Interpreting movements in high-yield corporate bond market spreads

By Neil Cooper, Robert Hillman and Damien Lynch of the Bank's Monetary Instruments and Markets Division.

Spreads of corporate bond yields over risk-free rates are often used as a leading indicator of macroeconomic conditions. The large widening of spreads within the US high-yield bond market during the second half of 2000 might be a precursor of a downturn in the US economy. This article describes work done at the Bank during the last two months of last year that attempted to interpret these movements and assess their implications for the US economy.

Introduction

Credit spreads in the United States widened considerably during 2000, particularly in the high-yield bond market. Even indices of single-A and AA rated bonds widened in the last few months of the year. By contrast, with the exception of telecoms bonds, there was little evidence of widening in UK credit spreads. In this article we explain why US spreads widened, and assess the implications for the US macroeconomic outlook.

Chart 1 shows movements in UK credit spreads against swaps(1) across credit classes. During the second half of 2000, there was evidence of only a very small widening in spreads for single-A and BBB firms. And they have certainly not attained high levels by historical standards. Chart 2 shows spreads against swaps for the same credit classes in the United States. It is clear that there was a much more dramatic widening of spreads from May 2000 onwards. By early November 2000, spread levels for all three credit ratings were at the levels reached during the recession of the early 1990s. Did this mean that financial markets were pricing in expectations of a recession? This article describes work done at the Bank during the last two months of 2000 that addressed this question. Since then, high-yield spreads have narrowed substantially. The focus of the article, however, is to interpret the movements from the beginning of June until the end of December.

Chart 1
Spread of UK corporate ten-year par yields over swaps

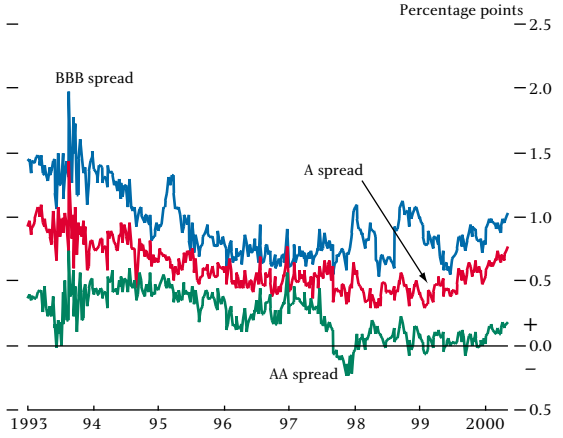
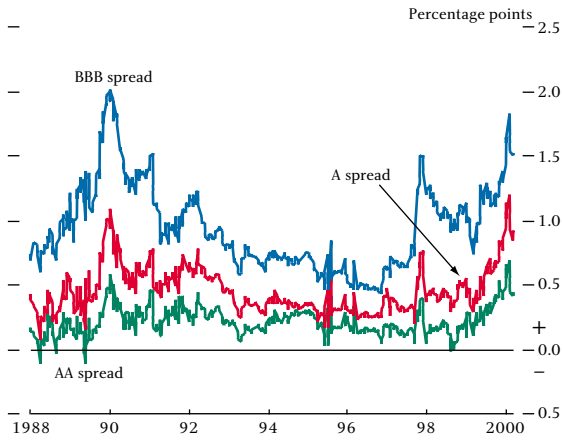


Chart 2
Spread of US corporate ten-year par yields over swaps



(1) We use interest rate swap rates rather than government bond yields as the benchmark. In both the United States and the United Kingdom, there is evidence to suggest that government bond yields have become an increasingly distorted proxy for risk-free rates, as the supply of government bonds has fallen. An interest rate swap exchanges an agreed fixed rate of interest on a notional principal—the quoted swap rate—for a floating interest rate. The fixed rate may be interpreted as the yield on a bond that is trading at par. Although in principle this yield contains a small credit risk premium, we think that changes in corporate bond spreads over swap rates are likely to be more accurate measures of changes in spreads over the 'true' risk-free rate than changes in spreads over benchmark government bond yields.

The leading-indicator properties of corporate bond spreads

Fixed-income market spreads have been used as leading indicators of macroeconomic conditions since the early part of the 20th century when Irving Fisher (1907) suggested a link between the term structure of interest rates and expectations of economic growth. Like other financial data, spreads are determined in forward-looking markets, and are available at a higher frequency than standard macroeconomic variables. These features have generated a substantial literature assessing the information in government bond term spreads (long yields minus short yields), swap spreads, international spreads, and corporate bond spreads.(1) While most of the latter work has used investment-grade bonds, recent work by Gertler and Lown (2000) has suggested that there may be more useful information contained in the spreads of lower-grade debt. In their paper, they attempt to capture the historical correlation between high-yield spreads and subsequent movements in output with a simple econometric model. They found that adding lags of the high-yield spread to a simple forecasting model containing lags of the US real output gap improved forecasts of the future real output gap. The statistical significance of the high-yield spread was found to be robust to changes in the model specification in the face of other competing explanatory variables.

