Downturn LGDs for Basel II

RMA Capital Working Group

August 2005

Downturn LGDs for Basel II[1]

Introduction.

Paragraph 468 of the Basel II Framework requires that Loss-Given-Default ("LGD") be measured "to reflect economic downturn conditions where necessary to capture the relevant risks." Each of the Advanced Internal-Ratings-Based ("AIRB") banks has been analyzing how to estimate such a downturn LGD ("DLGD") for each of its credit products, and this month the Basel Committee released new Guidance regarding a "principles-based" approach to satisfying the requirements of paragraph 468.[2] This paper provides a brief comment on the new Guidance, discusses our major concerns regarding DLGDs, and also provides the results of new research on the cyclicality of LGDs for several credit product categories within the U.S.

The RMA Capital Working Group appreciates the principles-based nature of the Guidance and agrees in broad terms with those principles. We also appreciate the regulators' recognition of the problems associated with estimating downturn LGDs and the lack of industry consensus on the issue. However, we remain concerned over the lack of recognition of a cross-product *diversification benefit* associated with Basel II's treatment of downturn LGD. That is, it would be an overly conservative approach to require that AIRB banks use a downturn LGD, measured in terms of LGDs observed over the cycle, for *each* of its credit products, without considering that LGDs for various types of loan respond to the cycle with diverse timing or respond to differing macro factors that are product specific. This lack of correlation in downturn LGDs ("DLGDs") across products may be quite significant in affecting the measurement of tail-risk for the portfolio as a whole. The next section summarizes this and other important issues surrounding the downturn LGD ("DLGD") concept. An appendix discusses the new research results.

Problems with DLGD.

The RMA Capital Working Group has commented extensively on the DLGD issue.[3] The notion of using a DLGD stems from the basic structure of the Basel credit risk model – the so-called Asymptotic Single Risk Factor model. In this model, capital is set equal to the amount necessary to cover unexpected losses associated with a bad "draw' of the unspecified, single macro-economic risk factor (i.e., the state of the economy). If the macro-factor is really bad (a "draw" that is worse than all but 0.1% of possible states of the economy), then capital must cover the realized high default frequency multiplied by some loss-given-default that would be experienced *during* this bad state of the economy. To the extent that default frequencies and LGDs at any point

[1] The Risk Management Association (RMA) is the leading professional association dedicated to the measurement and management of risk in banking and finance. The RMA Capital Working Group consists of senior officers at the leading banking institutions in the U.S. and Canada who are responsible for the measurement of risk and the determination of economic capital. Individual banks that are members of the Capital Working Group may have views on DLGDs that differ from those expressed in this paper.

[2] "Guidance on Paragraph 468 of the Framework Document," Basel Committee on Banking Supervision, July 2005.

[3] See "Response to the Proposed U.S. Supervisory Guidance for Retail Credit Risk Capital under the Basel II Framework," RMA, January 2005, pp. 8-12.

in time are correlated, the Basel model requires that the bad macro draw not only result in a high default frequency but also a high loss-given-default. Unfortunately, for most credit product lines, little or no publicly-available data exist to measure how much LGDs respond to the same risk factor driving default frequencies. Even if economic loss-given-default data were available for all credit products going back over the long term, we have expressed several concerns over how to estimate DLGD.

1) Regulators should not specify any particular historical calendar period as representing the "downturn" period. Historical peak loss rate periods may differ from product to product and from bank to bank (see data presented below). Moreover, the peak of LGDs may not correspond to the peak of default rates, because it takes many months for a defaulted loan to work itself through to an "end-state" such as sale-through-foreclosure. As a result, for any given product, the peak loss-given-default rate period could cover several quarters or years. The new Guidance does not disagree with this view, and the Capital Working Group has suggested that supervisors give banks the latitude to define the downturn broadly (e.g., as the 3-year period encompassing the year on either side of the year in which the analyst believes the single peak of LGD is observed). This definition of downturn might be appropriate, for example, if the product or portfolio LGD showed double or triple peaks during a number of years. In such a case it would be untenably conservative to force the bank to choose only one quarter or year as the "downturn" period.
2) The downturn period for some products may well be the years encompassing the recent recession. The Guidance again does not disagree with this view, indicating only that one of the ways in which any "adverse dependency" between default rates and recovery rates may be investigated is through "a statistical analysis of the relationship between observed default rates and observed recovery rates over a complete cycle. Of course, for some products there is little empirical or theoretical evidence suggesting much in the way of LGD cyclicality. Credit cards, for example, exhibit high LGDs, often well over 90%. For such credit products, a recession will affect the default rate but LGDs will rise little or not at all.[4]
3) There is a natural "diversification" effect associated with DLGDs in that it would be an unusually rare event (one never having been observed) that LGDs for all types of credit products and for all banks would peak during precisely the same quarters or years, and to precisely the same degree. This diversification effect stems from differences across credit products with respect to the primary type of risk factor to which default-rates and losses-given-default respond. For example, default and loss rates on loans to highly leveraged corporate entities (with variable-rate liabilities) are likely to respond primarily to the level of interest

