Response to Basel's Proposals for Allocating Capital to Securitizations

The Risk Management Association

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RMA Capital Working Group Response to Basel's Proposals for Allocating Capital to Securitizations[1]

I. Introduction.

This paper is intended to communicate our concerns over the developing Basel proposals for assigning regulatory capital to various securitization activities of banks. While this response is aimed at the proper treatment of securitization transactions, one cannot divorce the discussion of securitization capital from the discussion of capital for on-balance-sheet assets. That is, since an aim of Basel and the banking community is to reduce the need for expensive regulatory capital arbitrage, there needs to be a significant consistency between the treatment of capital for securitized assets and the treatment of capital for the same assets if they are held on the balance sheet. In effect, therefore, this response is addressed at several of the most recent pronouncements and Working Papers of Basel, including:

- "Working Paper on the Treatment of Asset Securitizations," October, 2001.
- "Working Paper on the IRB Treatment of Expected Losses and Future Margin Income," July, 2001.
- "Potential Modification to the Committee's Proposals," November 5, 2001.
- "Summary of Current MTF Proposals on the IRB Treatment of Retail Exposures," January 4, 2002.

RMA's Capital Working Group already has sent several written responses to Basel – most recently, the May, 2001 response to Basel II and the December, 2001 response regarding the July 2001 Working Paper (WP) on EL. Additionally, we have held numerous conversations with U.S. regulators on the subject. This response captures our most recent thinking on the subject and takes into consideration our understanding of the regulators' concerns with our earlier responses. Note that the current response does not address securitizations of revolving credits such as card transactions. We believe that the

[1] This response represents the view, as a whole, of the RMA Capital Working Group, whose members consist of the senior officers of their respective banks responsible for risk measurement and the determination of economic capital. The financial institutions and the staff members participating in the Group are listed in Appendix 3. Individual institutions may be responding separately to the various Working Papers, and/or may hold differing views than those expressed in this Response.

current parameterization of the regulatory model for card receivables is inappropriate. Until this difficulty is resolved, we do not believe that a discussion of the early amortization features of credit card securitizations would be productive. Nor does this response address ABCP facilities, which are the subject of other industry responses in progress or recently submitted. This response does, however, address both traditional and synthetic securitizations.

II. Overview.

We reiterate our desire, expressed in earlier responses, that securitization capital be determined by use of a full internal models approach. The October, 2001 WP indicates that this approach is not politically possible, primarily because of regulators' concerns that procedures for verifying Advanced banks' estimates of correlation coefficients are not yet established. While this may be a problem, we do not see why the problem cannot be corrected before implementation of Basel II several years in the future. Alternatively, in the case of the Advanced IRB approach, which employs a set of regulator-determined asset value correlations, the same regulatory model that is used for determining on-balance-sheet capital can be rigorously used to determine securitization capital – and this approach is discussed at length later in this response.

In any event, the approach or approaches used by Basel should adhere to at least two guiding principles:

- Capital for securitization tranches should be set so that there is complete or near-complete "neutrality" with respect to whether an asset pool is carried on the books or securitized. In the past, securitization was used as a device to effectively reduce overly harsh on-balance-sheet capital requirements for certain assets, and such arbitrage was, and is, expensive (and unnecessary from the point of view of achieving a minimum soundness standard for banks). In response to this problem – which is the key force behind capital reform – Basel should not "overreact" by raising capital requirements on securitization activities beyond the levels implied by application of best-practice measurement of the risk associated with such activities. Indeed, adherence to the principle of "neutrality" calls for Basel, wherever possible, to be a) forthcoming with regard to the underlying implicit or

explicit model it is using at arriving at a rational capital charge for on-balance-sheet capital, and b) apply this same model to securitizations. To a much greater extent than before, the October, 2001 WP is transparent in this regard, but significantly greater transparency and consistency is needed, in our view.

- Both the on-balance-sheet capital requirements and the securitization capital requirements should involve true *minimums* – with the expectation that a best-practice bank and a best-practice marketplace would require of the bank more capital than called for by the regulatory minimums. Basel has traditionally adhered to this principle. Further, Basel has repeated its desire to have individual countries impose "well-capitalized" standards over and above the Basel minimum. Thus, the Basel capital standards for both on- and off-balance-sheet positions should take account of the "slack" necessary to permit the "well-capitalized" standard to also be somewhat below the amount of capital that a best-practice bank and its market overseers would themselves require in the absence of regulation. Regulatory capital minimums should be binding only on a) those banks that do not employ best-practice methods for measuring risk or b) those banks that decide to adhere to too low a true soundness standard (e.g., below investment grade).

