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Credit Risk Measurement and Management: The Ironic Challenge in the Next Decade

Edward I Altman

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Abstract

We are experiencing dynamic changes in the interest and concern with credit risk management despite historically low default rates and losses in the loan and corporate bond markets. The reasons are that lending institutions are increasingly comfortable with transacting their assets in counterparty arrangements whereby credit risk exposed is shifted. This motivation has helped to stimulate the congruence of several important ingredients for the sophisticated treatment of corporate credit evaluation and management including stand-alone valuation techniques, portfolio management approaches, comprehensive and reliable relevant data bases and the growth in credit derivative and other types of credit insurance structures. We expect these dynamic forces to continue over the next several years.

Edward I. Altman[1]

The United States economy has been strong for more than six years and most of the world's stock markets have been booming for a substantial period, reflecting impressive corporate growth and low interest rates. As a result, credit markets in most parts of the world, with some conspicuous exceptions, e.g., Japan, Korea, Switzerland, and in some parts of Latin America, have been in a benign state, especially in 1997. Indeed, non-performing bank loans as a percent of total loans and the default rate on leverage loans and low-quality "junk" bonds have been well under 2% for the last three years (1994-1996) compared to an average non-performing loan percentage of close to 4% for the period 1988-1993 and an average annual default rate of 3.6% for junk bonds for the period 1971-1996.[2] With these positive credit market statistics, why are we now experiencing strong and dynamic (r)evolutionary changes in the interest and concern with credit risk management and integrated techniques to assess both

the stand-alone and portfolio aspects of corporate credit?

The answer, we believe, is that lending institutions, primarily commercial banks, have reached a certain maturation stage whereby they no longer want to simply make loans (buy) and hold them either to maturity or charge-off. Stimulated by pressures from regulators, dynamic trading markets and internal return on equity objectives, banks are increasingly willing to consider transacting their assets in counterparty arrangements whereby the credit risk exposure is shifted with the reduction in total risk of the original lender. Since the markets in which credit-assets are hedged or sold are quite young, still fairly illiquid and probably inefficient, banks and their counterparties are struggling to amass the information and analytical foundation for valuing the underlying assets in some form of meaningful risk-return framework. T h i s motivation has helped to stimulate the congruent "coming of age" of four important ingredients for the sophisticated treatment of corporate credit evaluation and management: (1) stand-alone valuation techniques, (2) attempts (not necessarily solutions) to the portfolio credit risk problem, (3) comprehensive and fairly reliable relevant data bases and (4) the advent and impressive early growth in the structuring and trading of credit risk derivatives and types of credit insurance and guarantees. By being more sophisticated in the assessment and laying off of credit risk related securities and assets, financial institutions can be more aggressive in the creation and trading of new products, eg., structured instruments. Before addressing these points, one should examine the economic environment that both predates and now surrounds the current surge in interest and activity in credit risk issues.

Credit Risk Management Interest and the Economic Environment

The assertion that the late 1990's is experiencing strong emphasis on credit risk

management from market practitioners does not imply that interest was non-existent or even low in the past. Indeed, there was significant *concern* in this arena with the structural increase in defaults in the late 1980's and early 1990's throughout most of the world. The United States led the way with record bank loan and public corporate bond defaults caused by many ill-fated, highly leveraged restructurings of the mid and late 1980's, an economic recession and the inability of marginal firms to refinance their obligations. The junk-bond default rate jumped to over 10% in each of the years 1990 and 1991 and there were many skeptics who argued that high credit risk markets, like leveraged bank lending and junk bond financing, were likely to disappear. (This proved to be far from the reality as new issuance in both of these lending markets have reached record levels in each of the last few years. Indeed in 1996, high yield public bond issuance was $66 billion and leveraged loan (low quality) new issue volume reached the $135 billion level). Specific sector problems, e.g., real estate, retailing, deregulated finance and transport, compounded the early 1990's default problems.