[4] Aggregate FDIC data for all insured institutions suggest that current cycle LGDs for HELOCs are higher than LGDs in the early 1990s. This result is intuitive, given that net-charge-offs (as a percent of average balances) during the early 2000's were approximately equal to the experience in the early 1990's, but defaulted loans (90+ DPD as a percent of balances) were significantly lower during the early 2000's than in the early 1990's. LGDs therefore must have risen substantially since the early 1990's. The aggregate industry data do not allow us to pinpoint the reason for this rise in LGDs but it is highly likely that there has been a secular rise in the average combined LTV for HELOCs over the past decade.

rates. Similarly, the overall level of consumer confidence and employment and wage conditions may drive credit conditions for loans to consumer-related corporate entities and for some types of retail loans. However, loss rates on defaulted mortgage loans may be driven primarily by housing price levels. And mortgage loans may experience very different loss rates depending on housing demand conditions in very specific geographic areas. That is, even with respect to a single credit product -- residential mortgages -- it would be untenably conservative to stress LGDs by assuming that all geographic areas of the country experienced simultaneously the same housing price declines as those experienced in, say, California in the mid-1990's or New England in the early 1990's. The same diversification issue exists with respect to commercial real-estate and multi-family lending.[5,6] In effect, the underlying assumption of the Basel II credit risk model – that all obligor asset values are driven by the same, single macro risk factor – clearly does not apply in the context of recovery rates across the range of credit products.

We believe that our concern over the diversification issue can be addressed, within the context of the Guidance, by permitting great flexibility in the exact manner in which AIRB banks measure DLGDs. In particular, supervisors should not specify any particular time period as representing a downturn period. Rather, the AIRB bank should be permitted to specify the downturn period with respect to how *portfolio-wide* DLGDs are measured. In the actual downturn period, which conceivably could cover a period of more than one year, some credit products

[5] DLGDs for CRE-MFL are further complicated by the fact that underwriting standards have changed dramatically since the early 1990's. For example, in the 1980's, expected rental inflation was routinely factored into NOI projections. Also, generous "multipliers" were factored into the capitalization of these NOI projections to arrive at property values (often the multipliers were based on Grade-A properties but applied to properties of all grades). As a result, loan to value ratios were understated when making the loan. Then, the 1986 Tax Reform Act eliminated accelerated depreciation on the properties, making property values lower than before the tax reform. Also, market rentals declined in the lead-up to the early 90's recession and beyond. As a result, default rates soared as debt service could not be maintained, nor could the obligor sell the underlying property at market prices covering the loan amount. Modern origination methods rely more heavily on realistic income stream projections and the setting of higher debt-service-coverage ratio (DSCR) cutoffs. At the same time and for the same reasons, underwriting standards expressed as loan-to-value requirements also have tightened. As a result, net charge-off ratios for CRE-MFL have declined steadily since the early 1990's, and the loss rates experienced during the current recession are more useful as indicators of future peaks in LGDs.

[6] Despite this cross-product evidence, it has been suggested that DLGDs can be estimated by utilizing the observation that recoveries on defaulted loans are driven by the asset values on defaulted obligors' balance sheets (see Jon Frye, "Collateral Damage," Risk, April 2000). If one adopts the assumption of a single risk factor for every credit type, one can estimate a DLGD by using a model similar to the Basel II ASRF model to show the DLGD associated with a "draw" of the macro risk factor at, say, the 99.9% confidence interval. To do so, one needs to have as inputs the estimated collateral value volatility and the estimated collateral value correlation ("CVC") with the macro risk factor. Frye suggests that such a CVC could be set equal to the AVC used for the particular credit product by Basel II. While this may be appropriate for ordinary corporate loans, the resulting estimated DLGDs for retail products can be extremely high, because the Basel II AVCs for retail products are significantly higher than best-practice estimates of AVCs (especially for first/second home mortgages and credit cards). See a paper by Ashish Dev and Michael Pykhtin ("Modeling Downturn LGD for Basel II," KeyCorp, mimeograph, April, 2005) for a look at modeled LGDs under the assumptions that CVCs are equal to Basel II AVCs and that the collateral volatility is 30%.

may have very high LGDs while other credit products may exhibit LGDs that are *lower* than their long-term average LGDs. For example, the bank might find that, on a balance-weighted basis, its portfolio-wide LGD might be highest during the recent downturn period of, say, 2001-2003, even though certain products had, during those 3 years, LGDs that are lower than their longer-run average. In this particular example, using each product's default-weighted long-run average LGD would result in a somewhat higher portfolio-wide DLGD than is indicated by the observed diversification effects.

To implement our recommendation, the AIRB bank would be expected first to identify the downturn period. Then, a portfolio-wide DLGD would be estimated on a balance-weighted basis for the loans that defaulted during the downturn period. Call this "DLGD1" – the portfolio-wide DLGD. This DLGD would then have to be apportioned back among the various products and/or segments in order to provide product or segment-specific LGDs as inputs into the various Basel credit risk equations. This could be done in a number of ways. For example, each product's long-run default-weighted LGD could be grossed up by the ratio of DLGD1 to a hypothetical DLGD2 that represents the down year's portfolio-wide LGD if all products' LGDs were set equal to their long-run default-weighted average LGDs.[7] Alternatively, the actual LGDs observed during the identified downturn period could be used for each product. If, for any product, this LGD is *less than* the product's long-run default-weighted average LGD, then the latter would be used within the Basel calculations.