Couched in terms of targeted "soundness standards", this second principle can be restated as follows. The Basel minimum should attempt to achieve a minimum implied rating of BBB- for the bank, while "well-capitalized" standards should imply a somewhat higher standard -- perhaps BBB+ or A-. Importantly, the current Basel II proposals for on-balance-sheet positions *do not consistently meet this test*, therefore the securitization proposals, no matter how well constructed, cannot meet an appropriate soundness standard while still adhering to the "neutrality" principle expressed above. To see this difficulty, we begin with a discussion of the shortcomings, as we see them, with regard to the current Basel II proposals for ordinary on-balance-sheet credit risk positions.

III. How should capital requirements for on-balance-sheet assets be rationalized?

This discussion is couched in terms of the "Advanced IRB" bank – the type of bank most heavily represented within the RMA Capital Working Group. For such institutions, Basel II utilizes, for on-balance-sheet positions, a regulatory model in which the Advanced bank estimates the positions' PD's and LGD's (with supervisory oversight) and the regulator sets the asset-value correlations within a Merton-type credit risk model to arrive at the capital calculation. In the September working paper on EL, and in the November and January releases, it was indicated that there would be 3 different regulatory models (with regard to the asset-value correlation, rho):

- Commercial loans: rho declines from 20% to a low of 10% as PD rises.
- Residential mortgages: rho remains constant at 15% (is invariant with PD)
- Non-mortgage consumer loans (including qualifying small business loans): rho declines from 15% to a low of 4% as PD rises.

Furthermore, regulatory capital is taken to be the loss at the 99.9% confidence interval (for a one-year horizon), <u>including</u> EL. That is, given inputted PD's and LGD's, and given the regulatory model's rho assumption, Total Capital is set equal to Loss at the Confidence Interval ($LCI_{99.9\%}$).

Earlier papers submitted by RMA (May, 2001; December 2001) and by ISDA (May, 2001 and October, 2001) have pointed out that these models' calculations of capital are sure to result in Total Capital requirements being equal to or *above* best-practice internal estimates of Economic Capital (EC), even before application of a "well-capitalized" rule in individual G-10 countries. In other words, the principle of regulatory capital as a <u>minimum</u> is sure to be violated. This is because best-practice estimates of EC call for capital to be allocated only against <u>unexpected</u> losses – the difference between LCI and EL. Furthermore, most of our member banks use a confidence interval for internal purposes very close to 99.9% (and in some cases lower than 99.9%). That is, assuming the regulatory model is parameterized similarly to industry models, the current proposals for regulatory capital would meet at least an A-minus soundness standard – too high to meet the principle of a "minimum" regulatory requirement. In the U.S.,

furthermore, "well-capitalized" requirements would call for Total Capital to be at least 1.25 times the Basel minimum.

Regulatory staff in the U.S. have pointed out that, since the Total Capital ("TC") requirement can be met with only one-half of the total being true equity capital, the TC requirement even at a 99.9% confidence interval is not too stringent. We disagree. In particular, even if a bank were to meet the standard with only one-half equity (impractical in most instances), subordinated debt is expensive to issue in amounts above those needed for funding and maturity-management considerations. Thus, the regulatory TC requirement has real costs that the bank would need to evade in order to maximize the value of shareholder equity. In other words, the too high TC requirement would naturally lead to expensive and unnecessary regulatory capital arbitrage. At the same time, we fully understand that, for those banks that do meet the TC requirement with only one-half true equity, the actual probability of insolvency might be too high from a regulatory point of view. That is, in many cases, true equity capital equal to one-half of the capital calculated at the 99.9% confidence interval might imply an effective confidence interval well below, say, 99.5% -- the confidence interval corresponding roughly to a BBB-minus soundness standard. This problem should <u>not</u> be treated by arbitrarily raising the TC requirement through use of a high confidence interval, but rather should be treated by eliminating the arbitrary two-to-one relationship between Total Capital and Tier 1 capital. This can be done by setting a second and separate Tier 1 requirement, based on the same underlying regulatory model, in which the confidence interval is set somewhat below the confidence interval used within the TC requirement. In past responses, the RMA group has specifically advocated use of a 99.5% confidence interval (one-year horizon) for setting the Tier 1 requirement.

We also are concerned that the 3 separate regulatory models – for commercial loans, for residential mortgages, and for non-mortgage retail credits, are too few in number to adequately account for the diversity of correlation assumptions used in industry best practice models. While we understand the Committee's desire to keep things simple, we believe that the entire Basel process is now well beyond any such "simplicity" goal – and that is as it should be, since the measurement of credit risk is an inherently complex subject. For the Advanced banks that are the subject of this paper,

there is very little to be gained by simplifying matters at this stage in the evolution of capital standards.

To summarize, we recommend that the following changes be made to the Basel proposals for on-balance-sheet positions:

- The three different regulatory models for the Advanced IRB approach, while generally reasonable with regard to the regulatory choice of asset-value correlations, should be broadened to include at least a separate model or other adjustments for high EL, low UL assets such as credit cards, and possibly one or two additional models.
- The confidence interval used for the Total Capital calculation should be lowered from 99.9% to perhaps 99.7%.
- The Total Capital calculation should be based on the standard industry practice of covering unexpected losses only – thus, the Total Capital calculation should be equal to $LCI_{99.7\%}$ less expected loss (EL).