While these events heightened concern about established credit management techniques and the lack of a meaningful credit culture within the world's largest and most sophisticated financial institutions, we did not as yet witness a pervasive interest in the creation and evaluation of new valuation techniques. What we observed was the occasional stand-alone valuation model, continued refinement of some relevant default data bases (first established in the mid 1980's) and surveys by regulators and consultants of existing techniques. The surveys invariably reached the conclusion that credit culture of financial institutions and their lending strategies needed to be rethought and possibly redesigned.[3]

These calls for reassessment have come at a time of increased competition in lending

markets as more varied types of firms are intermediating credit. Corporations no longer need to go to many different types of institutions for their complex borrowing needs. Banks are underwriting credits of all maturities and securities firms are making loans as well as underwriting bonds. The concept of a one-stop financial conglomerate has arrived, and with it the reduction of profit margins on traditional lending, as the markets become more competitive.

On the demand side, some investors in credit instruments are trying to enhance their yields by switching to non-traditional markets such as emerging market debt and asset-backed vehicles as well as moving down the credit quality spectrum. In addition to the greater risk that investors are now willing to take, the low interest rate environment creates greater vulnerability to market risk and, combined with credit risk migration concerns, (i.e., the risk that a firm's credit rating will drift downward), can result in mark-to-market losses, even if default incidence continues to be low. When defaults do increase, as they invariably will in the near future, these concerns will escalate.[4]

Stand-Alone Risk Procedures

The foundation for any comprehensive treatment of a credit portfolio of loans and/or bonds is the initial assessment of the risk of each asset in the portfolio on a stand-alone basis. If the analysis is faulty or incomplete as to the default and credit migration risk of the underlying entity, then no matter how sophisticated the valuation portfolio algorithm available, the end-result will be of little use. Stand-alone credit risk measurement involves a growing array of analytical techniques from univariate, qualitatively weighted quantitative and qualitative variable credit-scoring systems to an increasing number of more sophisticated procedures. These have included multivariate regression, discriminant and logit statistical models, models based on

contingent claims and market price proxies for asset value coverage of debt obligations and, finally, artificial intelligence procedures to either predict default or to replicate the bond rating results of established bond rating agencies. The latter objective is critical since it is directly related to one of the caveats of any credit evaluation system; **that, regardless of the credit scoring system utilized, the results should be linked to capital market indicators and experience.** We feel that the appropriate capital market indicators are bond ratings. This is suggested, not because we believe that the rating agencies have the best models and results with respect to default likelihoods, but because the relevant data bases on default and migration risk patterns (discussed below) are primarily based on the bond rating of the underlying credit. Hence, if the data that we use is based on ratings, then the scoring system should also be tied to ratings.

We have mentioned several times the notion of credit risk migration. In essence, the ultimate negative migration is from some initial state to a default (i.e., from a performing asset to one which either has missed a periodic interest payment or where a distressed restructuring is accomplished whereby the creditor receives a lower interest payment, an extension of the time period for repayment and/or a more risky claim on the asset than the initial contract specified). In addition, credit risk involves the possibility that the inherent risk of the asset migrates to a lower quality level, thereby resulting in lower security values in a mark-to-market pricing environment.

The final ingredient of the credit risk assessment of individual loans/bonds is the loss to the creditor if the asset's quality deteriorates or actually defaults. This mainly involves assessing the impact of the recovery level given a default, although the impact on the security's value

given a change in its credit quality is also relevant. The recovery rate concept is extremely important but is given small, if any, consideration in traditional bond rating systems. (Rating agencies do arbitrarily "hair-cut" or lower the senior unsecured bond rating equivalent for lower seniority levels of individual issues and explicitly consider recovery levels in their bank loan, proprietary rating programs). On the other hand, financial institutions of all types and the rating agencies themselves now realize that the recovery on defaulted assets plays an important role in assessing credit risk loss and we can expect increased research and resources spent on the empirical investigation of historical recovery experience, particularly of non-publicly traded private debt.[5]

To summarize, the stand-alone, individual asset ingredient in credit risk management systems involves credit scoring procedures, assessments of negative event probabilities and the consequent losses given these negative migration or default events. While I have been emphasizing, for many years, the important linkage between credit scoring procedures and capital market experience, an institution that ties its scoring system to its own portfolio's historical experience is certainly justified in using its own files to assess risk and losses. However, the experience of the bank, or several banks that agree to pool their data, must be rich enough in terms of statistical quantity and data reliability to provide meaningful future estimates.

