0.27	-0.013	-0.522	1.30	0.009	-0.205	1.33	0.01
CC	-0.118	0.39	-0.013	-0.103	0.24	-0.015	0.304	1.04	0.001

Panel B: ML BBB-A Rated

	ML BBB-A 1-10-Yr			ML BBB-A 10-15-Yr			ML BBB-A 15+Yr		
Announcement	Regression Coefficient	T-value	R^2	Regression Coefficient	T-value	R^2	Regression Coefficient	T-value	R^2
IP	0.099	0.36	-0.012	0.396	1.52	0.017	0.029	0.14	-0.013
CU	-0.165	0.60	-0.009	0.088	0.35	-0.012	-0.185	0.92	-0.002
GDP	0.336	1.23	0.008	0.090	0.26	-0.016	0.123	0.48	-0.013
UNEM	-0.053	0.19	-0.013	-0.049	0.19	-0.013	0.133	0.75	-0.006
NFP	0.040	0.14	-0.013	0.076	0.30	-0.012	-0.022	0.13	-0.013
CPI	0.297	0.62	-0.008	0.473	0.87	-0.003	0.141	0.44	-0.01
PPI	0.110	0.36	-0.014	-0.076	0.26	-0.015	-0.076	-0.38	-0.013
NAPM	0.333	0.76	-0.008	0.565	1.51	0.024	0.450	1.26	0.011
ARS	-0.016	0.14	-0.013	-0.042	0.18	-0.013	-0.134	1.29	0.009
CC	0.146	0.77	-0.006	0.067	0.37	-0.013	0.104	0.69	-0.008

Table 5–Continued

Panel C: ML High-yield Indices									
	BB			B			CCC-L		
Announcement	Regression Coefficient	T-value	R^2	Regression Coefficient	T-value	R^2	Regression Coefficient	T-value	R^2
IP	-0.182	1.17	0.005	-0.174	1.02	0.001	0.024	0.20	-0.013
CU	-0.256	1.69	0.02	-0.215	1.31	0.01	-0.094	0.78	-0.005
GDP	0.173	0.77	-0.007	0.295	1.17	0.006	0.163	0.91	-0.003
UNEM	0.343	1.86	0.03	**0.433**	2.60	0.08	0.167	1.38	0.012
NFP	**-0.477**	2.71	0.076	**-0.482**	3.00	0.094	**-0.280**	2.41	0.059
CPI	-0.369	1.08	0.002	-0.399	1.09	0.002	0.192	0.80	-0.005
PPI	0.172	0.85	-0.004	0.010	0.06	-0.016	0.011	0.10	-0.016
NAPM	**-0.616**	3.03	0.133	**-0.480**	2.14	0.063	-0.093	0.55	-0.013
ARS	**-0.400**	2.31	0.054	**-0.405**	2.30	0.054	**-0.284**	2.73	0.079
CC	-0.280	1.78	0.032	**-0.422**	2.92	0.102	**-0.272**	2.97	0.106

Panel D: S&P Indices						
	S&P IG			S&P SG		
Announcement	Regression Coefficient	T-value	R^2	Regression Coefficient	T-value	R^2
IP	-0.062	0.57	-0.013	**-0.323**	2.04	0.058
CU	**-0.232**	1.93	0.051	**-0.598**	3.64	0.194
GDP	0.132	1.13	0.005	0.000	0.00	-0.019
UNEM	0.093	0.87	-0.005	0.266	1.60	0.029
NFP	0.001	0.01	-0.019	**-0.401**	2.38	0.08
CPI	0.051	0.18	-0.019	-0.435	1.18	0.008
PPI	0.017	0.17	-0.019	0.184	1.10	0.004
NAPM	**-0.357**	4.02	0.222	**-0.606**	4.75	0.289
ARS	**-0.221**	2.46	0.089	**-0.291**	1.85	0.044
CC	-0.137	1.49	0.023	**-0.281**	2.48	0.089

Table 6
The Effects of Announcement Surprises on Credit Spreads: Combined Regression (Merrill Lynch Credit Spread Indices)

This table examines the overall explanatory power of macroeconomic announcement surprises in explaining the changes in log-credit spreads of Merrill Lynch indices. For each credit spread index, the following model is estimated :

$$\Delta S_t = \beta_0 + \sum_{i=1}^{10} \beta_{1,i} M_{i,t} + \epsilon_t, \tag{13}$$

where ΔS_t is the change in the logarithm of the Merrill Lynch corporate bond credit spread indices from the closing of business day $t-1$ to the closing of business day t, and $M_{i,t}$ is equal to zero if day t is not an announcement day of type i , and is equal to the standardized announcement surprises of announcement type i if day t is an announcement day of type i. The sample period covers 01/02/1997 through 06/27 2003 (N=1554). In parentheses are absolute values of t-statistics, based on the Newey-West heteroskedasticity and autocorrelation-consistent covariance estimator with 7 lags. Bold numbers indicate the coefficients are significant at the 5% level.