What can account for the leading-indicator properties of the high-yield spread for output? There are three possible (and not necessarily mutually exclusive) links between the two variables:

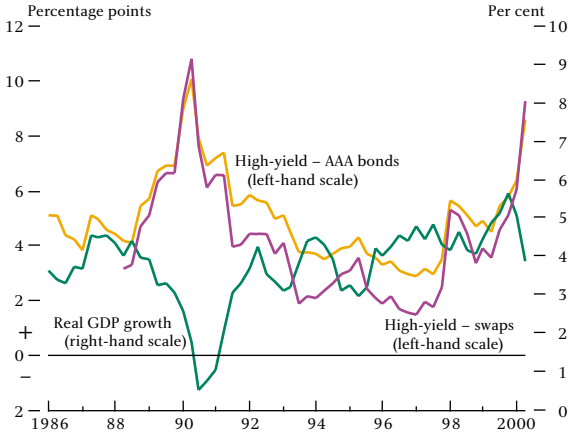
- Rational investors in corporate debt form expectations of the possible losses on a bond resulting from future default. In doing so they need to look forward and assess the strength of cash flows being generated by the firms issuing the debt. A perception of the possibility of a future macroeconomic slowdown is likely to result in a downward revision to these expected cash flows and an increase in default probability, particularly for high-yield bond issuers whose interest payments are relatively high. So if investors are expecting a macroeconomic slowdown, high-yield bond credit spreads may be a particularly informative leading indicator.

- The widening of credit spreads is as much a cause as a symptom of a slowdown. One part of the recent macroeconomics literature emphasises the role that financial market imperfections play in reinforcing a downturn in output. It argues that firms have to pay a premium for raising external finance rather than investing internally generated funds. In a slowdown, with less internal cash flow generated, firms respond by investing less—a reduction in the *demand* for capital. This then exacerbates an initial fall in output, and so on. Gertler and Lown (2000) argue that this premium is also likely to be counter-cyclical and that high-yield bond spreads are the best observable proxy for this premium. Hence a widening of the spread reflects an increase in the external debt premium, which causes companies to cut back on investment and GDP subsequently to fall.

- Widening credit spreads may be indicative of a broad-based and sudden restriction in the *supply* of credit via the bond markets. A deterioration of the financial position of investors may cause them to move away from risky assets towards less risky securities such as government bonds. The restriction in the supply of credit is also likely to result in a widening of corporate bonds spreads. So a widening of bond spreads is likely to lead a downturn in the macroeconomy.

Chart 3 plots the historical relationship between the spread of the Merrill Lynch high-yield index over swaps and US real GDP growth. Because we have swap data only back to 1988 we also plot the spread between the high-yield index and an index of AAA bonds to get a longer time series. The two spread indices tend to track each other closely. To gauge the implications of the historical correlation between high-yield spreads and

Chart 3
High-yield spreads and US GDP growth



(1) Two useful studies that also contain surveys are Dotsey (1998) and Bernard and Gerlach (1996).

output, we regressed real GDP growth four quarters ahead on lags of quarterly real GDP growth and lags of the high-yield spread.(1) From a base of 2000 Q4, this model predicted that annual US real GDP growth in 2001 would be 0.9%. Not surprisingly, the confidence intervals around this forecast are wide (the model predicts with 95% confidence that growth will be between –1.8% and +3.5%), but taken at face value annual growth of less than 1% is significantly lower than other forecasts being made at the time. For example, in December 2000 the average forecast for 2001 growth in *The Economist's* 'poll of forecasters' was 3.0%, and was still at 2.3% at the end of January 2001. This type of econometric model is bound to predict a sharp decline in growth because the last time spreads rose as much as they did, during the last half of 2000, GDP growth fell sharply. The crucial question was: is it sensible to extrapolate from what happened to aggregate spreads prior to the 1991 sharp downturn to the situation today?

Simple structural models of corporate bond spreads

What should drive credit spreads? Theory tells us that it should be the expected losses on a bond resulting from the possibility of default. Structural models of credit spreads following Merton (1974) use option pricing theory to show how to value the credit risk of corporate bonds. In the simplest version of this model firms issue equity and a single bond with a given face value. At the maturity of the bond, the firm either has sufficient value to pay off the bond or it defaults. If it defaults, the bond-holders receive whatever is available and the equity-holders get nothing. If the firm is worth more than the face value of the debt, the debt-holders receive the face value and the equity-holders get the rest.

The debt can be thought of as a combination of a default risk free bond minus a put option on the value of the firm's assets with a strike price equal to the face value of the debt. This put option reflects the opportunity the debt-holders provide to the equity-holders of walking away with limited liability in the event of bankruptcy. The credit spread is simply the price of this option in terms of the extra yield paid to bond-holders and reflects the expected losses on the bond. Given this simple framework we can use option pricing theory to work out the determinants of spreads, calculate theoretical values for the spread, and monitor the change in spread as the capital structure and characteristics of the firm change. This model is consistent with the Miller-Modigliani theorem: at any time the total value of the firm is unaffected by the capital structure. The model tells us how the firm's current value is split between equity and debt-holders.