We are hopeful that U.S. regulators will implement the DLGD Guidance in a fashion that addresses our concerns. As always, we stand ready to assist with additional analysis whenever necessary.

[7] If DLGD2 were greater than DLGD1 then each product's Basel LGD would be set equal to its long-run defaulted-weighed average LGD.

Appendix 1

Empirical analysis regarding the product diversification effect.[8]

This appendix explores two questions related to the diversification effect of downturn LGDs:

1) Do loss rates for various products tend to peak at roughly the same point in the cycle?
2) Do loss rates peak at the same time across banks, or are there substantial portfolio composition effects, or product-specific effects that determine the timing of loss rates?

Ideally, we would like to analyze actually observed LGDs, defined as in Basel II to include all economic costs and all recoveries, with proper discounting of the cash flows back to the point of default. Such real, economic LGD measures, however, exist only on a proprietary basis at individual best-practice banks and generally do not go back in time to cover the previous, early 1990's recession.[9] We are left instead with bank Call Report and Bank Holding Company Y-9 reports that show accounting losses by broad product category – i.e., net charge-offs ("NCOs") for all C&I loans, all 1-4 family residential mortgages, all credit cards, and all CRE-MFL credits.[10] Not only do accounting losses differ from economic losses, but also the charge-off rates for each product are composed theoretically of default rates and LGDs. That is, charge-off rates could rise because of a rise in default rates, or a rise in LGDs, or both. Moreover, the accepted method of defining a charge-off *rate* is to divide the level of net charge-offs for a period (say, a quarter) by average balances during that period. This ratio could rise (fall) simply due to a decline (rise) in average balances, rather than as a result of changes in credit conditions (changes in default rates or LGDs).

Keeping these caveats firmly in mind, we analyze net charge-off ("NCO") ratios for the top 5 bank holding companies in the country on a quarterly basis from 1991Q1 through 2004Q3. The cyclical nature of these loss ratios are compared bank-to-bank and also against NCO ratios provided by the Federal Reserve for the Top 100 banks. Graph 1 below shows the movement over time of the NCO rates for each of the 4 broadly-defined product lines for the Top 100 banks.

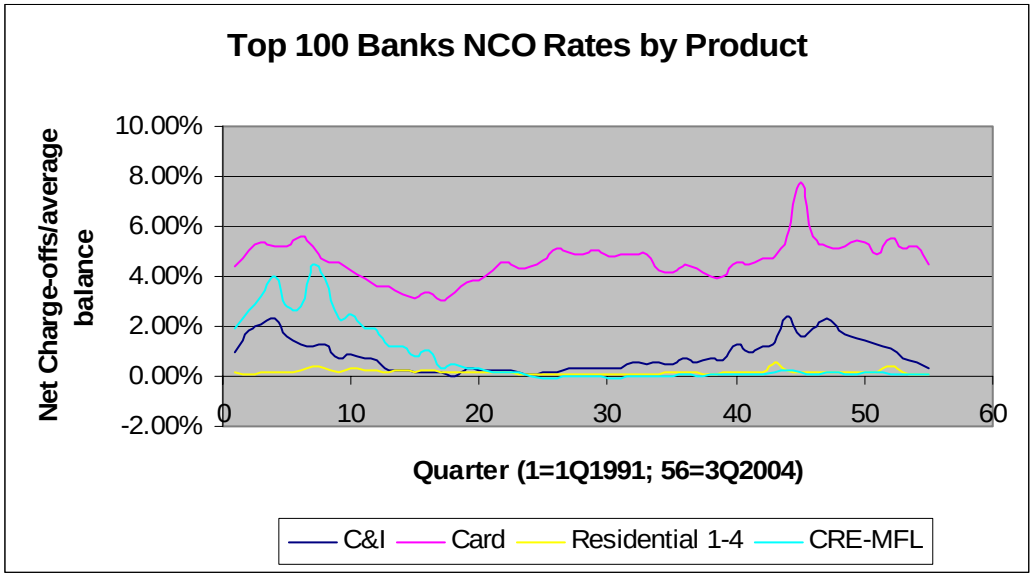
---

[8] John Walter, Bank of America, originally suggested this research and provided valuable insights. Other important contributions came from Michel Araten, JPMorganChase, and Amy Alexander, Washington Mutual. Sue Wharton of the RMA staff provided exceptional research assistance.

[9] Academic studies exist on LGDs for commercial loans utilizing proprietary data. See, for example, Michel Araten, Michael Jacobs, Jr., and Peeyush Varshney, "Measuring LGD on Commercial Loans: An 18 Year Internal Study," The RMA Journal, May 2004. For home mortgages, academic studies analyze proprietary data on the cycle's effects on loss-given-*foreclosure*, but no publicly available data are available for how the cycle affects "cure" rates (the percentage of defaulted loans that do not go through the foreclosure process but rather involve pre-payment, return to performing status, or sale at insubstantial loss).

[10] The Call Reports and Y-9's also allow us to view NCOs for agricultural loans, but these are a relatively small percentage of the assets of AIRB banks, and their study does not add to the analysis.