Parameter	AA-AAA 1-10 Yrs	AA-AAA 10-15 Yrs	AA-AAA 15+ Yrs	BBB-A 1-10 Yrs	BBB-A 10-15 Yrs	BBB-A 15+ Yrs	BB	B	C
constant	-0.049	-0.054	-0.024	0.030	-0.010	-0.000	0.017	0.033	0.028
	(0.96)	(0.69)	(0.54)	(0.85)	(0.26)	(0.01)	(0.38)	(0.74)	(0.82)
IP	1.264	0.487	0.818	0.411	0.635	0.299	0.016	-0.037	0.175
	(1.73)	(0.62)	(1.58)	(0.95)	(1.52)	(0.87)	(0.07)	(0.18)	(1.17)
CU	-0.848	-0.437	-0.399	-0.419	-0.351	-0.390	-0.254	-0.188	-0.222
	(1.35)	(0.65)	(0.83)	(1.17)	(0.94)	(1.35)	(1.19)	(0.81)	(1.53)
GDP	-0.260	-2.217	-0.405	0.302	0.110	0.146	0.222	**0.336**	0.219
	(0.60)	(1.48)	(1.50)	(0.90)	(0.35)	(0.61)	(1.35)	(2.04)	(1.94)
UNEM	-0.003	-0.471	0.060	-0.066	-0.025	0.104	0.271	**0.346**	0.114
	(0.01)	(1.81)	(0.28)	(0.32)	(0.14)	(0.91)	(1.62)	(2.21)	(0.84)
NFP	0.005	0.202	-0.056	-0.005	0.047	-0.052	**-0.391**	**-0.402**	**-0.260**
	(0.01)	(0.63)	(0.24)	(0.02)	(0.19)	(0.40)	(2.53)	(2.81)	(2.22)
CPI	0.616	1.033	0.369	0.262	0.474	0.131	-0.361	-0.386	0.222
	(1.04)	(1.15)	(0.77)	(0.91)	(1.21)	(0.55)	(1.18)	(1.04)	(1.22)
PPI	0.303	0.112	0.135	0.135	-0.022	-0.055	0.179	0.02	0.033
	(1.20)	(0.24)	(1.08)	(0.97)	(0.14)	(0.52)	(1.19)	(0.15)	(0.36)
NAPM	0.087	0.417	0.042	0.393	**0.642**	0.531	**-0.538**	-0.403	-0.011
	(0.20)	(1.00)	(0.13)	(1.09)	(2.03)	(1.83)	(2.56)	(1.39)	(0.06)
ARS	0.032	-0.524	-0.217	-0.035	-0.049	**-0.136**	**-0.423**	**-0.408**	**-0.282**
	(0.26)	(0.98)	(1.83)	(0.50)	(0.27)	(2.01)	(3.10)	(3.25)	(3.33)
CC	-0.123	-0.098	0.300	0.156	0.059	0.097	-0.275	**-0.414**	**-0.263**
	(0.47)	(0.28)	(0.93)	(1.06)	(0.33)	(0.64)	(1.85)	(3.23)	(3.14)
$\overline{R^2}$	-0.003	0.005	0.005	-0.002	0.000	0.002	0.016	0.018	0.009

Table 7
The Effects of Announcement Surprises on Credit Spreads: Combined Regression (S&P Credit Spread Indices)

This table examines the overall explanatory power of macroeconomic announcement surprises in explaining the changes in log-credit spreads of S&P indices. The same regression model as stated in Table 6 is estimated for the S&P investment-grade credit index and the S&P speculative-grade index. The sample period covers 01/04/1999 through 06/27 2003 (N=1119). In parentheses are absolute values of t-statistics, based on the Newey-West heteroskedasticity and autocorrelation-consistent covariance estimator with 7 lags. Bold numbers indicate the coefficients are significant at the 5% level.

Parameter	S&P IG	S&P SG
constant	0.014	0.059
	(0.39)	(1.36)
IP	0.181	0.142
	(1.35)	(0.73)
CU	**-0.375**	**-0.679**
	(2.21)	(3.70)
GDP	0.135	0.004
	(1.06)	(0.02)
UNEM	0.090	0.249
	(0.83)	(1.66)
NFP	0.011	**-0.287**
	(0.11)	(2.28)
CPI	0.052	-0.432
	(0.18)	(1.57)
PPI	0.027	0.173
	(0.33)	(1.52)
NAPM	**-0.343**	**-0.580**
	(3.92)	(4.01)
ARS	**-0.225**	**-0.321**
	(4.51)	(2.66)
CC	-0.137	**-0.286**
	(1.57)	(2.40)
$\overline{R^2}$	0.010	0.0352

Table 8
Macroeconomic News and the Conditional Volatility of Corporate Bond Credit Spreads
(ML High-yield Indices, January 1997-June 2003)