For an individual firm, the standard Merton (1974) model suggests that credit spreads should depend on:

- the value of the underlying assets; the higher the value of the expected cash flows generated by the firm's business, the more likely it is to be able to pay off its debt. A fall in the expected profitability of the firm *ceteris paribus* will cause a widening of credit spreads and a fall in equity values;

- the face value of the debt; the more debt there is, the more likely the firm will be unable to pay it off;

- the *future* volatility of the value of the firm's assets; the more diverse the range of future possible values for the firm, the higher will be the probabilities attached to states of the world in which the firm defaults. And higher probabilities will also be attached to states of the world where recovery rates are low; and

- the maturity of the debt; for most firms(2) there is an upward-sloping credit term structure. Firms' values may look fine now but the more time there is, the more chance there is that bad news will arrive to depress a firm's value.

The model is especially useful in showing the *non-linear* dependence of credit spreads on these variables. For a firm with a high valuation relative to debt, a big fall in the value of its equity (which is the observable proxy for the firm's underlying value) may not result in much

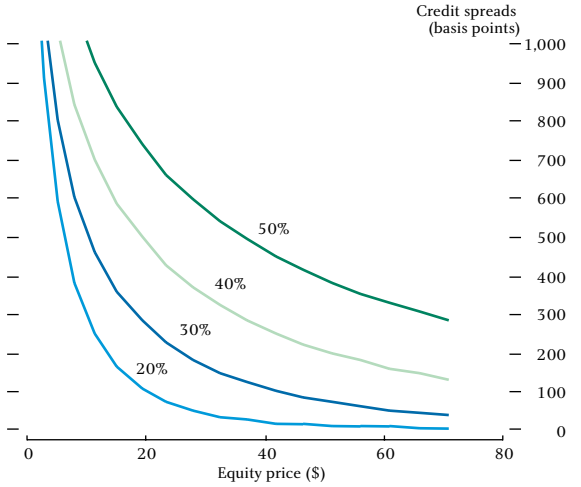
(1) We followed a general-to-specific methodology to specify the model. Beginning with four lags of the spread and four lags of GDP growth on the right-hand side, we dropped all insignificant variables (at 90% confidence), and were left with just the first lag of the spread and a constant. This model was used to generate the out-of-sample forecast. Because no lags of GDP growth were selected as explanatory variables, we were able to produce a forecast from this model in December 2000, before Q4 GDP data was available. We do not see this as an optimal forecasting model, but as a simple way to quantify the implications of assuming that a linear regression model can capture the visual relationship seen in the chart.

(2) Very highly geared firms have a downward-sloping credit term structure in this model. They have so much debt that if they had to pay it back tomorrow they would default. But with sufficient time, it is possible that enough beneficial shocks will occur to enable them to pay back their debt.

change in its credit spreads. Intuitively, even though the firm's value may have dropped significantly, the chances of default may still be very remote. But as valuations continue to fall, default becomes a real possibility and at some point credit spreads significantly increase. As we explain below, this insight is crucial to understanding recent conditions within US credit markets.

Chart 4 demonstrates this effect using the model. We assume a company with debts with a face value of $40 and a range of volatilities(1) for the underlying asset value. We then use the model to generate bond prices and the associated credit spreads for different levels of the firm's value and volatility. The equity price is given by the firm's value minus the bond price. The chart then plots credit spreads against equity values. It is easy to see that as the value of the firm's equity falls (reflecting falls in the underlying asset values), the credit spread increases at an increasing rate.

Chart 4
Merton model credit spreads (for alternative volatility assumptions)

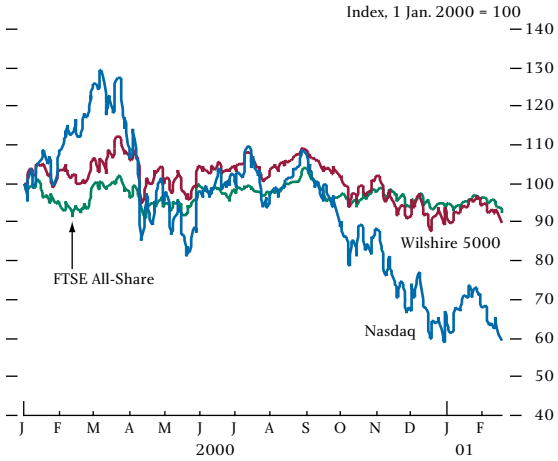


What can macroeconomic data tell us about bond spreads?

An obvious approach to interpreting the movements in high-yield bond spreads would be to apply this framework to corporate America as a whole. Could we attribute the widening of US credit spreads in the second half of 2000 to the above drivers of credit spreads at a macroeconomic level? And did they explain why US spreads widened during the second half of 2000 while UK spreads remained broadly stable?

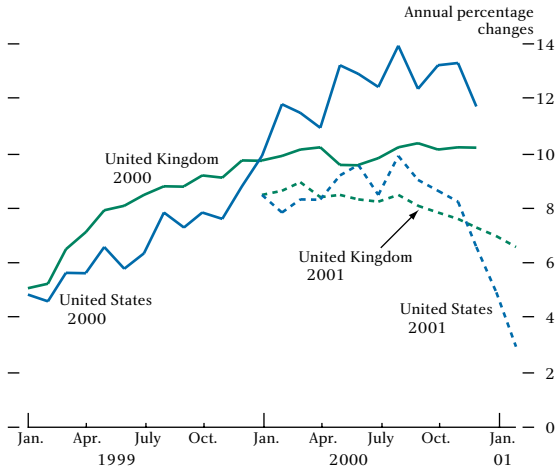
Taking equity values first, although there had been a great deal of volatility, by 2000 Q4 the broad equity indices (shown in Chart 5) were not far from their levels in January 2000. The Nasdaq was considerably lower than at the beginning of 2000 and much lower than the early spring peaks, but the broad-based Wilshire 5000 was only around 5% lower than at the start of 2000. And the movement in the Wilshire compared with the FTSE All-Share index could not explain the relative widening in spreads in the United States versus the United Kingdom.

