THE CHALLENGE OF MANAGING CREDIT SPREADS: NEW TOOLS ON THE HORIZON

by Andrew Kalotay, Leslie Abreo, and Michael Dorigan, Andrew Kalotay Associates, Inc.

Loosely speaking, "credit spread" refers to the additional yield investors demand on a bond in excess of the Treasury rate of matching maturity to compensate for the risk of default. Treasury rates are accepted by convention to be riskless. The additional yield depends on the underlying credit of the issuer, and on the seniority, structure, and term of the borrowing.

Corporate credit spreads fluctuate over time, just as Treasury rates do. The Russian default in late 1998 ushered in an era of unprecedented credit spread volatility—one that arguably has not ended at the time of this writing. As a consequence of this volatility, corporations face increased uncertainty about their borrowing cost. At the same time, investors and traders in the corporate bond and commercial loan markets are concerned about the effects of changing spreads on their portfolios.

How can market participants, be they issuers, investors, or traders, hedge their exposure to interest rate movements? Although they can efficiently and cost-effectively take a position on U.S. Treasury bonds (and by extension, Treasury rates) using Treasury-based futures contracts and options, no tools currently exist for conveniently managing credit spreads.

Standard & Poor's has announced two credit indices in the financial press[1]—one for U.S. investment-grade industrials and the other for U.S. speculative-grade industrials—that have the potential to fill this important need. Derived from the prices of actively traded bonds, these indices are likely to spawn a variety of tools that will enable market participants, including corporate treasurers, to manage their exposure to changes in credit spreads.

This article touches broadly on many aspects of credit spreads, the challenges they pose, and the tools available to manage them. Beginning with an overview of credit spreads, we proceed to describe how they manifest themselves in the primary market as incremental borrowing costs, and in the secondary market as differences in the yields of risky and riskless bonds. After discussing how credit spreads vary with the term of borrowing and the creditworthiness of the borrower, we examine their recent behavior in greater detail from empirical data, comparing volatilities and correlations across different rating categories.

Against this backdrop, we present a brief example illustrating the corporate treasurer's need for tools to manage credit spreads. We show how the S&P credit indices represent a potential source of these tools and describe their distinguishing features. Finally we discuss possible applications of the new credit indices, such as providing a basis for exchange-traded credit derivatives, and the potential treatment of such derivatives under FAS 133.

1. See *The Wall Street Journal*, February 16, 1999, p. C23 and *Businessweek*, April 19, 1999, p. 139.

OVERVIEW OF CREDIT SPREADS

Because of the risk of default, the market value of corporate debt, whether a bond or a bank loan, is lower than that of a (risk-free) U.S. Treasury bond of the same maturity. Depending upon the perceived level of risk, the discount can be fairly narrow (in the case of U.S. Agency bonds) or quite substantial (for speculative-grade bonds and emerging market loans). Stated differently, in order to sell for the same price as a Treasury bond, a corporate bond must pay a higher rate of interest, i.e., carry a higher coupon.

It is customary to convert the bond's price from dollars (or percentage of face value) to yield-to-maturity (or "yield," for short). Yield is expressed as an annual rate; in the case of a pure discount (zero-coupon) bond, it reflects the actual interest rate demanded by the market. For a coupon-bearing bond this interpretation can be misleading, particularly if there is any optional refunding feature, such as a call or a put.

The difference (or "spread") between the yield of a corporate bond and that of a comparable Treasury bond, quoted in basis points (hundredths of a percent), is a measure of credit risk. The riskier the bond the lower is its price, the higher is its yield, and the wider is its spread relative to Treasuries.

Of course, this spread depends not only on the perceived risk of default by the borrower but also on the specific features (coupon, maturity, etc.) of the bond under consideration. So we always have to bear in mind that spread is defined in reference to a specific debt structure.

Formal credit ratings designated by agencies such as Standard & Poor's and Moody's Investor Services provide some measure of the perceived risk—the higher the rating the lower is the risk of default. While a higher credit rating generally corresponds to a lower credit spread and therefore a lower borrowing cost, a credit rating cannot be converted directly into the incremental borrowing cost over the Treasury rate. That is a function of the market. Indeed, changes in the market's perception of risk as reflected in changes in prices (and therefore, spreads) often precede formal rating changes.