Graph 1



[Data are from the Federal Reserve Board of Governors website: http://www.federalreserve.gov/releases/chargeoff/chgtop100nsa.htm]

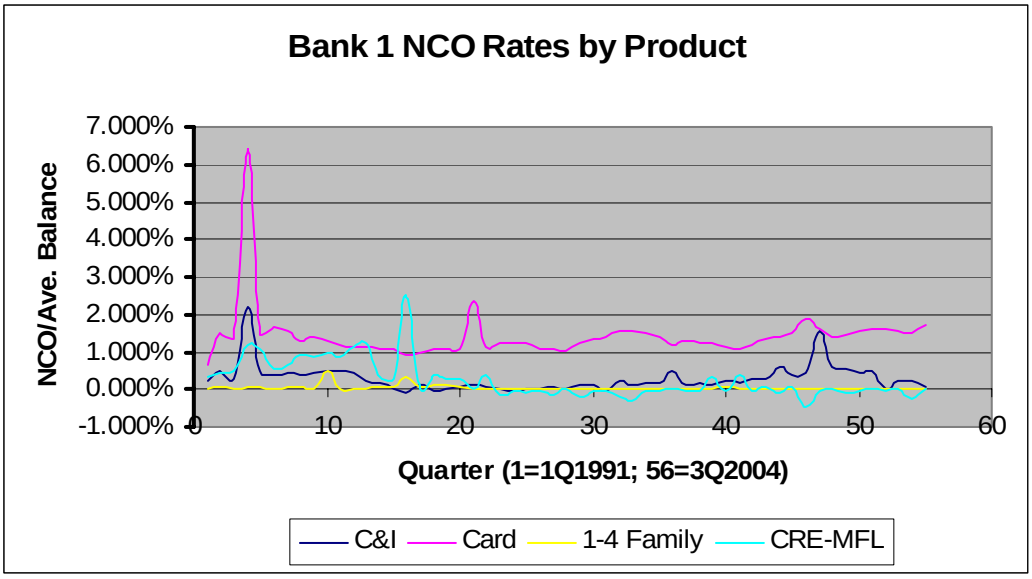
On an aggregate basis the charge-off rates for the product lines tend to move broadly together, showing peaks, as expected, during the early 1990's and the recent recession. Moreover, the NCO rates for residential mortgages and, during the late 1990's to the present for CRE-MFL, are very low compared to the other product lines. Several other interesting facts fall out of these data:

1) Some peak NCO periods are fairly long, involving more than a single year – see the "double-peak" for CRE-MFL in the early 1990's and the double-peak for C&I during the recent recession. This tends to support the RMA view that supervisors should provide great flexibility in defining a downturn period (e.g., as at least the year on either side of the year in which the analyst believes the LGD peak has occurred).
2) Peak NCO rates occur at somewhat different times for each of the products. The NCO peak during the current recession clearly is the worst case for cards during the entire period, while the CRE-MFL peak in the early 1990's was clearly the worst case for that product (and, as discussed earlier, the CRE-MFL experience in the early 1990's is in no way indicative of what would likely happen in future commercial real estate recessions). During the recent recession, loss rates for some products did not rise much at all (CRE-MFL and 1-4 Residential) helping to soften the impact of the rise in NCOs for C&I and Cards. Therefore, even at the level of the industry as a whole, the importance of the DLGD diversification effect is apparent.

Differences in level and timing of DLGDs become even more dramatic when viewing the NCO data for *individual* banking organizations. Graphs 2 through 6 below

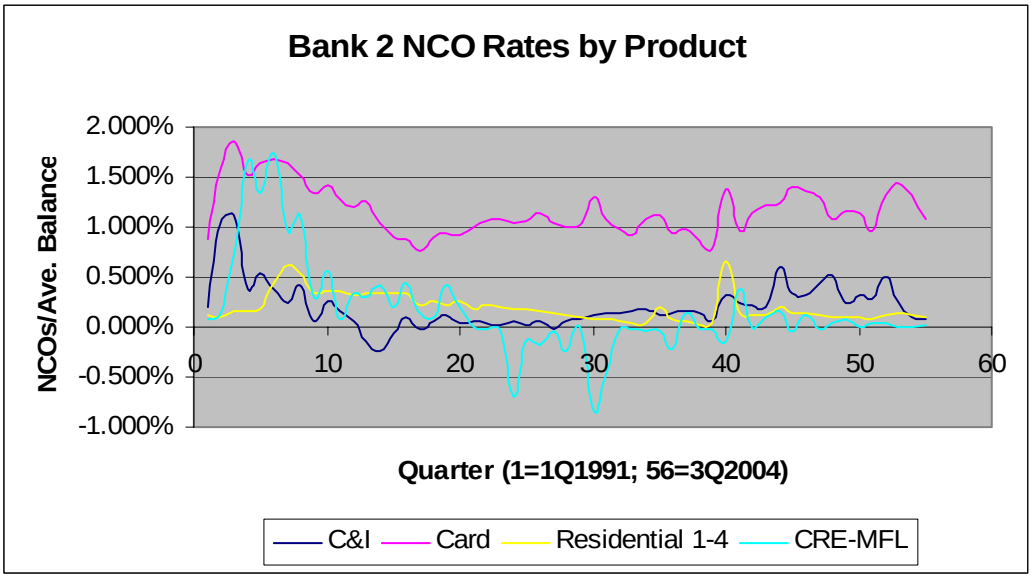
show how the NCO rates vary over time, product by product, for each of the largest 5 bank holding companies.[11]

