FYI: An Update on Emerging Issues in Banking

Estimating the Capital Impact of Basel II in the United States

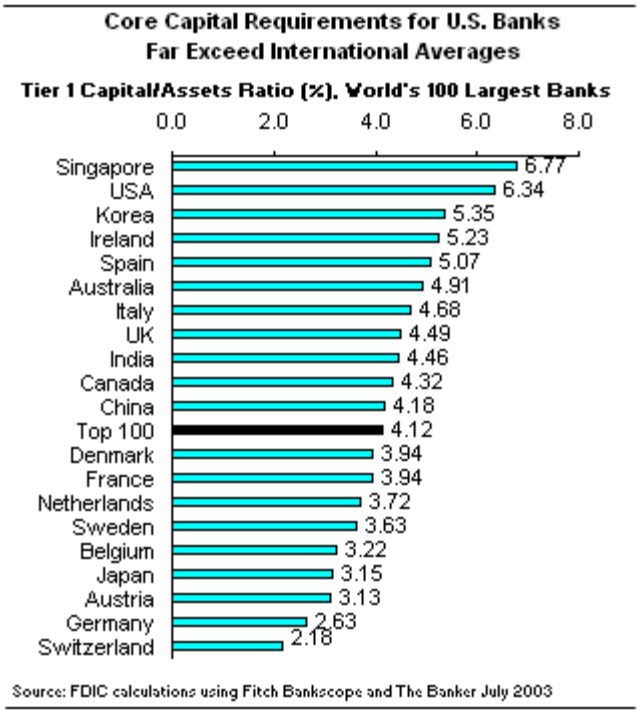
This *FYI* is a corrected version of the *FYI* of the same title originally issued December 8, 2003.

December 8, 2003 (revised August 5, 2004).[1]

This paper contains estimates of the capital impact of Basel II's advanced internal-ratings-based approach (A-IRB). We use 19 years of financial data from all FDIC-insured commercial banks to develop a range of values for the key Basel II risk parameters that banks might be expected to use over time. This allows us to estimate average capital requirements under the A-IRB approach under a range of economic conditions. Our preliminary conclusions are:

- Contrary to descriptions of Basel II not significantly changing overall capital requirements, we expect large percentage reductions in risk-based capital requirements.
- We believe that during most of a typical economic cycle, risk-based capital requirements for Basel II banks would be far below the levels needed for current Prompt Corrective Action (PCA) purposes.
- Consequently, U.S. regulators will have to choose between ignoring the output of Basel II's formulas or significantly weakening the current PCA framework.
- Extremely wide cyclical swings in capital requirements for wholesale lending are likely unless banks' risk inputs are actively managed by supervisors to an extent not currently contemplated.
- Unless PCA is significantly weakened, the already wide disparity in core capital requirements between U.S. banks and other banks (Chart 1) will be widened.

Chart 1



In addition, we have a less quantifiable public-policy concern about the wisdom of implementing the contemplated reductions in risk-based capital requirements for 1-4 family mortgages.

We discuss, at a purely conceptual level, options for changing the A-IRB framework to address our concerns. At their core, those changes would involve: i) implementing the concept of a "top down," minimum capital requirement within the international regulatory framework, and ii) identifying areas where the Accord could be made less prescriptive, in recognition of the added surety provided by that minimum requirement.

We have a high degree of confidence that our conclusions are qualitatively correct, but recognize others may question specific aspects of our work. We have attempted to make the analysis in this paper sufficiently transparent that others may replicate and/or improve upon these estimates. In this regard, we intend to refine these estimates and regard this paper as the starting point of a work in progress. We look forward to a dialogue on these issues and are receptive to analyses that would shed light on the validity of our concerns.

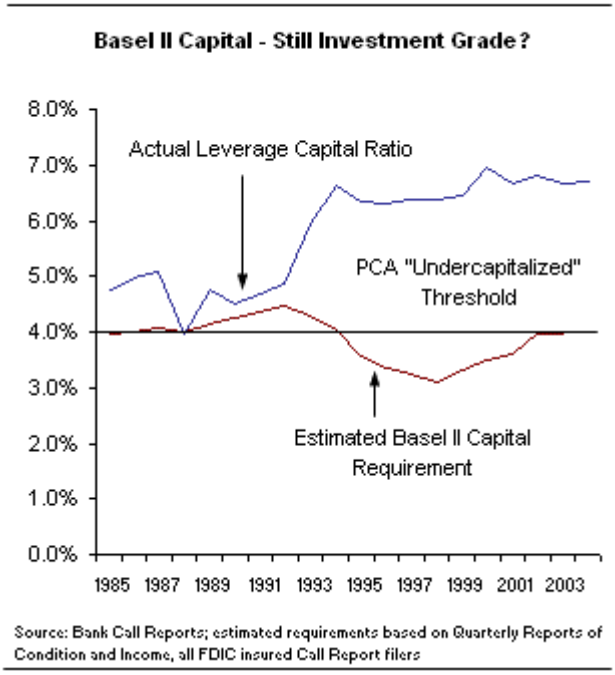
Methodology and Results

Previous Basel II capital impact studies have built their estimates from the bottom up, by surveying banks about the values of risk parameters used in their internal risk measurement systems. We construct our estimates from the top down, starting with historical losses to infer a plausible range of risk parameters, which we then input into the Basel II formulas. The approach is discussed in detail in the appendix.

At its heart, our analysis is extremely simple. The Basel Committee's Quantitative Impact Study 3 (QIS-3) showed a 17 percent reduction for credit-risk capital at U.S. banks. This reduction occurred despite the participating banks' use of credit loss assumptions that were far more severe than historical experience. If more normal loss assumptions were input into the Basel II risk functions, capital requirements would be expected to be much less than the QIS-3 predicts.

Our analysis appears to confirm this. Over time and on average, the A-IRB formulas would be expected to deliver much lower capital requirements than the current standards for the same pool of exposures. While we develop a range of capital estimates as described below, we believe Chart 2 describes the qualitative features of the most likely capital outcome of Basel II. Specifically, A-IRB capital requirements are likely to be at or below the leverage standards set by U.S. Prompt Corrective Action standards for "well capitalized," and could often fall into a range currently deemed "undercapitalized" by PCA. Consequently, U.S. regulators would be forced to ignore much of the output of Basel II or weaken the PCA standards. Not as evident from Chart 2, but as described in a subsequent section, Basel II also creates the likelihood of significant cyclical swings in risk-based capital requirements for wholesale lending.

Chart 2



Estimating the level of Basel II's A-IRB capital requirements

As described in more detail in the appendix, our starting point was the assumption that over time, average annual net charge off rates on broad loan categories should provide a good approximation to Basel II's 12-month expected loss measure that might be expected to prevail over the same period of time. For each broad loan category, we use historical loss rates as a percentage of on-balance sheet exposures to estimate an expected loss (EL). We assume a high and a low value for the weighted average loss given default on loans in each category. We then "reverse-engineer" a weighted average probability of default (PD) that, when multiplied by our assumed loss given default (LGD), would result in the estimated EL. The PD and LGD are fed into the appropriate A-IRB risk function to compute an "unexpected loss (UL)" capital charge (with an appropriate adjustment for the concavity of the risk function as described below).