If these were the only changes made to the Basel II on-balance-sheet proposals, and if the securitization proposals mirrored this approach (by rigorously using the regulatory model(s)), the need for regulatory arbitrage would be greatly reduced, perhaps even eliminated. But there would still be cases in which, when a bank used the Tier 1 minimums, set at an arbitrary one-half of Total Capital, true equity capital would be too low (to meet a minimum BBB- soundness standard). We urge Basel to consider this problem separately:

- We recommend no longer calculating the Tier 1 minimum at one-half of the Total Capital requirement. Rather, the same regulatory model used to estimate Total Capital should be used to estimate Tier 1, except by using a somewhat lower confidence interval – we suggest 99.5% to correspond to a BBB-minus soundness standard. In practice, this would tend to result in Tier 1 capital being more than one-half of Total Capital, thus being more in line with actual market ratios of Tier 1 capital to Total Capital.

III. The Securitization Proposals.

We believe that, unless our proposals are implemented for on-balance-sheet positions, neither those proposals nor the securitization proposals can be made to meet the two principles enunciated above – a) neutrality of capital charges between balance sheet activities and off-balance sheet activities, and b) capital charges for both that are a true minimum, reflecting a true soundness standard. Rather, Total Capital requirements will be too high, while Tier 1 requirements may be too low – for both kinds of activity. Achieving such "neutrality" in arbitrary fashion does neither regulators nor the bank any good.

Indeed, for any given type of risk asset, if the Total Capital requirements for both the on-balance-sheet and the off-balance-sheet activity are too high relative to economic capital, then, having eliminated (expensive but useful) arbitrage (through the setting of securitization requirements that are "neutral" with the on-balance-sheet requirements), the regulator will force the bank to cede to the unregulated sector the activity in question. Since the activity in question will be one with a relatively low "true" level of risk (i.e., a best-practice estimated EC that is lower than the arbitrary regulatory capital), the banking industry will simply lose the competitive battle for low-risk products to the non-bank sector.

Therefore, in the discussion that follows, it must be assumed that capital for the underlying asset pool on which a securitization is based will be set at a proper K_{IRB} – the regulator's term of art for the TC charge on the pool -- as discussed above.

A. Regulatory capital for the originator or sponsor of a securitization providing "true" first-dollar loss protection.

In most traditional securitizations, the sponsoring bank provides so-called first-dollar loss protection in the form of a guarantee, the issuing of a subordinated loan to the trust vehicle, the taking back of a most-junior security, or some other device that provides for cash flows from the underlying assets to be used to pay commitments to the trust's security holders (or to, for example, a spread fund within the trust) *before* any payments are made to the sponsoring institution. Such arrangements constitute true first-dollar loss positions whether the assets were originated on the books of the sponsoring bank and

then sold to the special purpose vehicle (SPV or trust) or whether the assets were "remotely originated" (e.g., by the trust vehicle itself).

For the preponderance of Advanced banks, the threshold question regarding this first-dollar loss protection is its level in comparison to the amount of Economic Capital the bank calculates for the underlying asset pool as if the assets remained on the books of the bank. If the market requires first-dollar protection *in excess* of a best-practice estimate of EC on the pool, then by securitizing the assets, the bank does not reduce its internal capital charge. The internal charge remains at EC on the underlying pool. This is because, no matter how much in excess of EC is the market-required first-dollar loss position, by holding the same absolute EC against the first-dollar position the bank maintains the same "probability that losses will exceed EC" as if the assets were not securitized. In essence, the bank is maintaining its defined soundness level by capping its internal capital charge at EC on the pool. If, on the other hand, the required first-dollar loss protection is less than EC on the pool, the internal capital requirement for the securitization should be no more than the bank's legal exposure for its first-dollar protection. Thus, many Advanced banks set EC for first-dollar positions as the *lower* of EC on the pool or the dollar amount of the position.

Still other institutions regard any securitization in which the bank holds less than all of the tranches as resulting in a *reduction* in risk vis a vis the risk of holding the assets on the balance sheet.[2] In this view, economic capital for all of the tranches of the securitization should add up to EC for the underlying pool of assets (if on the balance sheet), no matter which bank or banks hold each individual tranche of the securitization.