New Issue Spreads

The usual information source for a corporation's new issue spreads over Treasuries is the syndicate desk of any major investment bank that trades the corporation's bonds. The syndicate desk has its finger on the pulse of the market and actively monitors investor appetite for new issues. Since investment banks routinely provide estimates of new issue levels to their corporate clients, the corporation itself is a good source of its spreads for third parties.

How does a syndicate desk quote new issue levels? The yields of U.S. Treasury bonds of "key" maturities provide the "baseline." Of the hundreds of Treasury bonds outstanding, only a handful are relevant for this purpose—the so-called "on-the-run" Treasuries. These are the most recently issued Treasury bonds, and as such they tend to trade at prices close to par (100% of face value). The Treasury borrows only for particular maturities, such as 2, 5 and 10 years; there is no 4-year or 16-year on-the-run Treasury bond.

In the convention for quoting a new issue spread, bonds are understood to be sold at par, and the benchmark is the yield of the nearest on-the-run Treasury.[2] Suppose, for example, that a corporation's 10-year spread is quoted as 120 basis points relative to the 10-year Treasury bond, whose yield happens to be 6.00%. This means that, in order to sell at par, the corporation's 10-year bond would have to carry a 7.20% coupon. Of course, an 80 bp spread combined with a 6.40% Treasury bond yield would give rise to precisely the same borrowing rate.[3]

Table 1 displays such spreads for two issuers at different points on the credit quality spectrum. In addition to the fact that spreads widen as credit quality declines, we also observe that spreads widen with maturity.[4]

The actual cost of borrowing is the sum of the appropriate Treasury yield and the corresponding spread. According to Table 1, on September 8, 1999, the cost of a 10-year optionless ("bullet") bond for an agency such as the Farm Credit System would have been roughly 5.93% + 0.94%, or 6.87%. For a utility

2. On the long end of the borrowing term (30 years or beyond), banks sometimes quote spreads over the most recent *off*-the-run Treasury yield, sometimes called quoting "off the old bond." Because the off-the-run long bond is likely to have a higher yield than the on-the-run long bond due to liquidity considerations, the banks' quoted spreads tend to look a little more attractive than they actually are. There is a consequent lag before banks adopt the on-the-run Treasury ("the new bond") as a benchmark.

3. Although a corporation's absolute borrowing rate is determined by the level of Treasury rates and by the level of spreads, our focus is only on the latter.

4. Consistent with the findings of Jean Helwege, "The Slope of the Credit Yield Curve for Speculative-Grade Issuers," *Journal of Finance*, forthcoming.

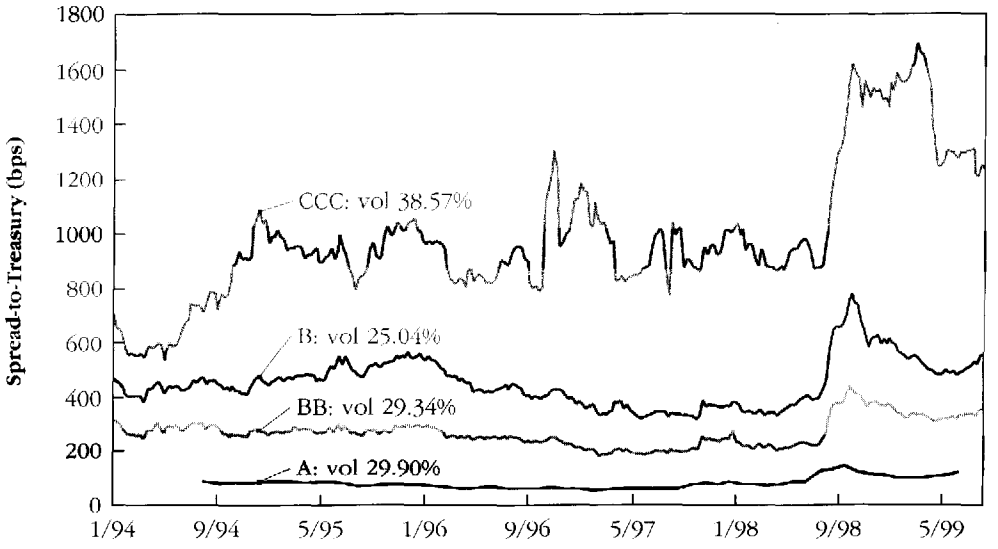
In order to eliminate the risk of rising rates, the corporation would have to lock in both components of its borrowing rate, the Treasury rate and the credit spread. Although market participants can cost-effectively take a position on U.S. Treasury bonds using futures contracts and options, no tools currently exist for conveniently managing credit spreads.