It is critical for the reader who wishes to comment upon our analysis to understand what we are measuring. The capital charges we compute should be regarded as overestimated capital charges for on-balance sheet credit exposures. Our approach attributes all credit loss during a year to the on-balance sheet loans at the start of that year. Therefore, if charge-offs during a year were taken on exposures that were not on the balance sheet at the beginning of that year (perhaps because those exposures existed only as undrawn lines or commitments at the beginning of the year, or because the charged-off loans had simply not yet been made at the beginning of the year), we would be overestimating the EL and hence the UL capital charge for the on-balance sheet loans. We do not know how quantitatively important this overestimation is.

Tables 1 through 4, and the accompanying text, describe the analysis that went into the construction of Chart 2. These tables are based on a Call Report presentation of asset categories and the capital that might be required for them. To shed more light on the effects of capital requirements for off-balance sheet exposures, we subsequently estimate changes in capital requirements in a QIS format in Table 6.

Table 1 summarizes the results of our estimates of A-IRB capital requirements by major type of lending, as a percentage of exposure. We did not conduct this analytical exercise for capital requirements for credit cards, because of the substantial policy uncertainty that still exists in that area. We consolidated small business lending into the wholesale category along with loans to banks, foreign governments, commercial

and industrial loans, and loans secured by non-farm, non-residential real-estate.

Table 1
A-IRB Capital Requirements Vary Depending on LGD Assumptions

	Using Low LGD			Using High LGD		
Loan type	**cyclic low**	**avg**	**cyclic high**	**cyclic low**	**avg**	**cyclic high**
Wholesale	2.77%	4.68%	6.41%	3.64%	6.59%	8.92%
ADC	0.00%	4.54%	9.14%	0.00%	5.89%	11.97%
1-4s	0.75%	1.17%	1.59%	0.91%	1.45%	2.02%
O. consumer	2.91%	3.30%	3.47%	3.73%	4.53%	5.10%

Source: FDIC

The cyclic highs and lows presented in Table 1 were computed by assuming that in every year, Basel II's EL for each broad loan category equaled the actual banking industry net charge-off rate for that loan category.[2] This approach certainly exaggerates the degree of cyclic variability that would be expected under A-IRB. For example, no one would seriously argue that the capital requirement for acquisition, development and construction (ADC) lending would ever be zero. Even so, as described in the next section, it is not clear how some fairly substantial degree of variability in capital requirements would be avoided.

The balance sheet weights, and the average values (over the 19-year period) of risk inputs used to construct these estimates are presented in Table 2. We used balance sheet weights for all insured commercial banks as of year-end 2002. This makes our results less sensitive to the details of exactly which set of banks ultimately adopt Basel II, but is subject to the criticism of understating the importance of credit cards and trading assets to Basel II's most likely adopters. Table 6, which gives a capital impact analysis in a QIS-3 format, is not subject to this criticism, and shows a very similar capital impact to the results displayed in Tables 1-4.

The "spread adjustment" in Table 2 refers to the percentage reduction we need to make to our estimates to account for the concavity of the risk functions. Inputting a single weighted average PD and LGD into the Basel risk functions, as we have done, overstates the capital requirement a bank would face if it had a range of PDs and LGDs equating to our averages. Inspection of the distribution of a sampling of individual banks' PD and LGD bands in the QIS-3 data suggested the adjustments listed in Table 2.

Table 2
Capital Impact Depends on the Level and Spread of Key Risk Inputs

			Low LGD		High LGD		
Loan type	**Weight**	**Avg EL**	**PD**	**LGD**	**PD**	**LGD**	**Spread Adjustment**
Wholesale	26%	0.99%	3.30%	30%	1.98%	50%	30%
ADC	3%	0.88%	2.20%	40%	1.47%	60%	30%

1-4s	16%	0.15%	1.00%	15%	0.50%	30%	20%
O. consumer	6%	0.90%	2.25%	40%	0.60%	60%	20%

Source: FDIC

For all other exposure categories we have simply made assumptions about the effective UL capital requirements under A-IRB as a percentage of exposure. Market risk capital requirements are included in our assumption about capital held for trading assets. The assumptions are listed below.

Table 3
Capital Requirements Assumed for Other Balance Sheet Accounts

Exposure type	**weight**	**Assumed UL capital req**
Cash and due	6%	1.60%
Fed funds and repos	4%	1.60%
MBS	10%	0.56%
Treasuries	1%	0.05%
Other securities	8%	1.60%
Credit cards	4%	8.00%
Trading assets	6%	4.00%
Other assets	10%	8.00%

Source: FDIC

Credit card lending received a substantial increase in capital requirements under the A-IRB approach described in the Basel Committee's Consultative Paper 3 (CP-3). Basel II's "standardized" banks, in contrast, saw a 25 percent reduction in capital requirements for credit card lending. Capital requirements for A-IRB credit card lending are under intensive review at this time, and the strong likelihood is that the requirements will be different-but we don't know how-than what was described in CP-3. We regard our assumption of "no change" in requirements for advanced banks relative to the current rules as a placeholder to be used until current policy discussions are resolved.

A range of overall UL capital requirements for credit risk (constructed by asset-weighting the categories listed in Tables 1 and 3) and operational risk is presented in Table 4. Much more detail is provided in spreadsheets in the appendix. Operational risk capital is assumed to be 12 percent of the capital requirement for credit risk. This

figure has been used by the Basel Committee as a rough indication of the potential magnitude of the operational risk charge, but in reality there is little basis for predicting its magnitude or its variation over time.

Table 4
Under Most Scenarios, Basel II Lowers Risk-based Capital Requirements Substantially

	Low LGD			High LGD		
Capital requirement	**cyclic low**	**avg**	**high**	**cyclic low**	**avg**	**high**
All credit risk	2.77%	3.44%	3.99%	3.11%	4.10%	4.86%
Operational risk	0.33%	0.41%	0.48%	0.37%	0.49%	0.58%
Subtotal	3.10%	3.85%	4.47%	3.48%	4.59%	5.44%
Current RBC	5.05%	5.05%	5.05%	5.05%	5.05%	5.05%
% reduction in capital	39%	24%	11%	31%	9%	-8%

Source: FDIC

The "current RBC" row refers to current weighted average risk based capital requirements-that is, a dollar amount equal to 6.75 percent of risk-weighted assets-expressed as a percentage of on-balance sheet assets for the 50 largest banks in the U.S. The 6.75 percent figure is obtained by subtracting 1.25 percent of gross risk-weighted assets from the basic requirement of 8 percent of risk weighted assets. Since we are estimating UL capital requirements under Basel II, we should subtract the portion of current capital requirements that can be met with loan loss reserves in order to get an "apples-to-apples" comparison.