We recognize that Basel does not appear to hold to this latter view, because within the October WP, for both the ratings-based approach and the Supervisory Formula approach, regulatory capital for all of the tranches generally adds up to more than the regulatory capital for the underlying assets. We believe that this result, in itself, tends to

[2] In contrast to the usual internal rule regarding EC for first-dollar positions, the bank could reason that, by selling off the risk of an extreme "tail" event to other investors, the bank has *reduced* risk and thus, even when the first-dollar loss position exceeds EC on the pool, the capital for first-dollar position should be lower than for the pool. This conclusion would be reached, for example, if a bank used an alternative definition of soundness, replacing "probability that losses will exceed capital" with "expected losses beyond capital." In short, the theory of economic capital indicates that securitization can *never* imply more capital than EC on the underlying pool and *may* imply less capital

violate the principle of neutrality in that, by and large, the regulated banking sector is disadvantaged in purchasing the tranches of a securitization. That is, even when a regulated bank sponsors the transaction and provides first-dollar loss protection, the regulatory minimum capital requirements for the mezzanine and senior pieces are likely to be higher than the unregulated sector's calculation of economic capital for each tranche – increasing the likelihood that the buyers of the mezzanine and senior pieces will not be banks.

Assuming that Basel continues to view as appropriate that the capital charges for all the tranches should add up to more than the capital for the underlying assets, it would still make no sense for any sponsoring bank providing first-dollar loss protection or retaining any other tranches to incur a capital charge that exceeded that of the capital charge on the underlying assets (i.e., exceeded K_{IRB}). However, the October WP specifically asks for the industry's input on this subject (suggesting that some regulators favor raising capital charges for first-dollar loss positions beyond K_{IRB}, if the first-dollar loss position exceeds K_{IRB}). Apparently, these regulators are concerned that, in the case when market requirements for first-dollar positions exceed K_{IRB}, this may be an indication that K_{IRB} is "too low" and, thus, capital for the first-dollar position should be made to exceed K_{IRB}. We see several practical and theoretical difficulties with such a view.

First, if regulators truly believed that K_{IRB} was too low, they should raise K_{IRB}. The reason this would be inappropriate, of course, is that the regulatory credit risk model presumably has been carefully calibrated (with regulatory-chosen obligor-asset-value correlation parameters that mirror best-practice). Risk practitioners, however, have for some time recognized that rating agencies' procedures for establishing prior loss requirements in securitizations do not resemble best-practice methods for estimating economic capital. Rather, rating agencies' procedures for assigning prior credit protection are based on stress-tests or rules-of-thumb. Recent evidence, moreover, demonstrates that ratings agencies have been quite conservative in establishing these prior credit enhancement requirements, perhaps because buyers of the securities cannot readily examine the individual assets comprising the underlying asset pool. Such conservatism results in historically lower default rates on senior investment grade

tranches than for corporate bonds of similar ratings. [See the paper by Pellegrini and Wise in Appendix 1] Thus, the observation that many securitization transactions require first-dollar credit enhancement in excess of K_{IRB} should not be construed as providing evidence that K_{IRB} is too low, only that marketing considerations require that the rating agencies assign conservative prior credit enhancements. For this reason, we continue to believe that an appropriately conservative regulatory treatment of first-dollar loss positions is to charge dollar-for-dollar capital up to a maximum absolute capital of K_{IRB}. Moreover, if the sponsoring bank holds other positions (e.g., the bank shares in holding a senior position) along with its first-dollar position, no matter how extensive these additional holdings, the aggregate Total Capital charge for the bank should not exceed K_{IRB}.

B. The Ratings Based Approach. For second-dollar and more senior positions, the ratings-based approach outlined in the October, 2001 WP is intended to be used for any rated tranche, when "an external ratings is available and/or the bank does not have the necessary information to calculate the IRB capital requirement (K_{IRB}) for the underlying assets." Table 1 in the WP provides the regulatory capital treatment for such rated tranches, expressed as a percentage of the dollar value of the tranche.

Table 1
Proposed ABS Scaling Factors for Tranches in Traditional and Synthetic Securitisations

Moody s Rating Category	Assumed 1 Year PD (%)	IRB risk weights For corporate Exposures provided in January 2001 CP (LGD of 50%)*	**ABS Scaling Factor**	ABS RWs (based on the IRB risk weights for corporate exposures provided in January 2001 CP)
Aaa	0.03	14%	**1.0**	14%
Aa	0.03	14%	**1.0**	14%
A	0.05	19%	**1.0**	19%
Baa1	0.15	37.7%	**1.2**	45%
Baa2	0.25	52%	**1.4**	73%
Baa3	0.40	70%	**1.7**	119%
Ba1	0.70	100%	**2.0**	200%
Ba2	1.00	125%	**2.5**	313%
Ba3	1.70	174%	**3.0**	522%

Unrated positions and those rated below Ba3 to be deducted from regulatory capital
*The corporate exposures are assumed to have a remaining maturity of 3 years.

In laying out the capital charges in Table 1 of the WP, reproduced above, the Committee must presume a particular PD and LGD associated with each rating category. These assumed PD's, along with a 50% LGD assumption, are provided in the Table.