Graph 2

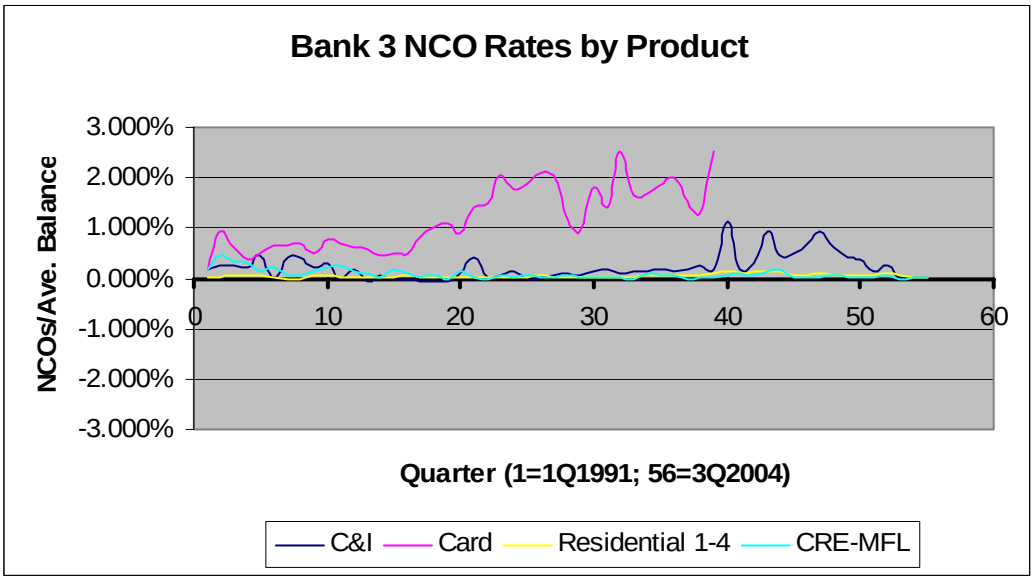


[11] These data are from the bank holding companies' Y-9 reports, which can be found on the website of the Federal Reserve Bank of Chicago. We used the BHC identification codes that are applicable today to these BHCs, which means that earlier data are for the BHC prior to a series of acquisitions and mergers. See: http://www.chicagofed.org/economic_research_and_data/bhc_data.cfm.