We believe that the estimates presented on the "low LGD" side of Table 4, or even lower numbers, are likely to be more reflective of the long run capital implications of A-IRB. In reaching this judgment, we have considered the impact of a number of factors not explicitly reflected in the numerical analysis. Most of these factors suggest that our analysis overstates A-IRB capital requirements. First, similar to the caveats articulated by the Basel Committee in its May 5, 2003, report on the QIS results, our analysis does not reflect that banks will be able to categorize various small business loans as retail, nor does it fully recognize the new opportunities for recognition of collateral and risk mitigation banks will have under A-IRB. The results do not reflect the A-IRB's expanded use of models in setting capital for repos, liquidity facilities, and possibly other securitized, traded or marked-to-market assets. Finally, our estimates of average through-the-cycle EL rates may be on the high side, as they are computed using a high-loss period that included the failure of over 1500 U.S. commercial banks, a period that future supervisors implementing Basel II may regard as atypical.

An important fact to consider when evaluating the QIS-3 estimates is that they were made in fall 2002, well into a U.S. corporate recession. To this extent, the QIS-3 estimates of capital for corporate exposures are likely to overstate the capital that may be required in the future. QIS-3's estimated EL (including the EL on defaulted assets) for corporate drawn exposures-the largest single contributor to bank capital requirements in QIS-3-averaged 1.60 percent of the drawn amounts across the

participating banks. This compares with a 1.00 percent average net charge-off rate on outstanding C&I loans over the 18 years we studied. This suggests the likelihood that over time, A-IRB capital for corporate exposures would be expected to come down significantly as compared to what was estimated by QIS-3.

Similarly, QIS-3's EL as a percentage of drawn residential exposures was 0.5 percent of the drawn balances, compared to a 0.15 percent historical average net charge-off rate. For other retail loans (not including credit cards), QIS-3 showed an EL of 1.8 percent of drawn balances, compared to a 0.9 percent historical average charge-off rate for "other consumer loans." These figures provide further indirect support to our analysis, and suggest that QIS-3 materially overestimated the long-run average capital requirements that Basel II is likely to bring.

We conclude from these arguments, in conjunction with the results presented in Table 4, that average risk based capital requirements for traditional banking activities would hardly ever exceed the five percent leverage threshold for being "well capitalized" under current U.S. Prompt Corrective Action regulations, and could well be less than four percent of exposures during strong expansions. In short, existing Prompt Corrective Action standards are likely to come into conflict with the new risk-based requirements of Basel II's advanced approaches.

Possible objections to our analysis

Several factors might, at least in principle, argue that there would be a smaller reduction in capital requirements than our estimates show. First is the effect of those parts of the Basel II framework that must currently be categorized as "moving parts." These include important parts of retail, securitization, credit risk mitigation, and recalibration to a UL-only framework. In this regard, most changes now under discussion are capital-reducing. Moreover, at least at this time, the type of recalibration being considered would not be expected to significantly increase capital relative to what the CP-3 formulas require.

A second factor that should be considered is the possibility that supervisors would require "stressed LGDs." The U.S. Advance Notice of Proposed Rulemaking (ANPR) indicated banks should use stressed LGDs where appropriate. To the extent this is actually done, Basel II's ELs could systematically exceed actual losses year after year, and our estimated capital requirements would be too low. We regard the extent true stressed LGDs will actually be used as unclear. An equally likely possibility is that real-world pressures will cause Basel II's risk inputs to be underestimated. We believe the best starting point for an analysis is simply to assume that ELs measure what Basel II says they measure: expected 12-month credit loss.

Another factor that should be considered is that if A-IRB resulted in greater capital being required for significant off-balance sheet exposures than did the U.S. version of Basel I, our conclusions regarding the likely direction and magnitude of the capital impact might be mitigated. In the QIS-3, this did not appear to be the case except for credit card banks.

Table 5 shows that QIS banks with large off-balance sheet exposures relative to their asset size did not tend to face greater A-IRB capital requirements as a percentage of their on-balance sheet assets. The U.S. version of Basel I already forces the largest banks to hold significant risk weighted assets for off balance sheet exposures. A significant portion of this off-balance sheet exposure has extremely low credit risk, including exposures arising from collateralized or highly liquid transaction processing businesses and unused prime credit card lines. Therefore, under A-IRB, most capital requirements for off-balance sheet risk decrease substantially compared to the Basel I requirements. The result is that, as illustrated in Table 5, A-IRB capital requirements diminish markedly both as a percentage of exposure and as a percentage of on-balance sheet assets, the greater the volume of off-balance sheet activities. Apart, possibly, from credit card lending, we view it as unlikely that new exposures banks would be forced to capitalize-and that they are not already capitalizing under Basel I-would increase enough to materially offset the effects of A-IRB's lower risk weights.

Table 5 - Large Off-Balance Sheet Exposures do not Imply Relatively Higher Capital Requirements		
Exposure to Assets	**% of exposure**	**% of assets**
>300%	1.52%	4.99%
200-300%	2.19%	5.45%
125-200%	3.81%	5.65%
<125%	6.69%	7.16%

Source: FDIC

Table 6 provides evidence from the QIS-3 in support of this contention. Table 6 is based on an approximating relationship described in the appendix. The basic idea is that the percentage change in the ratio of required risk-based capital to total assets equals the weighted average of the percent changes in each risk weighted asset category, but that some further assumptions are needed to account for the role of the loan-loss reserve in forming a "UL-to-UL" comparison of current and A-IRB capital requirements. Table 6 shows that the key driver of the overall change in the ratio of risk based capital to total assets is the change in the capital requirement for drawn credit exposure. The change in all other sources of risk-based capital, taken together, slightly increase the overall percentage decline in capital. Thus, the critical issue in terms of capital impact is, in fact, whether our estimates of capital for drawn credit are accurate.

Table 6 A-IRB Capital Impact Approximated by Weighted Change in Components			
Exposure Category	**Current RWA share**	**RWA est % change**	**Contribution to Change in overall RBC to Asset ratio**
All Current RWA	100.00%		
Drawn Credit Exposure, net of revolving	62.77%	-47.62%	-29.89%
Revolving	7.51%	0.00%	0.00%
Corp commitments	12.31%	-29.84%	-3.67%
Other commitments	1.64%	8.00%	0.13%
Trading book	7.35%	2.03%	0.15%
Equities	1.60%	228.32%	3.66%
Securitization			

- originators	5.58%	-11.31%	-0.63%
- investors	1.18%	-16.79%	-0.20%
All other QIS	0.04%	-94.59%	-0.04%
Subtotals	99.99%		-30.50%
Impact on Capital			
Current RBC to Asset ratio(excluding provisions)			5.05%
AIRB Credit Capital			3.51%
Operational Risk Capital			0.42%
Total AIRB Risk Based Capital			**3.93%**