The capital charges shown in Table 1 implicitly assume a high degree of correlation between the tranche and the rest of the portfolio of the purchasing bank.[3] We do not disagree in principle with this assumption. Of course, the actual degree of correlation between the tranche and the rest of the portfolio will depend critically on the specifics of that portfolio. Moreover, empirical work done by Pellegrini and Wise [Appendix 1] suggests that, for investment-grade tranches, both the PD's and the LGD's should be lower than the assumptions used within Table 1 of the WP. In particular, with respect to LGD's, the relative "thickness" of the senior tranches implies that, in the rare event of default, these losses-given-default are likely to be on the order of 10% of the

[3] We used a particular form of the regulatory model (see Pykhtin-Dev) to calculate the implied Obligor-Asset-Value correlations using the PD and LGD inputs shown in Table 1 (in so doing, we used a 99.9%

tranche, not 50%. The last table in Appendix 1 provides a set of capital allocations for investment grade senior tranches that more closely mirrors EC practice, even when using the assumption of high asset-value-correlations.

For rated tranches below, say, Baa2, the tranches are thinner (suggesting that higher LGD assumptions are appropriate) and we have no empirical data that support the conclusion that historical default frequencies are below that of corporate bonds with similar ratings. Thus, we do not object to the capital allocations in Table 1 for sub-investment grade tranches – except to note our concern over the use of a very high confidence level to compute the regulatory capital requirements. We also wish to remind the reader that for a sponsoring bank holding a first-dollar position as well as one or more mezzanine or senior positions, aggregate TC should never exceed K_{IRB} on the underlying pool of assets.

C. The Supervisory-Formula ("SF") Approach. This approach, in our view, holds significant potential for harmonizing the capital treatment of securitization tranches with the capital treatment of on-balance-sheet positions. In effect, the SF approach requires that dollar-for-dollar capital be allocated to credit enhancement positions up to and including K_{IRB}, while capital for all positions in excess of K_{IRB} be allocated capital in the aggregate equal to $\$ K_{IRB}$. Moreover, the amount of capital, $\$$, as a percentage of K_{IRB} that should be allocated to all positions in excess of K_{IRB} can be readily estimated by strict application of the regulatory model for the particular asset pool in question. The paper by Pykhtin and Mingo, attached as Appendix 2, describes this procedure. Basically, the tranches above K_{IRB} can be thought of, in the aggregate, as a series of infinitesimally small tranches, each with an LGD of 100% and a PD determined by the degree of prior credit enhancement for the tranche in question. For example, the PD of the tranche immediately above K_{IRB} is equal to 0.1% -- because K_{IRB} is calculated by applying a 99.9% confidence interval to the loss distribution for the underlying asset pool. These PDs and LGDs, along with an assumption regarding the correlation between the tranche and the rest of the purchasing bank's portfolio, are used within the regulatory

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confidence interval as per the regulatory model). These OAV correlations appear to range up to about 75% (for the very lowest rated tranches) in Table 1.

model in order to arrive at the capital for the tranche. In the paper in Appendix 2, these correlations are assumed to be high (80-95%).

Pykhtin and Mingo calculate that, for commercial loan pools with "typical" PD and LGD characteristics, $ should be on the order of less than 10% of K_{IRB} (see Table 1 in Appendix 2). This is a considerably lower $ than the arbitrary 20% used in the examples provided in the October WP. Similarly, the $ for retail products would range from about 3% to about 6%. That is, capital for all the tranches in excess of K_{IRB} would total to approximately 3-6% of K_{IRB}. Remember, we mean 3-6% of the *absolute* amount of K_{IRB} – which still can result in the capital allocated to a "thin" mezzanine piece being a high percentage of that tranche.

The method described in Appendix 2 can be used to estimate economic capital for any particular tranche above K_{IRB}. When this is done, the "proper" capital allocation for the tranche is seen to be closely mirrored by application of the Supervisory Formula, assuming that a proper $ (for the asset pool in question) is used within the Supervisory Formula. At most, the SF suggested in the October WP could be slightly altered, as suggested in Appendix 2, to allocate capital to various tranches in a fashion that more closely matches strict application of the underlying regulatory model for the pool in question.

The SF approach, like the ratings-based approach, rests on the belief that for securitization tranches of a given PD, the performance correlation with the rest of the purchasing bank's portfolio is likely to be higher than for an individual corporate bond of the same PD. Unlike the ratings-based approach, however, the SF approach uses the precise lower and upper bounds to the credit enhancement position of the tranche in order to allocate capital. That is, the SF would take into account that the tranche absorbs losses after x% losses on the pool up to y% losses on the pool. The Supervisory Formula is recreated below.