Portfolio Models

It is well known that the return distribution on risky debt assets is not as normal as it is on equities. While the debt investor is usually limited to the promised yield or slightly higher returns (given positive credit migration), the potential downside is total. The expected return distribution is therefore skewed toward lower than promised returns with a fairly large (fat) tail

at default levels. Hence, traditional mean return-variance of return models are not appropriate -- although they may be robust enough to use over short (e.g., one month or one quarter) measurement periods.

The search for alternative portfolio schemes seems to be heading either in the direction of monte-carlo simulation results of possible returns on a credit portfolio to help the credit-risk decision-maker, or to utilize a proxy measure of risk, other than the variance of return, in a return-risk tradeoff measure. One proxy that has received increased attention of late is the **unexpected** loss on individual or portfolios of loans based on some estimated distribution around the expected loss. In this approach, the expected loss estimate can be utilized in adjusting the promised yield to obtain the expected return. The unexpected loss is a by-product of this analysis and is an outcome that requires capital reserves. In all portfolio models, however, the illusive ingredient is to properly and reliably estimate risky-event correlations between assets. There is little agreement as to how this should be achieved, although meaningful attempts are being made by analyzing the time series correlations of rating series, equity prices or variables that explain equity prices.[6]

Data Bases

In both the stand-alone and portfolio treatment of fixed income assets, the solutions are dependent on both the methodology utilized and the data inputs to the models. Among the most important data inputs are the expected default rates and migration (drift) patterns from the initial credit rating of the asset. Fairly comprehensive data bases do exist on these inputs with the criteria being the bond rating, from Moody's or Standard & Poor's, either from original issuance or based on a basket of bonds at some point in time and then observed for subsequent years.

Data bases are available covering default and migration experience going back to at least 1971 and in some cases even earlier.[7]

In addition to default and migration rates, a third important input is the recovery rate on defaults, where the critical distinguishing feature of the bond or loan is its seniority. Although data for recoveries on bonds is fairly comprehensive (as indicated earlier), data on recoveries on defaulted bank loans is quite inferior and more needs to be accomplished in this area. As noted above, financial institutions may choose to use their own data bases rather than rely on rating agency inputs, but the reality is that few institutions have extensive data going back very far which are based on the credit scoring system currently in place. Hence, reliance on public data is likely to be the route that most decision-makers will take, at least in the near future.

Credit-Risk Derivatives and Credit Enhancement Mechanisms

The final factor related to the increased motivation of sophisticated credit evaluation and management techniques is the advent and impressive early growth both in the credit risk derivative and the corporate credit enhancement/financial guarantee markets. It is no longer necessary to sell a credit asset outright if for some reason the original lender no longer wants to assume the credit risk. Relatively simple and also more complex financial instruments are being devised to set up a type of insurance mechanism for transferring the risk of default, and also the risk of migration in the case of total return derivatives. These instruments have created new and dynamic counterparty exposures.

The credit derivative market is growing as banks, securities firms, corporations and other institutions seek to hedge their credit exposures or realign their lending portfolios. In the last five years, this market has grown considerably with many of the major securities firms providing

liquidity by immediately finding willing counterparties or taking on the insurance mechanism themselves, confident that a counterparty will soon be found.[8] The derivative seller provides insurance against any event (eg., default) which changes the value of the underlying asset. In all of these cases, the relationship between the original borrower or lender is preserved.