Chart 5
Broad equity indices



Neither by the end of November 2000 did survey measures of expectations of corporate profitability imply any dramatic fall in corporate profitability in the near-term future. Chart 6 shows the results of Merrill Lynch's survey of fund managers' expectations of

Chart 6
Merrill Lynch survey of investors' expectations of earnings per share growth



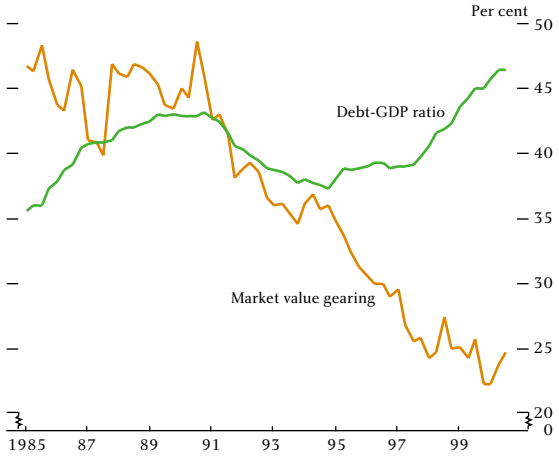
Source: Merrill Lynch.

(1) In the model the firm's future returns are normally distributed and the volatility determines their variability. A firm with a volatility of 20%, for example, will have future annual returns with a standard deviation of 20%.

aggregate earnings per share (EPS) forecasts. Although expectations of EPS growth for 2001 were lower than for 2000 and have since fallen sharply, at the end of November they were still buoyant at more than 7% in both the United Kingdom and United States.

Had levels of US corporate gearing risen dramatically during 2000? Chart 7 shows that aggregate gearing, measured by debt as a proportion of total market value, had actually been falling during the late 1990s and reached a low in early 2000. But this reflects the rapid rise in equity values over that period. The chart also shows the value of corporate debt as a proportion of GDP. Levels of debt had been rising to relatively high levels on this measure but there was no rapid rise in aggregate debt levels that would have suggested a large widening in credit spreads.

Chart 7
Corporate debt in the United States



Could equity market volatility at an aggregate level explain the rise in spreads? The answer again is no. By late November 2000, forward-looking expectations of volatility, as indicated by the implied volatility of equity index options, were lower in both the United Kingdom and the United States than at the start of 2000, despite the rises during the summer. And as Chart 8 shows, implied volatilities have tracked each other closely for both markets so this cannot explain the divergence between the United States and the United Kingdom.

It might be reasonable to expect credit spreads to be related to the probabilities of large falls in equity prices. So in Chart 9 we present the implied probabilities of large falls in the US and UK broad equity indices. Although these probabilities did increase a little towards the end of 2000 (but have since fallen back partially),

Chart 8
Equity index implied volatility

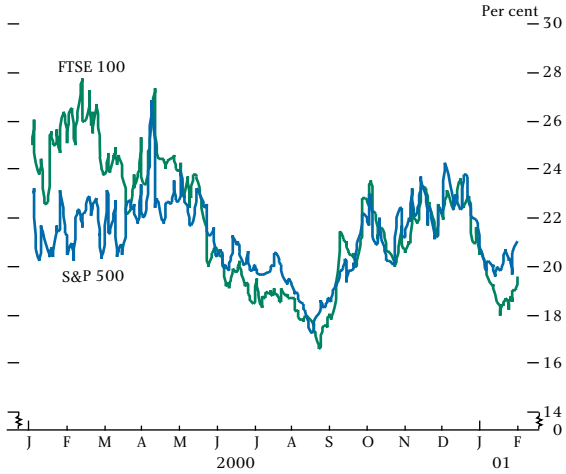
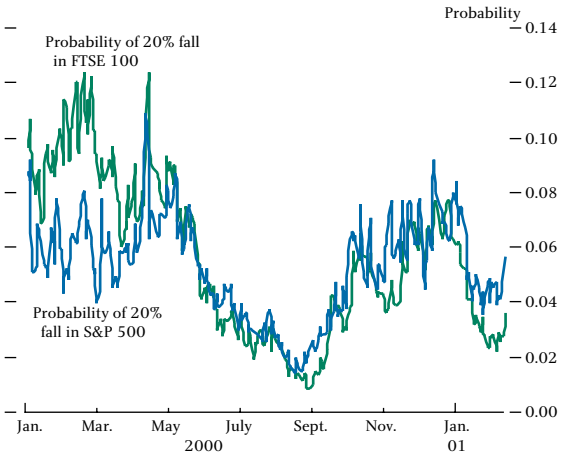


Chart 9
Implied downside risk of equity indices



the story is similar to that for implied volatility: downside risk was lower by the end of 2000 than at the start of the year and little higher in the United States than in the United Kingdom.