(1)

$$\textbf{Required Capital beyond } K_{IRB} = (1/* [e^{(Kirb - T1)*} - e^{(Kirb - T2)*}])$$

where:
T1 = lower bound of the securitised tranche;
T2 = upper bound of the securitised tranche;
K_{IRB} = reference capital level on the underlying pool;
$ = premium factor; and

$* is set so that $1/* [1 - e^{(Kirb-1)*}] = \$K_{IRB}$

Thus, the SF approach implicitly incorporates a precise PD estimate for the tranche in question (based on the lower bound of the tranche), rather than use whatever imprecise PD estimate is associated with an external rating for the tranche. That is, assuming the purchasing bank has sufficient information on the pool assets to employ the underlying regulatory model (to calculate K_{IRB}), that same regulatory model effectively can be made to calculate the implied PD for any particular tranche based on the underlying asset pool. This is the process used within the Pykhtin-Mingo paper and it is the process implicitly behind the October WP's Supervisory Formula. Therefore, because both the K_{IRB} for the on-balance-sheet assets and the SF for the securitization tranches rest on the same regulatory loss distributional model, the SF approach is likely to provide greater "neutrality" than the ratings-based approach. And because the PD's for the mezzanine tranches are higher than for the senior tranches, a much higher percentage of the capital allocated to all second-dollar tranches will fall on the mezzanine tranches rather than the senior tranches. For these reasons, we believe it is important to allow the Advanced bank, in the case where sufficient information is available on the underlying pool assets, to use the SF approach *even if there exists a rating on the tranche in question*. Finally, we remind the reader that, if a sponsoring bank provides first-dollar protection, the capital charge for that position plus the capital charge for any mezzanine or senior positions subject to the Supervisory Formula should never exceed K_{IRB}.

Appendix 1

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Calculating the Risk of Senior Asset-Backed Securities Relative to Corporate Debt Securities

Roger Pellegrini and Eric Wise, RBC Capital Markets[1]

In the "Working Paper on the Treatment of Asset Securitisations" and in subsequent discussions, the Securitisation Group of the Basel Committee has proposed "ABS Scaling Factors" which assess the relative riskiness of ABS versus corporate exposures. These scaling factors imply that the capital that would need to be held against a portfolio of ABS assets is, by and large, nearly as much, if not more, than would need to be held against a portfolio of corporate assets. We intend to prove that the seniormost tranches of ABS transactions should attract significantly less capital than equivalently rated corporate exposures. We will do this by carefully addressing the most important input parameters, performing the calculation of capital for each asset type and comparing the results.

The calculation of capital required to be held against the credit risk in portfolios of assets is based primarily on three variables:

1. **Probability of default for each asset**
2. **Loss given default for each asset**
3. **Correlation between the creditworthiness of assets**

In the following sections, we will show how these parameters might be estimated for a portfolio of ABS transactions, and how these estimates might differ from that used in corporate analyses. A final section will use these input parameters to estimate the capital requirement for senior ABS relative to like rated corporate loans.

1. Probability of Default

Statistics published in 2001 by both Moody's and S&P indicate that the default experience for senior tranches of ABS is significantly lower than for like-rated corporate bonds. Moody's, in fact, found no events of default in its entire rating history for senior rated ABS. S&P lists a single fraud-related event of default that is not significant in the measure of credit risk in ABS. Full ratings transition matrices published by both ratings agencies suggest that over a 5-year timeframe, the likelihood of downgrade of senior ABS transactions is 66% less than that for corporate positions. S&P has publicly stated that it believes the probability of default for senior ABS is lower than for corporate debt.

[1] Views expressed in this paper are those of the authors and do not necessarily represent the views of RBC Capital Markets or RBC Financial Group.

Moody's, in recognition of the problem, has sponsored an independent study of this matter, in which we are participating.

The following table was derived by averaging Moody's and S&P transition data for ABS transactions and then multiplying it out over the course of five years. The results were then compared against standard corporate transition data from S&P. The analysis shows the significantly greater ratings stability of ABS versus corporates, with the likelihood of downgrade fully 66% less than corporates. Even a highly conservative analysis of the data, as evidenced by defaults and downgrades in ABS, would conclude **that <u>senior ABS positions have no more than 50% of the default likelihood of like-rated corporate positions</u>**.

ABS Percentage Downgrade Risk Compared to Corporate

	# of notches over 5 years				
	1	2	3	4	5
AAA	-98%	-97%	-98%	-98%	-98%
AA+	-35%	3%	-4%	-10%	-11%
AA	-82%	-78%	-81%	-81%	-82%
AA-	-62%	-63%	-59%	-61%	-62%
A+	-90%	-87%	-88%	-89%	-89%
A	-98%	-94%	-91%	-92%	-91%
A-	-76%	-78%	-75%	-70%	-68%
BBB+	-91%	-53%	-29%	-31%	-32%
BBB	-87%	-85%	-80%	-77%	-79%
BBB-	-75%	-46%	-7%	-8%	11%
Average	**-66%**				