Source: FDIC

We estimated the percent change in capital requirements for drawn credit exposures net of revolving using our "low LGD" averages reported in Table 1. The balance sheet weighted average of our "low LGD-average" requirements for the wholesale lending, ADC lending, 1-4 family residential mortgages and other retail lending categories reported in Table 1 was 3.41 percent of exposures, equating to a 42.6 percent risk weight. For all commercial banks at year-end 2002, the average risk weight for all loans and leases, excluding credit cards and other revolving consumer credit (the excluded revolving credit does not include home equity loans), was 82 percent. The reduction in average risk weight from 82 percent to 42.6 percent equates to the 47.6 percent decline in risk weighted assets reported in Table 6.[3]

There is not a perfect mapping between the capital requirements we estimated for our four drawn loan categories and the QIS-3 category we have labeled drawn credit exposure, for three reasons. First, an unknown percentage of the QIS credit exposure buckets comprised securities, repos and cash and due. We believe, however, that A-IRB capital requirements for all of these items, with the exception of Treasury securities, declined substantially (for corporate, bank and sovereign repos, for example, the decline was greater than the 47.6 percent we report). Second, a portion of these credit exposures are in fact undrawn. We know of no reason to believe, however, that the decline in capital requirements for these undrawn amounts would be much different than for the drawn amounts. Finally, the drawn credit exposure category includes a miscellaneous assortment of lending categories for which we did not estimate a capital change and that are not separately estimated in QIS-3.

For revolving consumer credit, we again assumed no change in requirements, consistent with the discussion earlier in this paper. The change in risk weighted assets for all other categories is taken directly from QIS-3. The end result, a 3.93 percent ratio of risk based capital to total assets, is very close to the 3.85 percent figure reported in Table 4 for the "Low LGD—average" scenario.

To summarize, we estimated capital requirements using historical call report data for the major drawn loan categories except for credit cards and other revolving consumer credit. We made point estimates of all other risk based capital requirements for the traditional call report categories, arguing that our estimates were sufficiently conservative to more than cover any additional capital from off-balance sheet activities. In Table 6, we checked the answer that we got for the "low LGD" scenario

using the same low LGD assumptions for drawn credit, and using the QIS estimates for all other categories of exposure, and came to roughly the same answer.

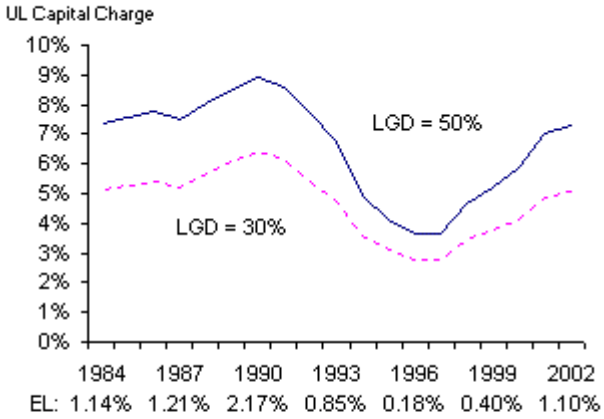
We believe that the overall conclusion that Basel II's A-IRB capital requirements would generally be well below current U.S. PCA requirements is difficult to challenge, and that the burden of proof is now on others to show where the A-IRB capital requirements would be sufficiently more stringent than we have estimated as to overturn our conclusions.

Cyclical swings in capital requirements

Swings in capital requirements over the business cycle would be expected to be very pronounced if ELs accurately measure 12-month loss at a point in time. Chart 3 plots estimated UL capital requirements for wholesale lending under the two alternative LGD assumptions. UL capital requirements for wholesale lending range from as low as about 3.6 percent of exposure to as high as about 8.9 percent of exposure if a stressed LGD of 50 percent is assumed. These are average figures that understate the degree of bank-specific variation that would be expected to occur.

Chart 3

Wholesale Capital Charges With "Unbiased" EL



Note: UL capital charge is from the CP-3 Wholesale risk weight function with EL subtracted from the capital charge. PDs calculated from assumed EL and LGD, M=2.5 years. EL "unbiased" at year end is the net charge-off rate for all wholesale loans during the subsequent year. Wholesale loans were defined as the sum of commercial loans, loans to foreign governments, depository institutions and secured by non-farm non-residential properties. Estimates adjusted for concavity and maturity bias.

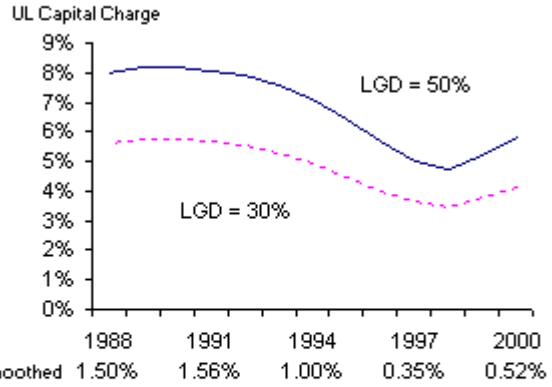
Source: FDIC calculations based on Quarterly Reports of Condition and Income, all FDIC insured Call filers

Using lower LGDs reduces swings in capital requirements but also reduces those requirements (in the limit when LGD is zero, there is no volatility—the capital requirement is zero throughout the cycle). For example, assuming a 30 percent through-the-cycle LGD for wholesale lending, UL capital ranges between about 2.8 percent of exposure and about 6.4 percent of exposure.

One way to avoid such volatility, at least in principal, would be for the supervisors to require inter-temporal smoothing of risk inputs. Chart 4 shows the results of a "smoothed EL" approach where we assume that expected loss rates are the average of seven years of actual loss rates, namely the current year, the previous four years, and the subsequent two years. The Chart shows that depending on the LGD assumptions, even such seven-year averaging of loss experience results in swings in wholesale capital requirements of several percentage points over the cycle.[4]

Chart 4

Wholesale Capital Charges With "Smoothed" EL



EL:Smoothed	1.50%	1.56%	1.00%	0.35%	0.52%

Note: UL capital charge is from the CP-3 Wholesale risk weight function with EL subtracted from the capital charge. PDs calculated from assumed EL and LGD, M=2.5 years. EL "smoothed" at year end is the average of the previous 4 years' and the next 2 years' actual charge-off rates for wholesale loans, defined as commercial loans, loans to foreign governments, depository institutions and secured by non-farm non-residential properties.

Source: FDIC calculations based on Quarterly Reports of Condition and Income, all FDIC insured Call filers

In the extreme, risk inputs could be smoothed so much that each loan segment would have EL rates that do not change over time. The result, in the context of this analysis, would be roughly steady capital requirements. Within the assumptions of our analysis, these would be expected to correspond to the "average" columns of Table 4.

It is not clear, in any event, how inter-temporal smoothing of risk inputs sufficient to ameliorate large swings in capital requirements could be accomplished within the implementation scheme now envisioned. While banks are encouraged to use default-weighted, or stressed, or conservative through-the-cycle LGDs, they are permitted to use point-in-time estimates of PD. With a steady LGD, point-in-time PDs would result in cyclic swings in EL, and hence UL capital requirements.