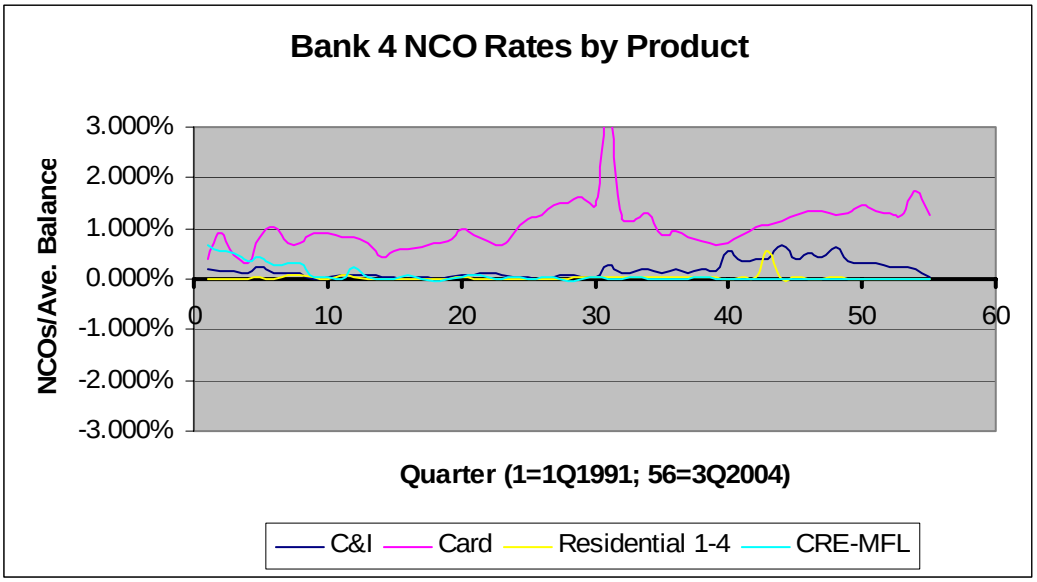
Graph 3



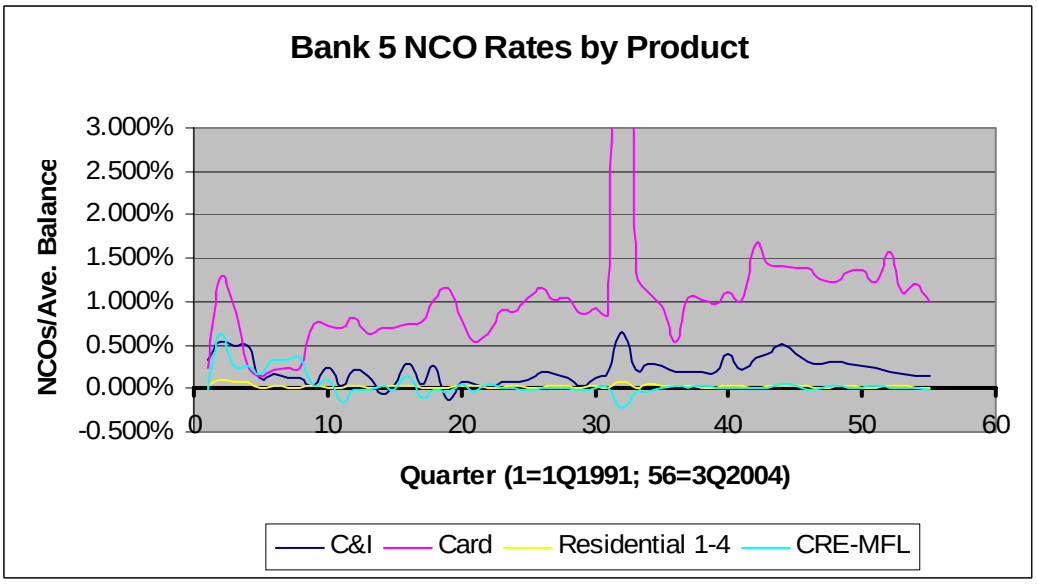
Graph 4



Graph 5



Graph 6



The clear message from these last 5 graphs is that charge-off rate peaks or valleys vary considerably in their timing and intensity, product-by-product and bank-by-bank. For the individual bank, therefore, the natural, cross-product diversification effect of DLGDs is much more apparent than for the industry as a whole.

Table 1 below shows for each of the 5 BHCs and the Top 100 banks the single quarter in which the maximum NCO rate occurs, reinforcing our view that setting all products' DLGDs equal to their individual peaks would constitute an assumption – that all products' DLGD peaks occur at the same time – which is entirely too conservative.

Table 1

	C&I NCO/ave. balances by quarter	Card NCO/ave. balances by quarter	1-4 NCO/ave. balances by quarter	CRE-MFL NCO/ave. balances by quarter	
Bank 1	2.220%	6.431%	0.507%	2.524%	Max
	1991Q4	1991Q4	1993Q2	1994Q4	Quarter of Max
Bank 2	1.119%	1.855%	0.668%	1.730%	Max
	1991Q3	1991Q3	2000Q4	1992Q2	Quarter of Max
Bank 3	1.130%	2.525%	0.157%	0.460%	Max
	2000Q4	2000Q3	2001Q2	1991Q2	Quarter of Max
Bank 4	0.665%	3.341%	0.536%	0.653%	Max
	2001Q4	1998Q3	2001Q3	1991Q1	Quarter of Max
Bank 5	0.648%	9.732%	0.093%	0.620%	Max
	1998Q4	1998Q4	1991Q2	1991Q2	Quarter of Max
Top 100	2.400%	7.800%	0.600%	4.460%	Max
	2001Q4	2002Q1	2001Q3	1992Q3	Quarter of Max

Table 1 again shows that peak NCO quarters happen at different times and with different intensities for each product and for each bank. The last line of Table 1 is especially interesting since it suggests that, for the industry as a whole, the single-quarter NCO peaks occurred during the *current* recession, except for CRE-MFL which has been declining steadily since the early 1990's. This suggests that the use of current recession LGDs as the AIRB banks' DLGDs would not be inappropriate from a regulatory point of view.

NCO rates are not true LGDs. The basic problem with using NCO rates is that such rates could be high due either to high default rates or to high LGD rates. We attempt a simple fix for this problem by combining the NCO data with data on loan delinquency rates. The Board of Governors website data for the Top 100 banks and the FRB Chicago website data for the BHCs give us delinquent loans, including those that are 90 days-past-due due or non-accrual. If we define such 90DPD and non-accrual loans as "defaulted" loans, we then know the *stock* of defaulted loans at any point in time for our observation period of 56 quarters. This stock of defaulted loans for any quarter, expressed as a percentage of loan balances, is *higher* than the quarter's default frequency because, as loans default, they remain in a defaulted state for many months until finally cured or worked out (e.g., foreclosed in the case of mortgages). It therefore takes several quarters' defaults to contribute to any one quarter's *stock* of defaulted loans. We can assume that, for each product type, there is a constant ratio over time between the actual default frequency (PD) and the stock of defaulted loans as a percentage of that product's portfolio of loans:

(1) $PD = \alpha * SD$ where SD is the stock of defaulted loans (as a percentage of all balances for the product in question)

We can also ignore the timing of charge-offs and recoveries, which will occur for a set of defaulted loans at various points (quarters) in the future after the loans turn to defaulted status. Then, the observed loss rate for any quarter is the product of the PD in equation (1) above and the unobserved LGD:

(2) NCO = PD * LGD = α*SD*LGD where NCO is our observed net charge-off rate for the quarter.