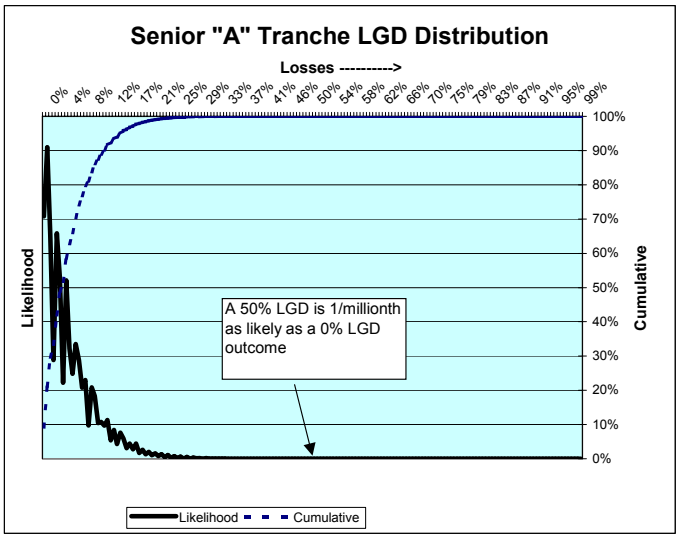
2. Loss given default for each asset

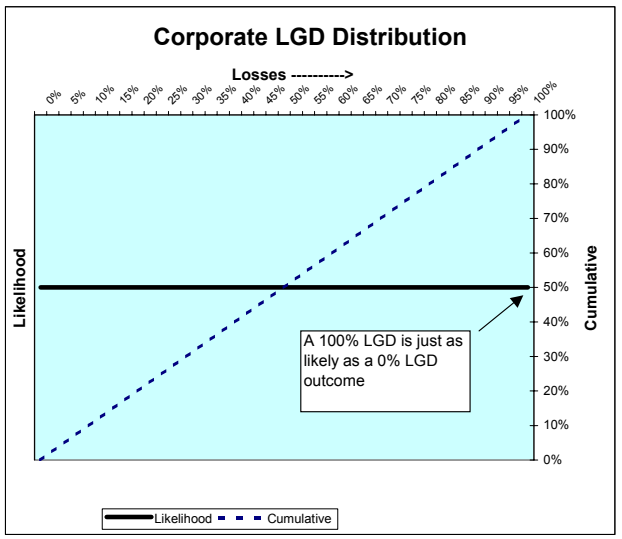
Analysis of the loss distribution for pools of securitized assets suggests that senior tranches would experience LGD averaging 5% or less. In addition, it becomes statistically extremely unlikely that LGD could exceed 20% or 30%, as the likelihood of those larger losses in the event of default are exponentially more remote. This is a very significant effect, as the LGD for senior ABS is a small fraction of that expected for corporate exposures, whose LGD is in the range of 50%.

The following analysis is characteristic of every ABS loss distribution, in that the seniormost tranche has extremely favorable LGD characteristics, inevitably indicating LGD's of 4-8%. The data underlying this particular example is the loss distribution of a pool of home equity loans, whose loss and correlation characteristics are consistent with rating agency experience. The amount of subordination in the tranche is also consistent with rating agency specifications. The graph shows the extremely skewed loss distribution, with the likelihood of large losses in the senior tranche vanishingly small. The probability weighted average LGD is in the range of 4-5%. An identical analysis was performed using auto loan data, with similar results. In addition, default simulation modeling for CDO's yields very similar results for the expected LGD of senior tranches.

Loss Given Default in ABS Structures is a Fraction of Corporate LGD

example: Home Equity Assets





LIED Estimates

	Tranche Structure		
	Approx. Start	End	Wgt Avg LIED
"A" Senior Tranche	15.50%	100.00%	4.86%
"AA" Senior Tranche	16.50%	100.00%	4.95%
"AAA" Senior Tranche	21.50%	100.00%	4.65%

Again, even using the most conservative assumptions, **the results show loss given default for senior ABS positions to be less than 10%**, significantly lower than that for corporate exposures.

3. Correlation between the creditworthiness of assets

One of the most complex issues surrounding the assessment of the capital for ABS portfolios has been the correlation between the events of default of senior tranches. The proposal states that ABS positions are more correlated to each other than corporate loans because portfolios of ABS transactions are already purged of the diversifiable idiosyncratic risk of the underlying assets.

The mathematical underpinning of this argument is sound. However, in the past, the magnitude of the effect has not been measured, and conclusions about its impact have been subject to conjecture.

We have developed a monte carlo simulation model that can finally measure this effect and calculate the asset correlation between ABS transactions. The model

- creates a large number of underlying assets which are correlated to each other.
- simulates default events of the underlying assets based on their rating using a monte carlo approach
- groups the underlying assets into ABS pools,
- imposes a tranching structure on the ABS pools,
- calculates the losses in each of the pools net of the credit enhancement and
- observes the resulting default correlation between, say, the senior tranche in pool A and the senior tranche in pool B.
- converts that default correlation into an asset correlation

The model has a few important inputs, which allow us to tailor

- the default probability of each of the underlying assets,
- the asset correlation among the underlying assets, and
- the amount of subordination in each of the ABS tranches.