So at an aggregate level it is difficult to understand the widening in credit spreads in terms of expectations of corporate profitability or their volatility, as the structural model above would suggest. And although levels of corporate debt have been rising in recent years, there was no sudden increase during 2000 that was likely to be sufficient to raise spreads by as much as actually occurred.

Interpretation via disaggregation

In order to reconcile the widening of average spreads with a lack either of falls in aggregate market indices or increases in volatility or gearing we have to disaggregate the data. In addition, we need to recognise two things:

first, the non-linear response of spreads to the equity price that was generated by our simple theoretical model and, second, the fact that there has been a great deal of heterogeneity in the movement of spreads within credit classes in the latter half of 2000. If firms whose share prices have dropped considerably suffer a much bigger widening of their credit spreads than the narrowing of spreads enjoyed by those firms who have seen an equivalent rise in their share price, then it is possible for the average of a set of spreads to rise even though the average equity movement is nil.

To examine this we calculated a large number of credit spreads for single-A, BBB and high-yield(1) US corporates. For each firm we then calculated the change in the credit spread between June and November 2000, and the corresponding change in the share price. Charts 10, 11 and 12 plot the change in the credit spread against the change in the share price for single-A, BBB and high-yield, corporates respectively. Each observation refers to a particular firm in each of these three rating classes.(2)

So we need lots of observations in the top left quadrant and few in the bottom right quadrant. In other words, some firms that have seen a big fall in share prices experience a large increase in their credit spreads, but firms whose share prices have performed well do not see an equivalent reduction in credit spreads. Note that we know from the theoretical model that it is perfectly possible for a firm to suffer a large fall in its share price and yet not suffer a large spread widening if it starts off with sufficiently low gearing. We are therefore likely to find that the firms whose spreads have dramatically increased come predominantly from the poorer end of the credit quality range.

Chart 10 demonstrates that our explanation works well at explaining movements in high-yield credit spreads. The mean increase in credit spread in this sector was 91 basis points but the median (50th-percentile) firm saw an increase of only 48 basis points. The average spread series is being pulled up by a few firms that are experiencing especially large spreads.

To see this effect in practice, we examine the behaviour of Xerox's share price and its credit spreads over the second half of 2000 (see Chart 13). Each observation plots the combination of the share price and the credit

Chart 10
Changes in spread vs changes in equity price for high-yield US corporates

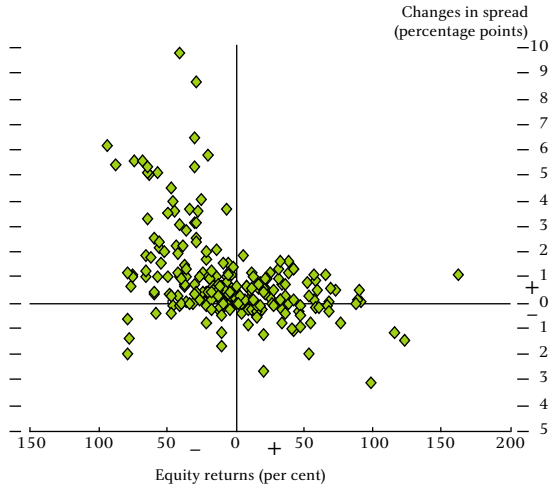


Chart 11
Changes in spread vs changes in equity price for BBB-rated US corporate bonds

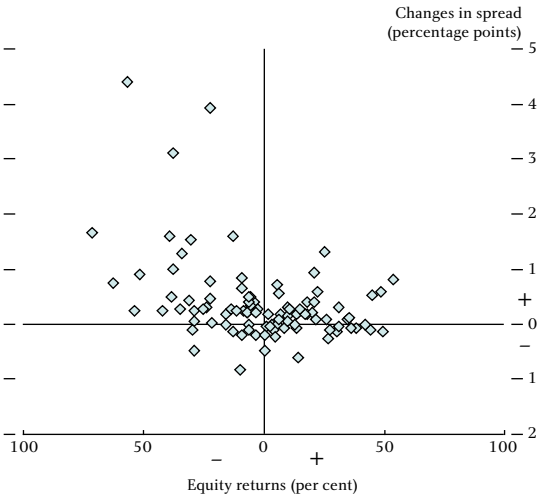
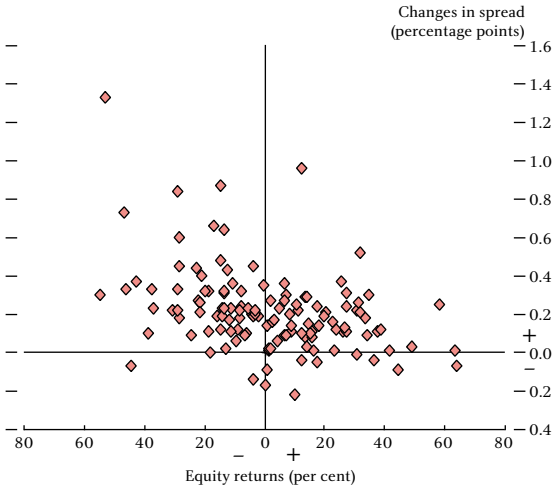
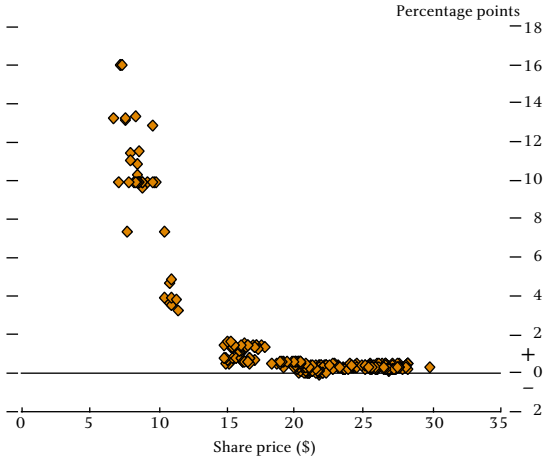