We cannot solve for LGD rates in any quarter without knowing what α is. However, we can solve for any quarter's *relative* LGD, as long as α (the relationship between default frequency and the stock of defaulted loans) for that product remains constant over time:

(3) $NCO_i / NCO_j = [\alpha*SD_i*LGD_i]/[\alpha*SD_j*LGD_j]$ where i and j refer to the i^{th} and j^{th} quarter of our series for any product, and j is the reference quarter.

Equation (3) can be solved for the LGD in period i as a ratio to the LGD in period j (the α's cancel out):

(4) $LGD_i/LGD_j = [NCO_i/NCO_j]*[SD_j/SD_i]$

Equation (4) could be estimated for each of our 5 BHCs, for each of the 4 product lines shown in our graphs above. However, we also are concerned that the net charge-off rate for any quarter is unlikely to be determined by the loans that default during that quarter – since workouts often take more than one quarter. To handle this concern we estimate equation (4) using delinquent loan stocks at the *beginning* of the quarter in question rather than the end of the quarter in question:

(5) $LGD_i/LGD_j = [NCO_i/NCO_j]*[SD_{j-1}/SD_{i-1}]$

Equation (5) is estimated for each product, for each of the 5 large BHCs and for the Top 100 as well. The quarter chosen for the comparison quarter (quarter j) is set at 1997Q4 – which is the mid-point in our complete period of observation (and also constitutes a point at the top of the economic cycle). Table 2 shows the peak-quarters for these 'relative' LGDs for each product, for each BHC, and for the Top 100 banks, compared against the bank's or industry's peak quarter for NCOs.[12]

[12] Only for Bank 3 – but none of the other banks or for the Top 100 – could we calculate the relative LGDs by quarter for CRE-MFL. This is because, for the other banks and the top 100, the NCO rate for the reference quarter (quarter j) was zero or negative, causing equation (5) to be insoluble.

Table 2

	C&I relative LGD	Card relative LGD	1-4 relative LGD	CRE-MFL relative LGD	
Bank 1	1991Q4	1991Q4	1993Q2	1994Q4	Quarter of Max NCO rate
	1991Q4	1991Q4	1993Q2	n.a.	Quarter of Max relative LGD
Bank 2	1991Q3	1991Q3	2000Q4	1992Q2	Quarter of Max NCO rate
	2000Q4	2000Q4	2000Q4	n.a.	Quarter of Max relative LGD
Bank 3	2000Q4	2000Q3	2001Q2	1991Q2	Quarter of Max NCO rate
	2000Q4	1995Q2	2000Q4	2001Q3	Quarter of Max relative LGD
Bank 4	2001Q4	1998Q3	2001Q3	1991Q1	Quarter of Max NCO rate
	1998Q3	1998Q3	1999Q3	n.a.	Quarter of Max relative LGD
Bank 5	1998Q4	1998Q4	1991Q2	1991Q2	Quarter of Max NCO rate
	1998Q4	1998Q4	1998Q4	n.a.	Quarter of Max relative LGD
Top 100	2001Q4	2002Q1	2001Q3	1992Q3	Quarter of Max NCO rate
	2001Q4	2002Q1	2003Q4	n.a.	Quarter of Max relative LGD

Table 2 generally repeats the timing of Table 1, demonstrating that peak relative LGDs differ across products and banks sufficiently to highlight the importance of a DLGD cross-product diversification effect. Also, Table 2's last line supports Table 1's result that, except for CRE-MFL, whose NCO rates and relative LGD rates have been declining since the early 1990's, the recent recession for the industry as a whole appears to be generating the highest LGDs (after taking account of relative defaulted-loan levels). Table 2 also shows several cases, for individual products at individual banks, where the peak NCO rates may have been due primarily to high default frequencies rather than high LGDs. For example, Bank 2's peak quarter of NCOs for C&I was 1991Q3, but its peak quarter for relative LGDs in C&I was 2000Q4.[13] The opposite was the case for Bank 3 – its peak quarter for NCOs for Cards was 2000Q3 but its peak quarter for relative LGDs was 1995Q2. On the whole, however, Table 2 supports the theory that, in general, the late 1990's and early 2000's were likely the period of highest LGDs, rather than the early 1990's. That is, 4 of the "relative LGD" cells in Table 2 point to the early 1990's as the

[13] The term "relative LGD" is really a convenience, not an accurate description of our estimating process. The results from estimating equation (5) for each product for each bank must be viewed with caution, since the relative LGDs at their peaks are, for some products, high (several times the reference LGD). These peak relative LGDs are substantially higher than the DLGD multipliers estimated by at least one of the RMA Capital Working Group members, using proprietary data going back to the early 1990's. Remember that our simple analysis assumes that high NCO rates are due to one of two things – high default rates or high LGDs. In fact, for a single product at a single bank, a peak NCO rate could be caused by a change in accounting procedures that causes a one-time spike in NCOs. There are fewer instances of abnormally high relative LGDs for the Top 100 than for the individual banks (the vast majority of relative LGDs range around 1.0). Moreover, it is certainly the case that the restrictive assumptions permitting our simple calculations -- that a) the relation between default frequency and the stock of defaulted loans is always constant, and b) there are no important timing-of-workout differences across banks or products – do not hold in the real world. In short, the accounting (Call Report) data are not useful for establishing absolute LGDs, and may be useful only for assessing rank orders of the relative contributions of default rates versus LGDs to the NCO rate. These rank orders are really what our term "relative LGD" means.

high LGD period, while 15 of the cells point to the period 1998 or later as constituting the high LGD time.