More generally, substantial input smoothing appears inconsistent with the conceptual framework of the A-IRB. The A-IRB approach contains no mechanism for achieving targeted capital outcomes. Risk inputs are to be evaluated loan-by-loan and pool-by-pool. Revisiting or changing a large number of risk inputs based on a bank's overall wholesale capital requirement is not envisioned. It is not clear how large-scale supervisory management of risk inputs to produce desired capital outcomes would square with the stated importance of banks' validation efforts.

Another way to avoid swings in capital requirements would be through supervisory overrides of those requirements. Placing ex ante reliance on supervisory overrides of regulations to correct perceived flaws in those regulations would appear problematical, however. If regulatory capital outcomes are considered so unacceptable that supervisory overrides would often be needed, that suggests that the regulations should be changed.

The foregoing discussion suggests that three questions need to be answered relative to the capital impact of the A-IRB.

- Are the risk-based capital outcomes pictured in Charts 2, 3 and 4 acceptable?
- If not, how will such outcomes be avoided under the CP-3 framework?
- Finally, if there is no good answer to this second question, how should the

framework be changed?

Mortgages

Another important issue is whether there are particular lending segments for which the reduction in capital is excessive. The reductions in capital for single-family residential mortgages appear to constitute a significant expansion of the safety-net support provided to this activity when conducted within national banking systems. A backward look at the credit risk performance of this sector may suggest such safety-net support will never need to be exercised, but this appears to be a heavy bet for bank regulators to place. It is noted that Standard & Poor's has expressed discomfort with the A-IRB retail capital framework in general.

International competitive issues

Finally, the proposed new risk-based capital rules would be expected to exacerbate the effects of cross-country differences in the regulation and supervision of bank capital. As seen in the beginning of the paper, Chart 1 shows that these cross-country differences are already considerable. The A-IRB approaches would appear to widen existing capital disparities, because minimum leverage ratio requirements will not permit U.S. banks to reduce their capital requirements by as much as banks in other countries.

Options

Our assessment is that on average and through the cycle, CP-3 will deliver substantial reductions in risk based capital requirements. U.S. policy-makers will be confronted with a choice between ignoring the results of Basel II or substantially weakening the PCA requirements. Without a significant weakening of PCA, the disparity in effective capital requirements U.S. banks already face because of leverage capital requirements will be widened. We believe that without significant change to the CP-3 framework, wide swings in capital requirements over the business cycle for wholesale lending activities are likely.

To the extent readers are convinced that this analysis does present a compelling case for change of the CP-3 framework, we suggest there are three logical directions for change, two of which, we believe, merit further discussion.

1. Change risk weight functions by raising and flattening them. Higher, flatter curves would reduce the potential for swings in requirements, make the capital outcomes closer to the Basel Committee's goals and may help reduce worldwide bank capital disparities. There would be much more risk sensitivity than under current rules, but somewhat less risk sensitivity than under CP-3.

2. Abandon the U.S. leverage ratio and institute full-models-based risk-based capital requirements so low that they are lower than point-in-time economic capital requirements at the height of an economic expansion. This is the approach a significant banking industry trade group has recommended in its comment letter, but it is not an approach we can support.

No one knows how to measure the hundred year flood plain for a large complex bank. Measuring the risk of extreme tail events in ever-changing bank loss distributions will always be an inexact science. Placing exclusive reliance on banks' statistical estimates of the likelihood of these tail events is not an acceptable way to protect the deposit insurance funds or, ultimately, the taxpayer. In this regard, a bank failure is costly to the broader economy, not just to the stakeholders in that bank. So even assuming a bank's models are accurate, the capital banks should hold from a social welfare perspective would normally be expected to exceed the capital that the banker calculates to meet his own needs. In the language of economics, minimum capital is needed to address the significant external costs of bank failures.

It should also be noted that the A-IRB risk functions are simply statistical calculation engines that can produce economic capital estimates that have an unclear connection to mainstream economic theory. The idea that there is no free lunch—that risk-free profit opportunities are arbitraged away—is a fundamental precept of standard

economics and finance. Yet the A-IRB risk functions are built on a conceptual framework that assumes an "unexpected loss" of zero for important categories of assets, including any exposure for which the bank estimates an LGD of zero, defaulted exposures, exposures purchased at a sufficient discount, and "partially charged off" exposures. The A-IRB approach in effect assumes that a bank's marginal investment in such assets provides a risk-free profit opportunity.

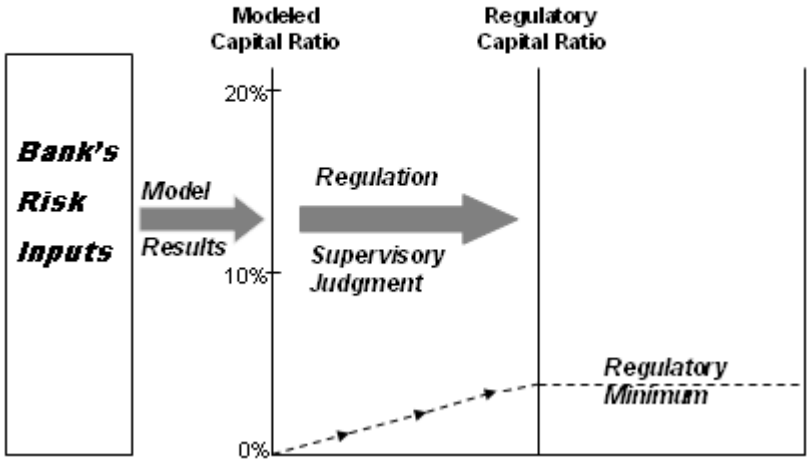
Minimum capital requirements are sometimes criticized as "not risk sensitive." The discussion above shows that when one considers the risk of model error, the "no-free-lunch" postulate, and the risk of damage to economic and financial systems that come from weak and failing banks, it is the lack of a minimum requirement that should more properly be criticized as "not risk sensitive." This brings us to option three.

3. Explicitly include the concept of a capital floor as part of the international capital regulatory framework. With the added surety of a floor as part of the framework, it may be possible to make certain other aspects of the Accord less prescriptive. The result, conceivably, could be a framework that better meets the safety and soundness objectives of prudential capital regulation while being less costly for banks to implement.

In many ways, we believe this third option could give the best of all worlds. At any event, we believe it is absolutely critical that our regulatory framework acknowledge the merits of both risk based capital and minimum capital (Chart 5). Modeled capital can be used as an input to regulatory capital, but should never be permitted to be the sole driver of regulatory capital. We look forward to discussions with all interested persons about the issues and options described in this paper.

Chart 5

Modeled Capital Vs. Minimum Capital: Our Regulatory Framework Must Accommodate Both



Appendix

The results of this paper are summarized in various tables and charts that display estimates of A-IRB unexpected loss (UL) capital requirements as a percentage of exposure. More specifically, let k denote the UL capital requirement per dollar of wholesale exposures implied by CP-3's wholesale risk function. The value of k depends on the risk inputs PD, LGD and M (probability of default, loss given default and maturity).

$k(PD, LGD, M) = [K_{UL}]/EAD$

where EAD is exposure at default and K_{UL} is CP-3's UL capital requirement (i.e., the total requirement minus calculated expected loss (EL)).