Chart 12
Changes in A-rated corporate credit spreads vs changes in share prices



(1) Members of Merrill Lynch's US high-yield master index.
(2) For these charts that compare spreads over time, we had to use bonds that were common to both the June and December indexes.

Chart 13
Xerox share price and credit spread



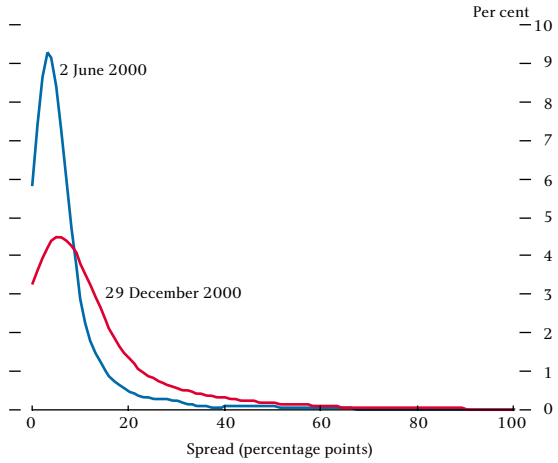
spread on a particular day. Xerox's share price fell dramatically when it issued a profit warning in early October. Until the share price dropped below $15 there was only a very limited widening in the credit spreads for its bonds. But as it dropped to $10 and below, the spreads increased to more than 1,000 basis points.

Charts 11 and 12 demonstrate that for the better credits the story does not work so well. There is still some evidence of a non-linear relationship within the universe of BBB firms. But at single-A it is more difficult to make that judgment. Remember, however, that it was mainly the widening in high-yield spreads to which observers were pointing as an indicator of a possible hard landing. And the evidence is that we can explain much of the average widening as the result of a subset of firms whose credit spreads have increased substantially.

How widespread have spread increases been?

There appears to have been a much greater diversity of experiences between US companies over the second half of 2000 than earlier in the year. Chart 14 plots the distribution of high-yield credit spreads at the start of June and the end of December. The mean spread in June was 7.61 percentage points; by December it was 14.22 percentage points. The median spread had also increased from 3.67 percentage points to 6.37 percentage points. The mean had been pulled up by some firms whose bond spreads had increased substantially, causing the distribution to become more positively skewed.(1) In June there were four bonds yielding 100 percentage points or more than swaps. By December there were 22 bonds in this position.

Chart 14
Distribution of US high-yield credit spreads



Note: The units on the y-axis represent the probability of the spread being within +/– 50 basis points of any given spread.

Lower-rated bonds experienced much greater widening of spreads than higher-rated bonds. For example the average spread (over Treasuries) in Moody's high-yield index of Caa-rated bonds widened by 753 basis points over 2000. By contrast, the average spread increase of Ba-rated bonds (the highest rating in their high-yield index) increased by only 141 basis points.

Another useful indicator that closely tracks the trends and turning-points in the high-yield spread is the ratio of downgrades to upgrades determined by ratings agencies. This, like the spread, is currently very high, nearly at the levels reached in the early 1990s. However, consistent with our analysis of the high-yield spread, there has been a considerable dispersion of experience within the index. The lowest-rated firms (the index comprises Ba, B, Caa-C) have suffered far more than the higher-rated firms.(2) This ratio was 5 to 1 (downgrades per upgrade) for Caa-C ratings in 1998–2000. For higher ratings, like Ba for example, the ratio was considerably lower at 1.2 to 1.

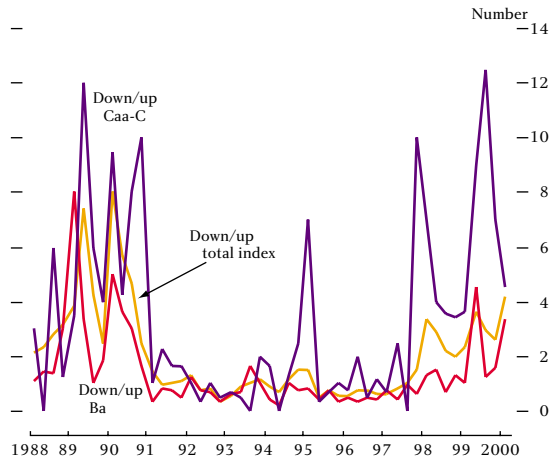
Downgrades per upgrade by rating category

	All ratings	Ba	B	Caa
1988–90	2.9	1.6	3.6	4.5
1998–2000	2.2	1.2	2.3	5.4

The table shows upgrade-downgrade ratios for 1988 to 1990 and 1998 to 2000. Chart 15 shows these ratios on a quarterly basis from 1988 to 2000. Prior to the last downturn, downgrades were much more widespread across the high-yield ratings. Anecdotal evidence

(1) Skewness (measured as (mean-median)/standard deviation) increased from 0.22 to 0.28.
(2) This analysis of upgrade/downgrades is based on data provided by Moody's, and is discussed by them in their *Global Outlook 2001*.