Summary and conclusions.

1) From the graphs, we can see that NCO rates sometimes have 2 or more peaks, occurring over several quarters or years. This is consistent with the view that downturns occur over a period of time and that it would be most appropriate to permit the AIRB bank to define the DLGD period fairly broadly (encompassing, for example, the years on either side of the year in which a peak LGD is observed).
2) High NCO rates can be due either to high default frequencies or high LGDs (or changes in accounting processes). Analysis of the accounting NCO rates, when coupled with analysis of delinquent loans, suggests that high NCO rates for some products in the early 1990's may have been due to high default rates rather than high LGDs. For the Top 100 banks, moreover, the 2001-2003 period appears to constitute the high NCO rate period *and* the high relative LGD period for 3 of the product lines – residential mortgages, C&I loans, and credit cards. A fourth product – CRE-MFL – has been undergoing a sea-change in origination procedures, so that 1990's NCO rates are not very useful for establishing DLGDs. Again, the recent recession may provide a better indication of DLGDs than the 1990's for this product.
3) The cross-product diversification effect of DLGDs is important in that downturns do not occur in the same year (let alone the same quarter) for all products at any given bank. Therefore it would constitute too much of a stress to require that every product be assigned a DLGD equal to its observed LGD during the downturn period *for that product*. We cannot measure this diversification effect for the industry as a whole, but, as suggested in the text, a portfolio-wide measurement of DLGD is possible for the individual bank and would naturally incorporate this diversification effect.

APPENDIX 2

Institutions in the RMA Capital Working Group:

ABNAMRO North American	Bank of America
Capital One	Citigroup
Comerica	HSBC/North American Holdings
JPMorganChase	KeyCorp
MBNA	PNC Financial Services Group
RBC Financial	State Street
SunTrust	Union Bank of California
U.S. Bancorp	Wachovia
Washington Mutual Bank	Wells Fargo

Staff participating in preparation or review of this paper:
Bank of America: John S. Walter, Senior Vice President, Risk Capital & Portfolio Analysis
Capital One: Geoffrey Rubin, Director, Economic Capital Group; William Nayda, Manager, Horizontal Financial Management
HSBC/North America Holdings: John Zeller, Executive Vice President, Credit Risk Management; David Coleman, Senior Vice President, Credit Risk Management; David Morin, Senior Vice President, Credit Risk Management; John Roesgen, Senior Vice President, Finance; Stephen Mongulla, Director, Credit Policy
JPMorganChase & Co: Michel Araten, Senior Vice President; Bradford Pollock, Vice President; Joe Lyons, Vice President; Adam Gilbert, Managing Director; David Nunn, First Vice President, Treasury; Daniel Riner, Senior Vice President, Consumer Risk Management; James Colton, Vice President, Consumer Risk Management
KeyCorp: Ashish Dev, Executive Vice President; Robert Kula, Senior Vice President; Thomas Boltja, Vice President.
PNC Financial Services Group: Shaheen Dil, Senior Vice President & Director, Risk Analytics; Terry Jewell, Senior Vice President & Manager, Quantitative Modeling Group; Thomas Bogdewic, Vice President, Portfolio Management
RBC Financial: Michael Cussen, Basel Coordinator; Jason Smith, Senior Manager, Credit MIS
State Street: Wendy Phillis-Lavoie, Basel II Project Leader; F. Andrew Beise, Basel II Credit Risk Team Leader; William H. Schomburg III, Director, Economic Capital; Norman J. Greenfeld, Director of Counterparty Review; Joseph J. Barry, Vice President, Legal & Industry Affairs
SunTrust: Kenneth J. Ferrara, Group Vice President; Jennie Raymond, Portfolio Analytics; David Fisher, Senior Vice President, Portfolio Risk
Union Bank of California: Paul C. Ross, Senior Vice President, Portfolio Risk Management; Desta G. Medhin-Huff, Vice President, Portfolio Risk Management

Wachovia: Gary Wilhite, Senior Vice President, Credit Risk Management; Ann Baker, Vice President, Credit Risk Review; David Gylfe, Vice President, Credit Risk; James Cypert, Asst. Vice President, Risk Management, Portfolio Management Group.
Washington Mutual Bank: John Stewart, First Vice President, Economic Capital Group; Amy Alexander, Vice President, Basel Credit Risk Analytics; Kurt Wisecup, Asst. Vice President, Economic Capital Group
Wells Fargo: Jouni Korhonen, Senior Vice President, Credit Risk Architecture; Dennis P. Jacovson, Vice President, Credit Reporting and Portfolio Strategies
The Risk Management Association: Pamela Martin, Director, Regulatory Relations & Communications; Mark A. Zmiewski, Director, Strategic Learning & Research; Suzanne I. Wharton. Project Manager, Strategic Learning & Research
Mingo & Co.: John Mingo, Managing Director