Write CP-3's wholesale correlation R as a function *R*(PD) of PD. For ease of notation let

J(PD) = N[(1 – R(PD))^-0.5 * G(PD) + (R(PD) / (1 – R(PD)))^0.5 * G(0.999)]

where the expression on the right is reproduced from the CP-3 wholesale risk function (N( ) is the standard normal cumulative distribution function and G( ) is the inverse of the standard normal cumulative distribution function). Again for notational convenience let

H(M, PD) = [1 + (M – 2.5)*b(PD)] / [1 – 1.5*b(PD)],

where b(PD) is CP-3's maturity adjustment b, written as a function of PD.

With this notation, KUL becomes

KUL = EAD*LGD*J(PD)*H(M, PD) – EAD*LGD*PD

so that dividing by EAD, we have

k(PD, LGD, M) = LGD*[J(PD)*H(M, PD) – PD]. (1)

We develop estimates of weighted average wholesale PD and LGD described below, assume a value of M, insert these three numbers in equation (1), and report the results. To reiterate, the reported results are estimated capital requirements per dollar of exposure. We follow a similar procedure for CP-3's mortgage, other retail, and high-volatility commercial real estate risk functions. We do not analyze qualifying revolving exposures (QRE), which we view as subject to too much policy uncertainty to allow for an impact analysis. We likewise do not analyze small and medium sized enterprise exposures, but instead combine those exposures with wholesale exposures.

The remainder of this section summarizes how we estimated the weighted average PDs and LGDs and the corresponding capital requirements. Essentially, whereas QIS-3 builds its estimates from the bottom up, using risk inputs to construct EL and UL capital requirements, we work from the top down, starting with estimates of EL to construct plausible ranges of the risk inputs which we then use to estimate the UL capital requirement.

1. We use data from quarterly financial reports of condition and income (Call Reports) for all FDIC-insured commercial banks, 1984-2002.

2. We construct "unbiased EL rates" that are set by definition to annual net charge off rates for the four loan categories (wholesale; acquisition, development and construction; 1-4 family mortgage; other retail). Call this estimated EL rate L.

3. For each of these loan categories we produce two capital estimates, one assuming a high long run average LGD and the other assuming a low long run average LGD

4. For each loan category we set weighted average PDs equal to L/LGD, using the L and the high and low values of LGD from the previous two steps. Note that as defined in CP-3, EL is a dollar amount equal to EAD* PD*LGD. Expressed as a percentage rate, EL per dollar of exposure, or L, is simply PD*LGD. Since we don't know EAD, we empirically estimate L using net loss per dollar of on balance sheet exposures for the given loan category. Since total exposure is in principal at least equal to on balance sheet exposure, we are somewhat overstating the loss per dollar of drawn exposure, and our estimates of PD and LGD will be correspondingly overstated for the drawn category. Thus we have to some extent overstated the resulting UL capital requirements for drawn exposures.

5. We assumed a 2.5 year average maturity for wholesale lending, the midpoint of the currently allowed CP-3 range of 1-5 years.

6. For each year, each exposure type, and each LGD (high and low) we input the estimated weighted average PD and LGD (and where applicable, M) into equation (1), giving an estimate of UL capital requirement expressed as a percentage of exposure, by year and exposure type. This procedure overstates the capital requirement because of the concavity of the risk functions with respect to PD. We adjust for this using a sample of actual PD bands for QIS-3 banks.

7. For other asset categories we simply assume a range of required capital.

8. We weighted all the resulting percentage capital requirements by the year-end 2002 aggregate balance sheet weights for all insured commercial banks to compute average A-IRB capital requirements "by year" for credit risk as a percentage of exposure. It should be noted we view these estimates not as "what Basel II would have required over time," but as an indicative of the capital requirements a portfolio with current balance sheet weights might face under varying economic conditions.

9. We added 12 percent of the resulting credit risk requirement to cover operational risk. The Basel Committee has suggested this 12 percent figure as an indicator of its intentions about the rough magnitude of the operational risk charge. In reality, however, there is little empirical basis for forecasting its magnitude.

Our basic proxy for EL rates described in step 2 assumes that ELs measure accurately what CP-3 says they are intended to measure-namely, twelve months of credit loss. To motivate the use of our specific EL proxy, note that industry-wide loss rates tend to move up and down in relatively small increments in line with economic conditions. A specific large, well-diversified bank might have a higher or lower expected loss rate than the industry as a whole, based on that bank's unique risk profile. Collectively, however, U.S. A-IRB banks should not have expected average loss rates that are much different from industry averages. There may be issues about the timing of charge-offs and recoveries that would cause the time path of a true economic measure of unbiased 12-month EL to be different than the time path of our estimates of unbiased EL. Such differences would not be expected to affect either the validity of our 19-year average EL measures, or the validity of the notion that unbiased ELs are much lower in expansions and much higher in recessions.

Notes to Table 6:

Table 6 is based on an approximation. Let

C_0 = total risk based capital, current rules, minus allowable portion of allowance for loan and lease losses
C_1 = total UL-only risk based capital, new rules, excluding op risk
R_0 = total risk weighted assets, current rules
R_1 = total risk weighted assets, new rules, excluding op risk
i = 1, …, n, credit exposure categories
$R_{0,i}$ = risk weighted assets, category i, current rules
$R_{1,i}$ = risk weighted assets, category i, new rules
A = total on-balance sheet assets
w_i = share in current risk weighted assets of exposure category i
p_i = percent change in risk weighted assets of exposure category i

Then

$$
\begin{aligned}
[(C_0/A) - (C_1/A)]/(C_0/A) &= (C_0 - C_1)/C_0 \\
&\approx 0.0675*(R_0 - R_1)/(0.0675*R_0) \\
&= (R_0 - R_1)/R_0 \\
&= (\textstyle\sum_i (R_{0,i} - R_{1,i}))/R_0 \\
&= \textstyle\sum_i (R_{0,i}/R_0)((R_{0,i} - R_{1,i})/R_{0,i}) \\
&= \textstyle\sum_i w_i p_i
\end{aligned}
$$

The approximation is in the second line of the chain of equalities above. We are assuming first that all of the allowable 1.25 percent of gross risk weighted assets is

used to offset the 8 percent capital requirement on total risk weighted assets. Thus, we write C0 = .0675*R_0 as our "UL-only" current capital requirement. Second and more significantly, we assume that in moving from CP-3/QIS-3 numbers that included an EL-component for the capital charge, to a UL-only capital requirement post-Madrid, that the relationship

0.08 * (UL-only risk-weighted assets) ≈ 0.0675 * (EL + UL risk weighted assets)

is approximately satisfied. Roughly speaking, this means that a bank that exactly met its EL + UL capital requirement with a 1.25 percent reserve would continue to exactly meet it UL-only capital requirement with no additional capital shortfall or credit.

If so,

$C_1/A \approx C_0/A[1 - \sum_i w_i p_i]$.