Chart 15
Downgrades per upgrade by rating category

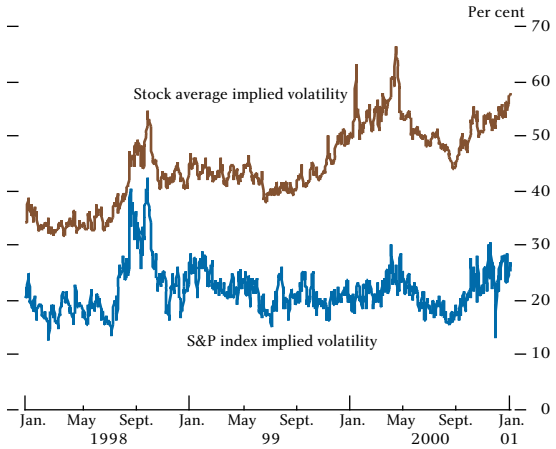


suggests that this is what we would expect to find in terms of our spread distributions as well.(1) There was a more generalised widening of spreads the last time the index had reached the recent high levels. These findings lend weight to the idea that we should perhaps be careful about extrapolating from the past based on just the aggregate index data.

Idiosyncratic risk and sector-specific stories

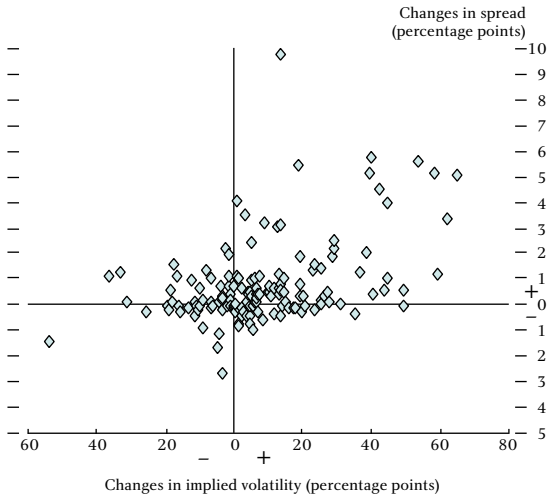
One factor that can explain this widening of the high-yield sector is an increase in idiosyncratic risk affecting firms. We have already demonstrated that implied index volatility was at about the same level at the end of the year as halfway through the year, and somewhat lower than at the start of the year. However, there have been big increases in firm-specific risk as measured by individual equity implied volatilities based on individual firm options. Chart 16 below plots two series. The first is simply the implied volatility for the S&P 500 index. The second is the average of the implied volatilities of the individual stocks that make up the index. The two differ because the index is effectively a diversified portfolio of stocks. The risk that is idiosyncratic to a firm is diversified away in such a portfolio leaving only risk that is systematic to all firms. What the chart shows is that forward-looking expectations of individual firms' volatility have on average increased from about 35% at the beginning of 1998 to close to 60%. In contrast, the implied volatility of the index has increased only from 20% to 25%. In other words there has been a large rise in the degree of idiosyncratic risk associated with future movements in US firms' values. And the chart shows that most of this increase has occurred since mid-1999.

Chart 16
Stock average vs index implied volatility for S&P 500



This matters for interpreting credit spreads because the expected loss on a firm's debt is determined by the total risk of a firm's returns—idiosyncratic as well as systematic risk. Increased risk in the US economy may well have been an important factor in explaining the widening of credit spreads during 2000. But risk has to be measured at the level of the individual firm using the implied volatility for each firm's equity, and not from the implied volatility of the index. This is demonstrated by Chart 17, which plots changes in firms' credit spreads against changes in the implied volatility of their equity prices. This indicates that for high-yield firms, there was a positive relationship between changes in implied volatility and changes in credit spreads

Chart 17
Changes in US high-yield credit spreads vs changes in implied volatilities



