Credit Risk Measurement: Avoiding Unintended Results

Part 1

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This article—the first in a series—provides an overview of credit risk measurement terminology and a basic risk measurement framework. The series focuses on credit risk measurement concepts, how they are implemented, and potential inconsistencies between theory and application. Subsequent articles will present common implementation options for a given concept and examine how each affects the credit risk measurement result.

The basic concepts of credit risk measurement—default probability, recovery rate, exposure at default, and unexpected loss—are easy enough to describe. But even for people who agree on the concepts, it’s not so easy to implement an approach that is fully consistent with the starting concept. Small differences in how credit risk is measured can result in big swings in estimates of credit risk—with potentially far-reaching effects on risk assessments and business decisions.

Trend Toward Credit Risk Quantification

As credit risk modeling methodologies have improved over time, banks have incorporated models into risk-grading, pricing, portfolio management, and decision processes. As the role of credit risk models has grown in significance, it is important to understand the different options for measuring individual credit risk components and relating them for a complete measure of credit risk.

Consumer lenders, in particular, rely heavily on borrower scorecards to lower underwriting costs and improve portfolio management. Quantification of commercial credit risk has moved forward at a slower pace, with a significant acceleration in the past few years. The relative infrequency of defaults and limited historical data have constrained model development for commercial credit risk.

Although vendors offer default models for larger (typically public) firms, quantifying the risk of small business credits remains a challenge for banks where there is a void between scorecard-driven...
approaches to retail credits and formally graded large facilities. Basel II as a driver. The introduction of dual rating systems that would meet the criteria proposed in Basel II has accelerated the interest in credit models to support risk-grading frameworks. Credit models have been introduced to explicitly measure borrower default risk and the risk of loss given default on individual loan facilities. Basel II has been a catalyst for banks to develop and or strengthen measures of loss given default. Significant improvements in LGD modeling approaches can be expected over the next few years as more data becomes available and institutions validate recently implemented modeling/grading methodologies. The development of robust economic capital frameworks has allowed banks to measure credit risk concentrations and the marginal contribution of new credit exposures. As institutions have become more comfortable with their economic capital frameworks, risk-adjusted performance measurement has become a key driver for assessing customer profitability, measuring business line performance and setting senior management compensation. Basel II also will be a catalyst for the introduction and enhancement of economic capital frameworks. To qualify for the advanced approaches under Basel II, banks must be able to measure economic capital and use this information to support business decisions.

Credit Risk Measurement Conceptual Framework

The general framework for measuring credit risk is simple. Credit risk can be divided into two components: expected loss and unexpected loss. As formalized in Pillar I of Basel II, expected losses are calculated as:

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EL = \frac{Exposure \times Probability\ of\ Default (PD) \times Loss\ Given\ Default (LGD) \times Exposure\ at\ Default (EAD)}{Exposure\ at\ Default (EAD)}
\]

Historically, banks have combined the risk of PD and LGD into a single measure. Rather than having dual ratings systems (one rating for PD and the other for LGD), most banks had a one-dimensional rating system. Borrower and facility were considered together in assigning a rating, which was the product of the probability of default (PD) and the fraction of the loan’s value likely to be lost in the event of default (LGD). Typically, strong collateral supporting a facility could notch up an obligor risk rating. These rating systems were commonly used to rank-order risk, rather than to link ratings to explicit measures of credit loss.

Credit Risk Measurement Terminology

A sign of the advancement of credit risk measurement has been the emergence of common terminology. This reflects, in part, the maturity of measurement methodologies and the initial success of Basel II in creating a common language. Several years ago, the discussion of PDs, LGDs, and EADs would have produced blank stares in most circles. These acronyms have now worked their way into everyday discussions among credit and noncredit professionals.

**Probability of Default (PD).** This is the risk that an obligor, or borrower, will fail to make full and timely payment on its financial obligations over a given time horizon. This is a frequency measure. Another common name for this concept is expected default frequency (EDF).

**Loss Given Default (LGD).** This is a less mature measurement concept. It measures the risk that a loss will be incurred given that there has been a default event. This same concept may be called loss in the event of default (LIED) or loss severity. The inverse of this concept is the recovery rate. LGD is typically expressed on a net present value basis. It is expressed as a percent of the outstanding balance at default.