TABLE 1
NEW ISSUE SPREADS (BPS)
SEPTEMBER 8, 1999

Issue	Maturity (years) 2	5	10	30
U.S. Treasury Yields (%)	5.66	5.80	5.93	6.06
Federal Farm Credit Banks (U.S. Agency)[a]	44	73	94	108
Georgia Power (Utility) First Mortgage Bonds (A-credit)[b]	85	115	135	170
Georgia Power (Utility) Unsecured (BBB-credit)[b]	95	125	145	185

a. Source: FFCB.
b. Source: Southern Company.

FIGURE 1
CREDIT SPREADS ARE VOLATILE



such as Georgia Power Company, the 10-year rate would have been 7.28% for its first mortgage bonds, and 7.38% for its unsecured bonds.[5]

The Variability of Credit Spreads

Table 1 shows new issue spreads at a point in time. But these spreads are not static; they vary from day to day and intra-day, just as Treasury rates do. Historical information at the level of precision and detail (by rating category and maturity) shown in Table 1 is not readily available. However, some major investment banks compile generic spread levels based on transacted or estimated prices provided by their own traders.

The five-year history of A-credit corporate spreads, provided by Salomon Smith Barney, and of BB, B, and CCC spreads, provided by Bank of America, is displayed in Figure 1. The variability inherent in the spreads is evident. It is hard to miss the virtual doubling of spreads in the fall of 1998 when, for example, single-B spreads increased from below 400 basis points in mid-July to over 780 basis points by mid-October.[6] It was about this time that the so-called "Russian Crisis" was in full swing and news of the possible collapse of the hedge fund, Long Term Capital Management, was making headlines.

Spreads across rating categories tend to move together, as can be seen in Figure 1. The disruption in the fall of 1998 is a case in point. While the degree of change varies across the credit ratings, the spreads in each of the four groups increase during that period. The visual evidence of the tendency for spreads to move in tandem is confirmed by the high positive correlation in Table 2.

5. These rates do not reflect transaction costs.

6. It is noteworthy that even though spreads widened substantially, there were very few actual bankruptcies during this period.

TABLE 2
CORRELATION OF SPREADS BETWEEN RATING CATEGORIES*

Rating:	A	BB	B	CCC
A	100%			
BB	89%	100%		
B	78%	92%	100%	
CCC	74%	58%	58%	100%

*A-Credit spreads are 60 monthly observations from Aug 1994 through Jul 1999. BB, B and CCC spreads are 295 weekly observations from Jan 6, 1994 through Aug 26, 1999.

Table 2 also reveals that the nearer the ratings are to each other, the higher is the correlation between the spreads. For example, the correlation between A and BB spreads is 89%. It declines to 78% between A and B spreads, and finally to 74% between A and CCC spreads. The 92% correlation between BB and B ratings is the highest in the table, providing further evidence that the correlation is tied to proximity in rating.

The volatility[7] of these spreads over the last five years ranged from 25% to 39%, depending on credit rating (see Figure 1). As we discuss in the next section, it is this volatility that concerns a treasurer planning to issue new debt in the future.

TREASURER'S DILEMMA: HOW TO LOCK IN BORROWING RATES?

Consider a corporation that has an outstanding bond that will become callable three months from now. Current interest rates are low and the treasurer observes that calling the bonds three months hence will result in substantial savings. However if rates rise in the meantime, the savings from the transaction will be reduced.[8]

In order to eliminate the risk of rising rates, the corporation would have to lock in both components of its borrowing rate, namely the Treasury rate and the credit spread. As discussed above, this can be readily accomplished for Treasury rates; the customary method is to sell short an appropriately structured futures contract.