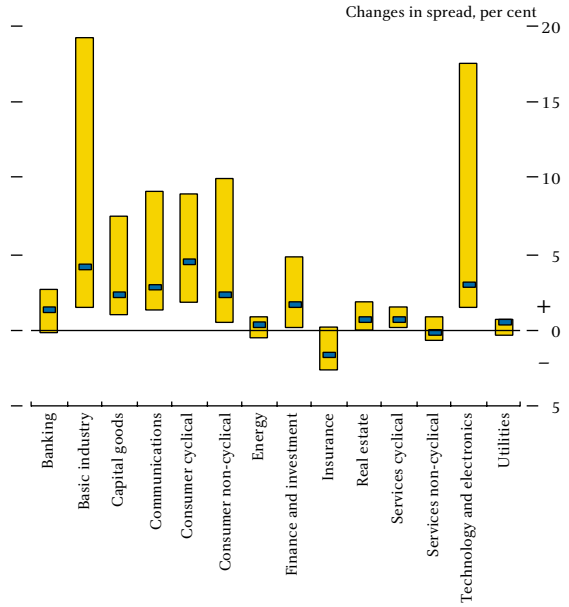
(1) Unfortunately prior to 1996, Merrill Lynch only has the high-yield bond index number, and not the list of constituents or individual bond yields. This has limited our ability to do disaggregated analysis historically, given that we would like to determine the extent to which the increases in spreads in the early 1990s were a generalised phenomenon.

between the beginning of June and the end of December 2000.

We also explored whether most of these firms with credit spread increases were heavily concentrated within particular sectors. Given the large falls in the Nasdaq index during the second half of 2000, it might be expected that many of the firms whose spreads had widened were within the technology sectors. To examine this, we divided firms into sectoral groups and examined the distribution of changes in spreads between the beginning of June and the end of December 2000. Chart 18 shows the results. The yellow bar represents the range between the 25th percentile and the 75th percentile of spread changes for each sector. The blue lines represent the median spread change. A number of observations may be made:

- there is clearly a great deal of dispersion even within particular sectors;
- although it is true that two of the sectors that experienced large widening of spreads were telecommunications and technology, there were also plenty of firms whose credit spreads widened dramatically within the basic industry, consumer cyclicals, consumer non-cyclicals and capital goods sectors. In other words this was not just a 'new economy' story; and
- the large difference between the 75th percentile and the median change in spreads suggests that even within sectors there is a considerable diversity of experience.

Chart 18
Distribution of spread changes in high-yield industry sectors



So, overall, sectoral distinctions seem to play a minor role. Rather, as we argued before, much of the widening of aggregate credit spread indices appears to be due to firm-specific phenomena.

What are the implications for the US macroeconomic outlook?

Summarising the stylised facts associated with the widening in US high-yield spreads during 2000:

- High-yield bond index spreads widened dramatically during the second half of 2000 to levels not seen since the US recession of the early 1990s.
- At an aggregate level it is difficult to understand why this widening occurred in terms of movements in equity prices, volatility or gearing levels.
- The disaggregated data show that the relationship between credit spreads and their determinants is highly non-linear. Because spreads change much more in response to bad news than good, an increase in the diversity of corporate performance can increase spreads on average. So much of the widening of credit spreads has been due to very large spread increases suffered by a limited subset of firms.
- Some sectors have performed worse than others but there remains a great deal of dispersion within sectors, suggesting that much of the widening is as a result of firm-specific events.

What do these facts imply for the macroeconomic outlook? One possibility is that the diversity of firms' experience has been much greater recently than in previous episodes. The market had dramatically revised down the valuations of a specific subset of firms, causing in some cases massive increases in the cost of debt capital. Such events are perfectly consistent with the notion of capital markets efficiently re-allocating capital between firms. And the degree of heterogeneity between firms' experiences was arguably a natural phenomenon in an economy experiencing a high degree of structural change. This suggests that the historical negative correlation between high-yield spreads and subsequent macroeconomic performance

may have broken down, and the outlook is less pessimistic than an extrapolation of this relationship would indicate.

But another possibility is that this diversity of corporate experience is typical of oncoming recessions, which 'weed out' weak firms, so that what has been witnessed is the market assessing which firms might be likely to default, ahead of a slowdown. On that basis, the previous sequence might be expected to recur, with a slowdown following a widening of credit spreads.

There is no conclusive evidence enabling us to choose decisively between these two possibilities. In particular we cannot now subject previous episodes to the same disaggregated analysis as we apply to the events of last year. We have only limited evidence from credit ratings and from market anecdote that experience across firms is more diverse this time round.

But even if large increases in the cost of debt capital are unusually concentrated in a specific subset of firms, this could still have significant macroeconomic consequences. If the firms in trouble were those that had invested heavily in recent years, there might still be a significant downside risk to aggregate investment if their investment were drastically curtailed.

On balance the recent experience seems to be sufficiently different from that of the early 1990s that it would be unwise to rely on a simple forecast using a high-yield credit index. On the other hand we could not rule out the possibility that the widening of spreads *was* a precursor to a slowdown. In particular, there might be a significant downside risk to investment.

References

Bernard, H and Gerlach, S (1996), 'Does the term structure predict recessions? The international evidence', *BIS Working Paper*, No. 37.

Dotsey, M (1998), 'The predictive content of the interest rate term spread for future economic growth', *Federal Reserve Bank of Richmond Quarterly Review 84/3*, Summer, pages 30–51.

Fisher, I (1907), *The Rate of Interest*, New York: Macmillan.

Gertler, M and Lown, C S (2000), 'The information in the high yield bond spread for the business cycle: evidence and some implications', *NBER Working Paper*, No. 7549.

Merton, R C (1974), 'On the pricing of corporate debt: the risk structure of interest rates', *Journal of Finance*, Vol. 29, pages 449–70.

Moody's (2001), *Global Outlook 2001*.