Financial guarantees provide, in some cases, a leaner, less ambiguous form of a credit derivative since there is no question of a change in ownership of the asset if some credit event occurs. The guarantor simply pays off the original lender based on some pre-determined formula. This is particularly useful in the case of a non-transferable loan.

The seller-counterparty in a credit risk derivative transaction or the more traditional credit insurance providers are increasingly mindful of managing and trading their own credit portfolios. Hence, these institutions are particularly interested in techniques to combine the stand-alone and portfolio aspects of their revenue based assets. The credit risk derivative and credit enhancement markets have and will continue to improve the credit market's liquidity and vice versa. This in turn will require more accountability and transparency as to asset values and also motivate attempts to more profitably price the product.

Conclusion

We are witnessing an impressive escalation in analytical resources devoted to the more effective management of credit risk. This comes at a time when credit related losses in the United States and in many other countries are historically very low. The primary motivating factors have been explored in this article. These includes refinements of traditional techniques to evaluate the default likelihood of individual assets, larger and improved data bases to translate risk ratings into expected losses and the dynamics of market mechanisms like credit derivatives

and other credit enhancement techniques. When and if defaults increase in the near future, we can expect even more refinements and perhaps further breakthroughs in the credit portfolio management arena.

End Notes

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2. From E. Altman and V. Kishore, (1997) "Defaults and Returns on High Yield Bonds: Analysis Through 1997," **NYU Salomon Center, Special Report,** January.

3. For example, Wuffli and Hunt (1993), "Survey of Credit Risk Management Techniques," McKinsey Quarterly.

4. In a recent report, I estimated that U.S. public bond defaults will approximate $22 billion (face value) in 1997-1999, see E. Altman, S. Schimpf and J.Seltzer, 1997, "The Investment Performance of Defaulted Bonds and Bank Loans and Market Outlook," **NYU Salomon Center, Special Report,** January.

5. Numerous studies have documented the recovery experience on corporate bonds including E. Altman and A. Eberhart, 1994, "Do Seniority Provisions Protect Bondholders Investment?," **Journal of Portfolio Management,** Summer; E. Altman & V. Kishore, (1996) "Almost Everything You Wanted To Know About Recoveries On Defaulted Bonds," Financial Analysts Journal, November/December; Moody's, (1997) "Corporate Bond Defaults & Default Rates, 1938-1996," L. Carty and D. Lieberman, January, and Standard & Poor's, (1997) "Rating Performance 1996," February. Moody's also has estimated the recovery rate on a small sample of defaulted corporate bank loans, L. Carty and D. Lieberman, (1996) "Defaulted Bank Loan Recoveries," **Moody's Special Report,** November. A new study by E. Altman & H. Suggitt, (1997) documents the recent default rate experience on bank commercial and industrial loans, "Default Rates in the Syndicated Bank Loan Market: 1991-1997," NYU Salomon Center, Fall.

6. Some recent analytical models have been promoted by J. McQuown, "All That Counts is Diversification," (1994) **KMV Corporation,** San Francisco, CreditMetrics, (1997) J. P. Morgan & Company, New York (April) and E. Altman and A. Saunders, (1997) "Credit Risk Measurement Over the Last 20 Years," **Journal of Banking and Finance,** 20th Anniversary Issue.

7. See E. Altman & D. L. Kao, (1992) "Implications of Corporate Bond Rating Drift," Financial Analysts Journal November/December, L. Carty and J. Fons, "Measuring Changes in Credit Quality," Moody's, (1993) November; **Standard & Poor's,** (1997) "Ratings Performance 1996: Stability and Transition," February. E. Altman's, "Rating Migration of Corporate Bonds' Comparative Results and Investor/Lender Implications,"

Salomon Brothers Inc, New York, May 13, compares and contrasts these three rating migration data bases.

8.   See **Euromoney**, (1996) "The Launch of a New Market: Credit Derivatives," March and **Derivatives Strategy**, (1997) "The Long Awaited Arrival of Credit Derivatives," January.