However, there is currently no cost-effective way of locking in the spread. Forward rates quoted by investment banks are prohibitively expensive, partly because the banks cannot offset their own positions conveniently. For this reason, issuers mitigate the risk of rising rates in one of three ways—none of which is very efficient. They lock in Treasuries and (with their fingers crossed) leave their exposure to spreads unhedged. They refund in advance of the call date by purchasing the outstanding bonds in the market at a premium to their fair value. Or, they issue the refunding bond ahead of time and invest the proceeds at a "negative carry" until the call date. Clearly none of these courses of action is completely satisfactory.

THE S&P CREDIT INDICES

As mentioned before, Standard & Poor's earlier this year announced credit spread indices for two rating spectrums—investment grade and speculative grade industrials. Each index, reported daily, is derived from the market prices of a pool of 99 equally weighted bonds of similar rating. The ratings of the issues in the investment grade pool are BBB– or better; the speculative grade pool consists of bonds rated BB+ and below, but no lower than CCC–. The duration of each pool is controlled within tight boundaries.

The primary obstacle to creating a bond index is the absence of reliable prices. Because bonds trade over the counter, at any given time the same issue can change hands at widely disparate prices. Further, most bonds do not even trade on most days. Such ambiguity does not arise with the well-known stock indices such as the S&P 500 or the Dow Jones Industrials, which are calculated from transparent exchange-transacted prices.

In order to address this pricing problem, S&P screens bonds by liquidity for inclusion in an index

7. As measured by the annualized standard deviation of first differences.

8. For a review of the problems of managing callable bonds, see Andrew Kalotay and Leslie Abreo, "Ratchet Bonds: Maximum Refunding Efficiency at Minimum Transaction Cost," *Journal of Applied Corporate Finance*, Vol. 12 No. 1 (Spring 1999).

pool and obtains quotes for each selected bond from several market makers (brokers and dealers). These quotes are then converted into a single price. The index is computed as the *portfolio OAS* (option adjusted spread) of the pool.

In the next section we discuss what OAS is and how it is calculated. For the time being, suffice it to say that OAS converts market value to a spread relative to the Treasury yield curve. In this respect, OAS is a refined credit spread.

Why Option Adjusted Spreads?

As we discussed earlier, bond prices are usually quoted either as a percentage of face value, say 99.125%, or as a yield, say 7.95%. The spread between the bond's yield and that of a like Treasury bond is a measure of credit risk.

What complicates the calculation of this yield spread is the absence of a like Treasury bond. Ideally, all attributes—coupons, maturities, and refunding provisions—should match. A compromise could render the comparison anywhere from slightly flawed to completely misleading.

To illustrate this, consider a long-term high-coupon corporate bond that is about to become callable, similar to that in the example discussed in "Treasurer's Dilemma" above. There is no like Treasury bond because Treasury bonds are generally non-callable. To cope with this problem, one may assume that the bond will be called and consider, not its yield to maturity (YTM), but its yield-to-call (YTC) instead. At first blush, the difference between this YTC and the YTM of a Treasury maturing on the call date seems like a reasonable estimate of incremental borrowing cost or credit spread.

But what happens if interest rates suddenly rise, reducing the likelihood of call exercise? In that case YTC is no longer the appropriate yield measure and YTM emerges as the more meaningful. But at what point should we switch yield measures? Clearly we need a method that extracts from the bond's price a consistently meaningful measure of credit spread.

The solution is the OAS relative to the Treasury yield curve.[9] The OAS, also stated in basis points, is a refinement over the traditional spread measure, which is simply the difference between two yields. In fact, if the Treasury yield curve is flat and the bond is optionless, the OAS is precisely the difference between the bond's YTM and the level of Treasury rates. Also, the lower the price, the higher is the bond's OAS. So OAS behaves like a spread measure.

But OAS has the distinguishing advantage of accounting for the presence of embedded options. It is applicable to both floating-rate and fixed-rate securities. Moreover, it takes cognizance of the shape, as well as the level, of the Treasury yield curve. In essence, OAS is the shift of the Treasury yield curve required to explain the observed market value.