Writing the capital ratios in percentage points, this relationship is the basis for the capital impact portion of Table 6:

$C_1/A \approx 5.05[1 - 0.3381] = 3.34$

The individual components of Table 6 were constructed as follows:

Current RWA share was derived from relative aggregate shares from the QIS-3 results for U.S. banks:

1. Drawn Loans: sum of QIS-3 categories for "drawn and off balance sheet" categories: corporate, retail residential, retail non-residential, SME corporate, specialized lending, sovereign, bank, SME retail, and purchased receivables; plus the sum of corporate, bank, and sovereign repos. Note: "Off balance sheet" in this context would typically refer to the undrawn portion of a line of credit that may well be drawn in the normal course of business. This is distinguished from the "commitments" categories below that typically refer to arrangements such as a letters of credit that are not expected to be exercised in the normal course of business.
2. Revolving: QIS-3 categories for qualifying revolving loans.
3. Corporate Commitments: sum of QIS-3 categories for "commitments": corporate, SME corporate, specialized lending, sovereign, bank
4. Other Commitments: sum of QIS-3 categories for commitments: retail revolvers, retail residential, retail non-residential, SME retail.
5. Trading book: sum of QIS-3 categories for trading book: trading book: derivatives, repos, specific risk, market risk, plus the sum of corporate derivatives, bank derivatives, SME corporate derivatives
6. Equities: QIS-3 categories for equities
7. "Securitization originator" uses the QIS-3 category of that name
8. "Securitization investor" uses the QIS-3 category of that name
9. All other QIS: Investment in related entities
10. Note all other categories had de minimis amount of exposures reported

RWA percentage change used the QIS-3 results for U.S. banks: with the exception of the following categories: drawn loans: corporate, retail residential, retail non-residential, SME corporate, specialized lending, sovereign, bank, SME retail. This analysis used the weighted average capital charge estimated in the analysis for the, "Estimated Capital Charge IRB bank Optimistic LGD's" for: wholesale loans, ADC, residential mortgages, and other consumer retail loans over the time period reported compared to the 12-2002 reported weighed average capital charge for these loan categories from Schedule RCR of the Quarterly Reports of Condition and Income for the QIS-3 reporting banks.

The Current RWA share times the RWA percentage change generated the Contribution to the change in the overall RBC to asset ratio.

This net reduction times the current RBC (excluding provisions) to asset ratio

generated the estimated AIRB credit capital ratio.

Operational risk is 12 percent of AIRB credit capital ratio.

Total AIRB risk based capital is the sum of operational risk capital and AIRB credit capital to assets.

Table 7
Estimated Capital Charge IRB Bank Pessimistic LGDs

	Portfolio Share	**Avg.**	**2002**	**2001**	**2000**	**1999**	**1998**	**1997**	**1996**	**1995**	**1994**	**1993**	**1992**	**1991**	**1990**	**1989**	**1988**	**1987**	**1986**	**1985**	**1984**
Cash and bal due from depositories	6%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%
Fed funds and repos	4%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%
Securities																					
MBS	10%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%
Treas	1%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Other	8%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%

Wholesale loans LGD=50%	26%	6.59%	7.32%	7.00%	5.87%	5.23%	4.67%	3.66%	3.64%	4.12%	4.91%	6.79%	7.73%	8.60%	8.92%	8.52%	8.04%	7.51%	7.77%	7.55%	7.39%
ADC LGD=60%	3%	5.89%	5.12%	4.56%	2.80%	2.41%	1.24%	0.00%	5.31%	5.68%	9.05%	10.96%	11.97%	11.57%	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%
Credit card	4%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Residential mtg. LGD=30%	16%	1.45%	1.52%	2.01%	1.27%	1.25%	0.91%	1.02%	1.06%	1.26%	1.50%	1.82%	2.02%	1.78%	1.45%	1.45%	1.45%	1.45%	1.45%	1.45%	1.45%
Other consumer LGD=60%	6%	4.53%	5.10%	5.01%	4.93%	4.80%	4.80%	4.80%	4.62%	4.18%	3.75%	4.10%	4.65%	4.89%	4.78%	4.59%	4.37%	4.40%	4.43%	4.13%	3.73%
Trading book	6%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
total	90%																				
Other assets	10%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%

total	100 %																			
Total Credit Capital		4.10 %	4.31 %	4.28 %	3.81 %	3.62 %	3.39 %	3.11 %	3.26 %	3.40 %	3.72 %	4.33 %	4.68 %	4.86 %	4.72 %	4.60 %	4.47 %	4.33 %	4.40 %	4.33 %	4.26 %
Total Credit plus 12% op risk		4.59 %	4.83 %	4.80 %	4.27 %	4.06 %	3.80 %	3.48 %	3.65 %	3.80 %	4.16 %	4.85 %	5.24 %	5.24 %	5.44 %	5.29 %	5.16 %	5.00 %	4.85 %	4.93 %	4.84 %

Note: UL capital charge is estimated from the CP-3 risk weight functions with EL subtracted from the capital charge. Wholesale and ADC loan estimates were reduced by 30% to reflect the concavity and maturity bias induced by the estimation method. Residential mortgage and other retail were reduced by 20% to reflect the concavity effect.

Source: FDIC calculations based on Quarterly Reports of Condition and Income, all FDIC insured Call Report filers

Table 8
Estimated Capital Charge IRB Bank Optimistic LGDs

	Portfolio Share	**Avg.**	**2002**	**2001**	**2000**	**1999**	**1998**	**1997**	**1996**	**1995**	**1994**	**1993**	**1992**	**1991**	**1990**	**1989**	**1988**	**1987**	**1986**	**1985**	**1984**
Cash and bal due from depositories	6%	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %
Fed funds and repos	4%	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %	1.60 %

Securities																					
MBS	10%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%
Treas	1%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Other	8%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%	1.60%
Wholesale loans LGD=30%	26%	4.68%	5.08%	4.85%	4.15%	3.77%	3.43%	2.78%	2.77%	3.08%	3.58%	4.71%	5.40%	6.13%	6.41%	6.07%	5.66%	5.23%	5.43%	5.26%	5.13%
EL		0.99%	1.10%	0.94%	0.54%	0.40%	0.30%	0.18%	0.18%	0.23%	0.34%	0.85%	1.34%	1.93%	2.17%	1.88%	1.54%	1.21%	1.36%	1.23%	1.14%
ADC LGD=40%	3%	4.54%	4.09%	3.69%	2.34%	2.02%	1.04%	0.00%	4.23%	4.48%	6.52%	8.13%	9.14%	8.76%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
EL		0.88%	0.17%	0.14%	0.05%	0.04%	0.01%	0.00%	0.19%	0.22%	0.87%	2.42%	3.41%	3.03%							
Credit card	4%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Residential mtg. LGD=15%	16%	1.17%	1.22%	1.59%	1.03%	1.02%	0.75%	0.84%	0.87%	1.02%	1.20%	1.44%	1.59%	1.42%	1.17%	1.17%	1.17%	1.17%	1.17%	1.17%	1.17%

