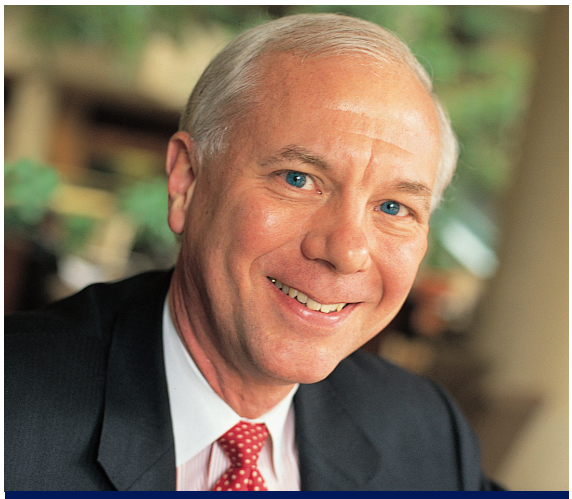
Correlation and credit risk

Active development of full credit portfolio modelling continues apace, even though it is not recognised in the proposed Basel II framework. An important issue is the relationship between probability of default and loss-given default. In this last of four columns on integrated credit risk mitigation, David Rowe argues for caution in interpreting apparent correlation between the two

Despite not being recognised within the proposed Basel II framework, full portfolio-based credit modelling is an important part of best-practice credit risk management. Its central objective is to go beyond analysis of individual exposure characteristics and measure the risk-mitigating implications of portfolio diversification. The ultimate goal is to allow this deeper level of insight to influence future decisions on whether to extend credit and on what terms. In the language of Basel II, this involves modelling the probability of default (PD), the exposure at default (EAD) and the loss-given default (LGD) as a percentage of the EAD. Modelling means not only estimating the distributions of each but also the covariation among these variables and across obligors. It is our understanding of this covariation that the Basel Committee believes is not sufficiently well developed to justify inclusion of such models in the regulatory framework.



David Rowe is group executive vice-president for risk management at SunGard Trading and Risk Systems
e-mail: david.rowe@risk.sungard.com

Default correlations

In recent years, much effort has been devoted to estimating correlations among default probabilities of different obligors. Clearly, such correlations are the main determinant of how much unexpected loss is reduced by diversification of a credit portfolio across obligors, industries and regions.

There are two approaches to this task. Variations on the CreditMetrics approach involve simulating default based on a combination of random industry and regional drivers plus idiosyncratic terms unique to individual companies. Correlations among default probabilities emerge implicitly from the behaviour of the drivers combined with the weights applied to them for different obligors.

The alternative approach is based on an idea first proposed by Nobel laureate Robert Merton. It views corporate equity as an option on the assets of a firm with a strike price equal to the value of the firm's liabilities. PD (sometimes called expected default frequency or EDF) is based on the volatility of the value of the assets and the amount that the current value of the assets exceeds that of the liabilities. Being based on equity prices that are observable from day to day, this approach generates time-series data from which correlations among default probabilities can be estimated directly.

Other correlations

Attention has also been paid to correlations between PDs and the other key concepts of EAD and LGD. The correlation between PD and EAD is most prominent in the context of market-driven credit exposures arising from derivatives trading. Wrong-way exposure occurs when EAD is driven higher by the same market events that tend to weaken a counterparty's ability to pay. The ability to highlight such situations early is one of the most important diagnostic features of a trading credit risk assessment system.

LGD has often been treated as a fixed percentage of EAD depending on the seniority of the obligation. In fact, of course, LGD is not constant and recent efforts have been directed towards treating it stochastically. This has limited benefit if the expected value of LGD is still considered constant. A more interesting approach is to treat LGD as dependent on other variables. Some have pointed out an empirically positive correlation between LGD and PD and argued that this should be incorporated into loss simulations. I think this approach is mistaken.

Correlation and causation

One of the basic lessons of statistics is that correlation does not imply causation. As one of my first finance professors put it: "When it comes to determining causation, correlation is totally useless." The point is that consistent covariation can have several causes. X can be dependent on Y or Y can be dependent on X or, very commonly, both may be dependent on a third variable. It is not surprising that LGD is positively correlated over time with PD. Both would be expected to have a negative correlation with economic growth, leading to a positive correlation with each other. For LGD, if general economic conditions are weak then effective reorganisation is more difficult, and there will be fewer interested buyers for the assets in a liquidation. In either case, LGD will tend to be higher when the general economy is soft.

The logical approach to incorporating this effect is to link the expected value of LGD to whether a default was driven primarily by idiosyncratic factors or by general economic conditions. If a default is caused by a severely adverse company-specific event, LGD will probably be smaller than when generally weak conditions in the company's markets are the primary cause.

Improved estimation of correlations is the key to more reliable credit portfolio analysis. In pursuing this goal, however, it is important that researchers focus clearly on the distinction between correlation and causation, and not fall into the trap of assuming that the former implies that latter. ■