A concept related to OAS is option adjusted (or effective) duration, which likewise captures the effect of embedded options. It is the percentage change in the value of a portfolio corresponding to a 100-basis point shift of the Treasury yield curve. In general, for bonds of a given credit, the longer the effective duration, the higher is the option-adjusted spread to Treasuries.

A Preview of the Indices

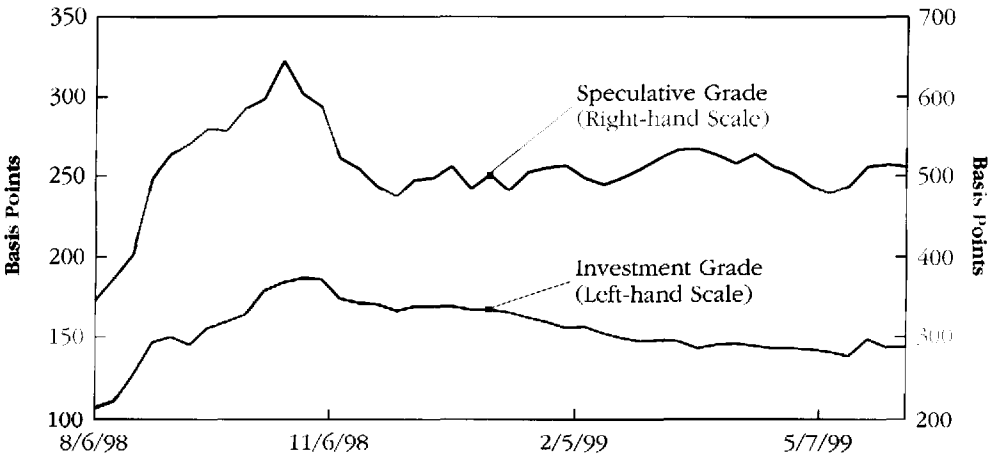
S&P has provided a 44-week history of their pilot credit indices (see Figure 2). During the period extending from August 6, 1998 to June 4, 1999, the weekly levels for the investment grade credit index ranged from just over 107 basis points to almost 187 basis points. In the same period, the speculative grade index ranged from nearly 345 to over 510 basis points.

The volatilities of the indices—30.85% for the investment grade index and 38.28% for the speculative grade index—are quite similar to those of BB (36.99%), B (38.26%), and CCC (38.26%) spreads from a comparable time series. The A spread volatility of 56.09% is much higher than the others (but this measure was obviously skewed by the extreme volatility in the fall of 1998, given the small sample size of 11 monthly observations).

The S&P Credit Indices were tested for correlation with spreads for a comparable period, i.e., August 4, 1998 to June 4, 1999. The S&P Investment Grade Credit Index tracks fairly closely the Single-A corporate spreads provided by Salomon Smith Barney. In fact, the correlation between the two is a relatively high 81.5%; the correlation between the S&P Specu-

9. For a discussion of option adjusted spread (OAS), see Andrew Kalotay, George Williams, and Frank Fabozzi, "A Model for Valuing Bonds and Embedded Options," *Financial Analysts Journal*, May/June 1993, pp.44-45.

FIGURE 2
S&P CREDIT INDICES



lative Grade Index and the single-B credit spreads provided by Bank of America is 76.5%. The 89.0% correlation between BB spreads and the average of the investment and speculative grade indices suggests there is room for development of more finely graded indices.

POTENTIAL APPLICATIONS

The S&P Credit Indices can form the basis for forward contracts or options, both of which can be used for either hedging or speculative purposes.

Let us revisit the corporation that wishes to lock in its borrowing rate three months hence. Assume a 30-year $100 million issue. Using the current borrowing rate, say 7.70%, for discounting, a one basis point rise in coupon would result in a $116,400 increase in borrowing cost (in present value terms).

We assume that the issuer's 30-year spread is highly correlated with the S&P Investment Grade Index.[10] Locking in the Treasury rate, say at 6%, is straightforward. To counter the spread risk, the corporation can enter into a forward contract, cash settled three months from now, based on the S&P Investment Grade Index. The Index is currently 170 basis points, and we assume for simplicity that the fair (at the money) forward contract is also at this level.