EL		0.15%	0.15%	0.23%	0.12%	0.12%	0.08%	0.09%	0.09%	0.12%	0.15%	0.20%	0.23%	0.19%						
Other consumer LGD=40%	6%	3.30%	3.47%	3.47%	3.46%	3.42%	3.42%	3.42%	3.36%	3.16%	2.92%	3.12%	3.37%	3.45%	3.41%	3.35%	3.25%	3.27%	3.28%	3.13%	2.91%
EL		0.90%	1.46%	1.29%	1.18%	1.04%	1.04%	1.04%	0.89%	0.66%	0.50%	0.63%	0.92%	1.13%	1.02%	0.87%	0.75%	0.76%	0.78%	0.64%	0.50%
Trading book	6%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
total	90%																				
Other assets	10%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
total	100%																				
Total Credit Capital		3.44%	3.55%	3.54%	3.22%	3.11%	2.95%	2.77%	2.89%	2.99%	3.20%	3.59%	3.84%	3.99%	3.90%	3.80%	3.69%	3.58%	3.63%	3.58%	3.54%
Total Credit plus 12% op risk		3.85%	3.98%	3.96%	3.61%	3.49%	3.31%	3.10%	3.24%	3.35%	3.58%	4.02%	4.30%	4.47%	4.37%	4.26%	4.14%	4.01%	4.07%	4.01%	3.96%

Note: UL capital charge is estimated from the CP-3 risk weight functions with EL subtracted from the capital charge. Wholesale and ADC loan estimates were reduced by 30% to reflect the concavity and maturity bias induced by the estimation method. Residential mortgage and other retail were reduced by 20% to reflect the concavity effect.

Source: FDIC calculations based on Quarterly Reports of Condition and Income, all FDIC insured Call Report filers.

[1] This paper corrects a calculation error in the estimation of wholesale capital requirements reported in the original version of this paper, published on 12/8/2003. The author is grateful to Schyler Thiessen of Economists. Inc. for alerting him to the issue. The error, described in footnote 2 of this paper, does not affect the original paper's qualitative conclusions about the proposed capital framework that existed at the time the original paper was published. This version of the paper is intended solely to correct the original calculation error, and not to reflect the many changes made to the Advanced Internal Ratings-Based framework that have subsequently been made. The new framework is described in " International Convergence of Capital Measurement and Capital Standards," published in June, 2004 by the Basel Committee on Banking Supervision, with the support and agreement of the FDIC.

[2] The historical net charge-off rates for wholesale loans were calculated incorrectly in the 12/8/2003 paper as a result of a cell reference error in a spreadsheet that created a weighted average wholesale charge-off rate by combining the individual charge-off rates for C&I loans, non-farm non-residential real estate loans, loans to banks and loans to foreign governments. The historical average net charge off rate for wholesale loans was reported as 0.52 percent when it should have been 0.99 percent.

[3] Table 6 in the original paper reported a reduction in risk-weighted assets of 52.9 percent for credit-risk (excluding revolving retail). Given the incorrect wholesale estimated capital requirement from the original Table 1 of 3.69 percent of exposure, Table 6 should have reported a decline in RWA of over 55 percent. Instead, the 3.69 percent from Table 1 was miscopied as 3.96 percent, resulting in a smaller percentage reduction appearing in the original Table 6, and inadvertently mitigating (at least in Table 6) some of the effects of our calculation error.

[4] For numerical tables of data in Charts 3 and 4, refer to end of document.

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Last Updated 08/05/2003

Chart 1	
Core Capital Requirements for U.S. Banks Far Exceed International Averages Tier 1 Capital / Assets Ratio (%), World's 100 Largest Banks	
Singapore	6.77
USA	6.34
Korea	5.35
Ireland	5.23
Spain	5.07
Australia	4.91
Italy	4.68
UK	4.49
India	4.46
Canada	4.32
China	4.18
Top 100 Banks	4.12
Denmark	3.94
France	3.94
Netherlands	3.72
Sweden	3.63
Belgium	3.22
Japan	3.15
Austria	3.13
Germany	2.63
Switzerland	2.18
Source: FDIC calculations using Fitch Bankscope and The Banker July 2003	

Chart 2

Basel II Capital - Still Investment Grade?

Year	Estimated Basel II Capital Requirement	Actual Leverage Capital Ratio
2003		6.72%
2002	3.85%	6.67%
2001	3.98%	6.81%
2000	3.96%	6.66%
1999	3.61%	6.96%
1998	3.49%	6.44%
1997	3.10%	6.37%
1996	3.24%	6.38%
1995	3.35%	6.29%
1994	3.58%	6.33%
1993	4.02%	6.62%
1992	4.30%	5.94%
1991	4.47%	4.85%
1990	4.37%	4.70%
1989	4.26%	4.51%
1988	4.14%	4.75%
1987	4.01%	3.96%
1986	4.07%	5.08%
1985	4.01%	4.97%
1984	3.96%	4.71%

Source: Bank Call Reports; estimated requirements based on Quarterly Reports of Condition and Income, all FDIC insured Call Report filers

Chart 3 Wholesale Capital Charges With "Unbiased" EL			
Year	**EL**	**LGD=30%**	**LGD=50%**
2002	1.10%	5.08%	7.32%
2001	0.94%	4.85%	7.00%
2000	0.54%	4.15%	5.87%
1999	0.40%	3.77%	5.23%
1998	0.30%	3.43%	4.67%
1997	0.18%	2.78%	3.66%
1996	0.18%	2.77%	3.64%
1995	0.23%	3.08%	4.12%
1994	0.34%	3.58%	4.91%
1993	0.85%	4.71%	6.79%
1992	1.34%	5.40%	7.73%
1991	1.93%	6.13%	8.60%
1990	2.17%	6.41%	8.92%
1989	1.88%	6.07%	8.52%
1988	1.54%	5.66%	8.04%
1987	1.21%	5.23%	7.51%
1986	1.36%	5.43%	7.77%
1985	1.23%	5.26%	7.55%
1984	1.14%	5.13%	7.39%

Chart 4 Wholesale Capital Charges With "Smoothed" EL			
Year	**EL:Smoothed**	**LGD=30%**	**LGD=50%**
2000	0.52%	4.10%	5.79%
1999	0.39%	3.76%	5.22%
1998	0.31%	3.46%	4.72%
1997	0.35%	3.62%	4.99%
1996	0.49%	4.02%	5.66%
1995	0.72%	4.50%	6.46%
1994	1.00%	4.94%	7.13%
1993	1.25%	5.28%	7.58%
1992	1.43%	5.52%	7.88%
1991	1.56%	5.68%	8.07%
1990	1.63%	5.77%	8.18%
1989	1.62%	5.75%	8.16%
1988	1.50%	5.61%	7.99%

Chart 5 -Modeled Capital Vs. Minimum Capital: Our Regulatory Framework Must Accommodate Both

This chart explains the fact that the ultimate level of capital held by a given institution should include an analysis of both quantitative and qualitative factors. That is, the validity of model-generated capital numbers must be assessed through the regulatory process, and modeled capital and minimum regulatory ratios must coexist.