**Exposure at Default (EAD).** This concept only applies to non-term exposures, such as lines of credit and is also known as usage given default (UGD). This is the measurement of the expected drawn exposure at the time of default. For consumer portfolios, the concept of exposure at default is often captured in the dollar-weighted default probability.

**Expected Loss (EL).** This concept is simply the product of the above three metrics multiplied by the exposure and is a measure of the probability of credit loss over a given time horizon. For a loan portfolio, over an extended period of time, expected loss should be comparable to the net charge-off rate.

**Unexpected Loss (UL).** This is a measure of the volatility of credit risk and captures portfolio concentration risk. Unexpected losses may be calculated using a credit value-at-risk methodology (as popularized by JPMorgan’s CreditMetrics methodology) or by using stress testing and scenario analysis.
The last term in the formula for expected loss—exposure at default (EAD)—is necessary for commitments and revolving credits, which may be undrawn, fully drawn, or anywhere in between. (Depending on how an institution manages its lines, a borrower may not be able to draw as it nears default or the borrower may fully draw down on the line.)

If exposure-weighted default rates are used, then EAD is already implicitly captured in the default risk component. (An exposure-weighted default rate measures the default amount as percent of the outstanding portfolio balance.) If incidence-weighted default rates are used (as required for Pillar I internal ratings calculations under Basel II), then outstanding exposure at the time of default must be measured separately in an EAD calculation. (An incidence-weighted default rate measures the number of defaults as a percent of the number of active borrowers.)

As much by convention as by theory, expected loss is typically measured over a one-year period. Under Basel II, this one-year horizon is formalized under Pillar I. A one-year view is also often taken for economic capital frameworks. In contrast, many banks have used a life-of-the-loan concept for setting loan loss reserves. Rather than assessing risk over a one-year period, credit risk is measured over the remaining life of the portfolio.

While expected loss is a measure of average losses over a given risk horizon, unexpected loss (UL) is a measure of what could go wrong in some stressed, or unexpected, scenario over this same time period. Institutions typically use a credit value-at-risk (CVaR) approach to measure at a given confidence interval the risk of unexpected losses over a given period. Measuring UL gives an institution a measure of the potential volatility in its credit portfolio. For example, an increased exposure to a given customer or industry could lead to greater volatility in credit losses.

Theory Versus Practice: Getting the Details Right

Theorists can deal in concepts, but practitioners need concrete (and consistent) results. Given the costs of being wrong, the process of quantifying credit risk is like walking through a minefield: Every step requires judgment and experience, and a misstep can have disastrous results. Each element in the process—data selection, risk drivers, measurement methodology, and model application—drives differences in the final estimate. A sound understanding of the nuances of credit risk measurement will help bankers choose which lending opportunities to pursue and then price and monitor the credits appropriately.

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Practical Implementation Issues: Future Article Topics

While basic credit risk measurement concepts are easily understood, the way these concepts are implemented can yield a range of results—some useful, some potentially misleading. Future articles in this series will examine the following topics:

Default probabilities—use of incidence versus exposure-weighted default rates. This article will examine the challenges and potential pitfalls in moving from an incidence-based measure of default risk to a measure of expected credit losses, which implicitly relies upon an exposure-weighted default measure. The article will show how using unadjusted incidence-based default probabilities could result in understating or overstating potential defaults.

Loss given default—selection of the discount rate. This article will focus on the selection of the discount rate for the net present value calculation of loss given default (LGD). The U.S. bank supervisor’s guidance for Basel II implementation proposes that banks use a current market rate for discounting post-default cash flows. To calculate reserves for specific impaired loans, institutions are required to use the rate on the loan at the time of default. This article shows how these alternatives—current market rate versus borrower rate—affect the LGD estimate. It also examines how LGDs need to be applied and interpreted differently under the two discounting approaches.

Basel II Pillar I and loan loss reserves—similarities and differences. As institutions move toward quantifying the credit risk of commercial lending activities, there will be an inevitable convergence and/or comparison of metrics used across the institution. Basel II’s Pillar I and loan loss reserves for non-impaired loans is an obvious starting point. This article will focus on the integration of Basel II expected loss calculations and loan loss reserve frameworks. The quantification of credit risk will drive an understanding of the similarities and differences considering a variety of factors such as time horizons, lookback periods, and the incorporation of unexpected losses. This article will focus on the similarities and differences between these two measures of expected losses.