A forward contract whose payoff at expiration is $116,400 times the deviation of the index from 170 basis points would achieve the desired hedge. For example, if spreads move from 170 basis points to 190 basis points, the incremental borrowing cost of $2,328,000 would be offset exactly by the gain on the forward contract. If spreads went the other way, the loss on the forward contract would be compensated for by the savings in borrowing cost.

As an alternative to a forward contract, a corporation can employ an option on the index.[11] This strategy provides protection against rising spreads while retaining the benefit of falling spreads. For example, the corporation might purchase an option struck at-the-money. Since a one basis point rise in spreads results in a $116,400 increase in financing cost, the option is structured to have a matching payoff. Figure 3 shows how the option provides such protection while allowing the issuer to retain the full benefit of spreads declining below 170 basis points.[12] For example, if spreads widen to 200 basis points, the issuer's financing cost increases by 30 basis points, i.e., $3,492,000, which exactly matches the option payoff. If spreads tighten to 150 basis points, the issuer saves 20 basis points in financing costs and lets the option expire unexercised.

The cost of such an option will of course be market determined, but one can estimate it by applying the standard Black-Scholes formula. An annual spread volatility of 35% indicates an option value of $1.522 million.[13]

10. In practice, the correlation is likely to be less than perfect. A corporation contemplating the use of an S&P Credit Index derivative should satisfy itself that its spreads have an adequately high correlation with the index. The derivative contracts can then be sized accordingly.

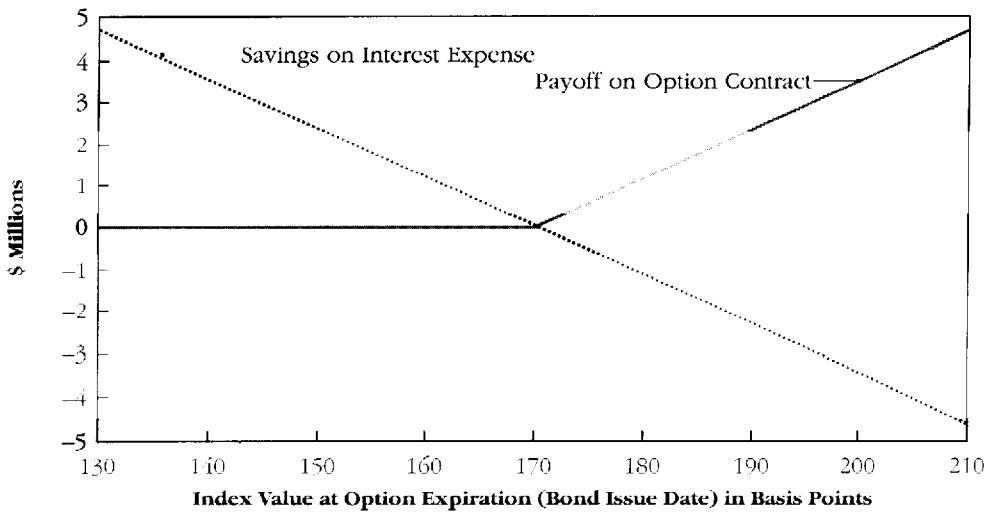
11. The corporation might be able to buy an OTC option to sell a specific structure at, say, 30-year Treasury + 170 basis points. But since this type of option is uniquely tied to a particular bond, it is not amenable to standardization. See Jayesh Bhansali, "Credit Derivatives: An Analysis of Spread Options," *Derivatives Quarterly*, Summer 1999.

12. Ignoring the cost of option.

13. An option paying $1 per basis point in excess of the 170 strike would cost $13.07.

The 89.0% correlation between BB spreads and the average of the investment and speculative grade indices suggests there is room for development of more finely graded indices.

FIGURE 3
OPTION ON CREDIT INDEX CAPS INTEREST EXPENSE ($100 MILLION 30-YEAR ISSUE)



At this stage any estimates regarding the pricing of forward contracts and options based on the S&P Credit Indices are speculations at best. We expect, however, that because of the transparency with which the indices are constructed and because of the liquidity of their component bonds, the pricing is going to be significantly more efficient than that of alternatives based on the in-house indices of investment banks. In particular, since the S&P Credit Indices consist of actively traded bonds, market participants can actually establish a replicating portfolio whose payoff matches that of a contract based on one of the indices. For example, shorting the constituent bonds and buying a Treasury portfolio of appropriate duration would produce the same payoff as that of a forward contract that gains when the index rises.