This table presents quasi-maximum likelihood estimates of the conditional variance parameters in the ARX-ARCH-Jump model specified in Eq (7) using Merrill Lynch high-yield credit spread indices. In the ARX-ARCH-Jump model in Eq (7), the disturbance ϵ_t has expectation zero and is a mixture of two normal distributions: with probability $(1-\lambda_t)$, when jumps do not occur, it is distributed as $N\left(-\lambda_t\mu_J, h_t^2\right)$; with probability λ_t, it is distributed as $N\left((1-\lambda_t)\,\mu_J, h_t^2+\sigma_J^2\right)$. h_t^2 is the conditional variance of ϵ_t in the no-jump state and is specified as a modified ARCH(1) process to incorporate macroeconomic release information:

$$\begin{aligned} h_t^2 &= \exp(\delta_0 + \delta_1 I_{FOMC,t-1} + \delta_2 I_{NFP,t-1} \\ &\quad +\delta_3 I_{ARS,t-1} + \delta_4 I_{CC}) + b_1\left(1 - D_{1,t-1}\right)\epsilon_{t-1}^2, \end{aligned} \tag{14}$$

The jump probability λ is

$$\lambda = \exp\left(p_0 + p_1 * VIX_{t-1}\right) / \left(1 + \exp\left(p_0 + p_1 * VIX_{t-1}\right)\right), \tag{15}$$

where VIX_{t-1} is the lagged level of CBOE VIX volatility index. The asymptotic heteroskedasticity-consistent standard errors are below the parameter estimate. Bold numbers indicate the parameter of interest is significant at the 5% level

Parameter	BB	B	CCC-L
δ_0	0.1213	0.2420	-0.7422
	(0.109)	(0.138)	(0.086)
δ_1	0.0349	-0.2036	-0.4348
	(0.368)	(0.225)	(0.270)
δ_2	0.2867	0.1400	0.4008
	(0.202)	(0.188)	(0.301)
δ_3	**0.5032**	**0.4811**	0.1595
	(0.213)	(0.166)	(0.185)
δ_4	0.1347	0.1467	0.0694
	(0.268)	(0.244)	(0.210)
b_1	**0.1328**	**0.0532**	**0.0828**
	(0.043)	(0.021)	(0.025)
p_0	-5.2158	-5.6410	-4.8971
	(1.373)	(1.462)	(0.870)
p_1	0.0581	**0.0809**	**0.0837**
	(0.030)	(0.034)	(0.022)
μ_J	1.0308	0.8527	0.2518
	(1.654)	(1.299)	(0.294)
σ_J	5.3321	**4.0933**	**2.3259**
	(2.742)	(1.921)	(0.532)
$Ln(L)$	-2592.08	-2611.16	-1992.34

Table 9
Macroeconomic News and the Conditional Volatility of Corporate Bond Credit Spreads
(S&P Credit Indices, January 1999-June 2003)

This table presents quasi-maximum likelihood estimates of the conditional variance parameters in the ARX-ARCH-Jump model specified in Eq (7) using the S&P credit spread indices. In the ARX-ARCH-Jump model in Eq (7), the disturbance ϵ_t has expectation zero and is a mixture of two normal distributions: with probability $(1-\lambda_t)$, when jumps do not occur, it is distributed as $N\left(-\lambda_t \mu_J, h_t^2\right)$; with probability λ_t, it is distributed as $N\left((1-\lambda_t)\,\mu_J, h_t^2+\sigma_J^2\right)$. h_t^2 is the conditional variance of ϵ_t in the no-jump state and is specified as a modified ARCH(1) process to incorporate macroeconomic release information:

$$\begin{aligned} h_t^2 &= \exp(\delta_0 + \delta_1 I_{FOMC,t-1} + \delta_2 I_{NFP,t-1} \\ &\quad +\delta_3 I_{ARS,t-1} + \delta_4 I_{CC}) + b_1 \epsilon_{t-1}^2, \end{aligned} \tag{16}$$

The jump probability λ is

$$\lambda = \exp\left(p_0 + p_1 * VIX_{t-1}\right) / \left(1 + \exp\left(p_0 + p_1 * VIX_{t-1}\right)\right), \tag{17}$$

where VIX_{t-1} is the lagged level of CBOE VIX volatility index. The asymptotic heteroskedasticity-consistent standard errors are below the parameter estimate. Bold numbers indicate the parameter of interest is significant at the 5% level

Parameter	S&P IG	S&P SG
δ_0	-0.8196	-0.4606
	(0.164)	(0.206)
δ_1	0.2122	0.2564
	(0.619)	(1.046)
δ_2	-0.2270	0.4673
	(0.294)	(0.253)
δ_3	-0.0567	0.5842
	(0.374)	(0.363)
δ_4	-0.0311	-0.2595
	(0.246)	(0.384)
b_1	**0.2137**	**0.0753**
	(0.077)	(0.036)
p_0	-5.0533	-4.9139
	(1.864)	(1.234)
p_1	0.0587	**0.1476**
	(0.042)	(0.056)
μ_J	0.9757	0.0843
	(1.152)	(0.179)
σ_J	2.9685	**1.2222**
	(1.926)	(0.286)
$Ln(L)$	-1377.62	-1352.70