This transparency and the independence of the contributing price sources arguably make the S&P Credit Indices favorable candidates for SEC approval as bases for exchange-traded derivatives. In contrast, the indices provided by investment banks are less than transparent. In addition, the prices on which they are based are likely to come from a single pricing source, raising some concern about occasional "stale" prices. Moreover, if that single source is the indexing organization itself, there is always a lingering doubt as to independence.

Credit Spread Derivatives and FAS 133[14]

Statement No. 133 issued by Financial Accounting Standards Board (FASB) in June 1998 attempts to standardize accounting for derivative securities. A simple synopsis of the statement, which was the culmination of work that began as far back as January 1992, is as follows:

- All derivatives must be carried on the company balance sheet at *fair* value; and
- Changes in the fair value of the derivative securities must be accounted for in the company income statement.

A significant effect of FAS 133 is that the required marking to market of derivatives will increase the volatility of reported earnings. However, in cases where a derivative is employed as a hedge, the statement allows the corresponding asset or liability to be marked to market, thus avoiding a possible "hit" to earnings.

Qualification for hedge accounting requires that the derivative security in question pass an "effectiveness" test. In short, the degree to which the derivative is correlated with the instrument it is meant to hedge will determine the accounting treatment. The implication for credit index derivatives is that in order for them to qualify for hedge accounting, the risk being hedged must be highly correlated with the credit index employed.

14. Judging from the content of a number of references, accounting for derivatives is a daunting task. For a summary of the statement's implications, see *The New Standard on Accounting for Derivative Instruments and Hedging Activities (FAS 133): An Executive Summary*, PricewaterhouseCoopers, 1998. The summary accompanies *A Guide to Accounting for Derivative Instruments and Hedging Activities: Understanding & Implementing Statement of Financial Accounting Standards No. 133*, PricewaterhouseCoopers, 1998. Also, see *Accounting for Derivative Instruments and Hedging Activities: An Introductory Analysis of FASB Statement 133*, Ernst & Young LLP, 1998.

CONCLUSION

Credit spreads constitute a critical and rapidly developing area of fixed income. The yield of a fixed income security, whether a bond or a loan, depends on the Treasury rate and a credit spread that compensates for default risk—and both components are volatile. Moreover, credit spread represents a significant percentage of the total yield (and therefore total interest cost), particularly for issuers rated below investment grade.

The liquidity of the Treasury market has given rise to an abundance of related exchange-traded derivative products (Treasury futures and options). In contrast, the dearth of reliable, accurate corporate bond prices has been an obstacle to the creation of a liquid market for credit spread derivatives.

In this paper we have examined historical behavior of credit spreads from "in-house" data provided by two major investment banks, and our results are consistent with expectations. We have found that the weaker the credit, the higher is its spread relative to Treasuries and the greater is the volatility of such spread. When we adjusted these volatilities to take into account the absolute level of spreads, the results turned out to be remarkably similar, ranging from 25% to 39%. Moreover, we found the correlation between credit spreads of different rating categories to be directly proportional to the proximity of the rating categories.

The recently announced S&P credit indices could potentially revolutionize the management of credit spreads. Each index is derived from the market prices of selected liquid bonds; several traders and dealers independently provide prices for each security. Their transparency and freedom from potential bias make the S&P credit indices a natural foundation for forward contracts and options and, in the longer term, for exchange-traded credit derivatives.

■ ANDREW KALOTAY

is the founder of Andrew Kalotay and Associates, a New York-based debt management advisory firm. Dr. Kalotay is also a member of the Fixed Income Analysts Society Hall of Fame. While at Salomon Brothers, he pioneered the concept of liability management as a formal discipline. Among his other innovations are the concept of call efficiency, the Ratchet bond, as well as the recently announced Standard & Poor's Credit Indices discussed here.

■ LESLIE ABREO

is a Senior Financial Analyst at Andrew Kalotay Associates.

■ MICHAEL DORIGAN

is a Senior Associate at Andrew Kalotay Associates.