We have performed a number of simulations which give similar results. For example, the following assumptions are consistent with consumer ABS transactions:

- default probabilities for the underlying assets consistent with "B" rating
- asset correlation among the underlying consumer loans approximately 10%
- amount of subordination adequate to create senior tranche with "AAA" rating

Given these assumptions, the model suggests that the asset correlation between "AAA" rated senior tranches of consumer ABS could be as high as 88%. Of course, in any institution, the correlation of these assets to the other assets of the institution would be significantly less.

4. Calculation of Capital

We performed a standard measure of capital allocation for both ABS and corporate loans that is consistent with industry practice, and based on a montecarlo simulation of defaults using conservative estimates of the input parameters discussed in detail above. We summarize these inputs below.

Inputs	**Corporate**	**ABS**
Probability of default	"BBB+" to "AAA"	50% of the corporate values
Loss given default	50% LGD	10% LGD
Asset correlation	20% pairwise asset correlation	90% pairwise asset correlation
Number of exposures	100	100

Loss distributions for each portfolio were computed. The results from the economic capital model are tabulated below, and are based on the amount of capital that would be suggested for a "A" bank (i.e. a "A" confidence threshold)[2]. The results have been converted into a ratio of the ABS capital to the corporate capital, giving an "ABS Scaling Factor". Note that these results assume senior positions in the ABS capital structure.

Rating	**Calculated ABS Scaling Factor**	**ABS RW's (based on the IRB risk weights for corporate exposures provided in January 2001 CP)**
AAA	0.29	4%
AA+	0.32	4%
AA	0.35	5%
AA-	0.38	5%
A+	0.43	8%
A	0.48	9%
A-	0.63	12%
BBB+	0.78	29%

These exhaustive calculations show that the appropriate ABS scaling factors for investment grade senior ABS positions should be much less than 1.0, and should range as low as 0.29 for "AAA" assets.

[2] Capital calculations here are inclusive of expected loss, and were calculated at the 99.5% confidence point.

Appendix 2

Apportioning Economic Capital Among Tranches of an Asset Securitization – the Basel 2001 Proposals

Revised, April 3, 2002

Michael Pykhtin and John Mingo[1]

1. Introduction. This paper is intended to assist the Basel Working Group on Asset Securitization in parameterizing its proposed "model" for assigning capital to various tranches of an asset securitization. The reader is presumed to have familiarity with the Basel Working Paper (WP) on the Treatment of Asset Securitizations, October 2001, which embodies the Securitization Group's proposals.

The analysis below deals only with the case in which the securitization transaction is subject to the proposed Supervisory Formula (SF). In this formula, K_{IRB} is designated as the reference regulatory capital level on the underlying asset pool (as if the assets were held on the books of the originating bank). Regulatory capital on tranches covering losses beyond K_{IRB} are, under the SF, supposed to attract additional capital in the aggregate equal to βK_{IRB}, where the value of β is yet to be determined. The WP presumes that K_{IRB} is "intended to approximate the credit enhancement that would be needed to achieve roughly a BBB rating on a senior asset backed security backed by those assets" (i.e., backed by the underlying pool assets). In the discussion below, we take this statement to mean that the logic of the WP is based on the assumption that K_{IRB} is roughly equal to the loss at the 99.5% confidence interval associated with a best-practice estimate of the credit loss distribution for the underlying assets. Of course, regulatory capital on the underlying assets is not easily related to Economic Capital (EC) on the underlying pool, nor is regulatory capital related directly to loss at any particular confidence interval on the underlying loss distribution. Finally, the balance sheet definitions of regulatory capital are not consistent with the precepts of EC practice.[2]

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[1] Ashish Dev and Robert Kula of KeyCorp provided valuable comments on this paper. The views expressed herein are solely those of the authors and may or may not be those of KeyCorp or its senior management.

[2] See RMA, "Response to the Working Paper on EL and Future Margin Income," November 2001.

Therefore, there would need to be significant changes in the way Basel is proposing to set regulatory capital for the underlying assets before any rational securitization capital policy could be established.

2. The Supervisory Formula. The SF is based on the premise, first, that the bank providing the "first-dollar" loss protection for the pool, which we presume is the originator of the assets for purposes of this discussion, should hold dollar-for-dollar capital on such first-dollar protection, up to and including K_{IRB}. This premise is consistent with internal practices at many advanced-practice banks (assuming K_{IRB} is set properly). In effect, the capital on the first-dollar position is set under the assumption that there is no diversification benefit accruing to the first-dollar holder – losses on the underlying pool and losses on the bank's existing portfolio are assumed to be perfectly correlated, so that capital for the first-dollar position should be the same as if the underlying pool assets were the only assets owned by the bank. Further, a first-dollar loss position in excess of K_{IRB} would involve no additional capital charge for the originating bank. That is, even though recourse above K_{IRB} is provided, the bank is meeting its soundness standard by holding K_{IRB} in capital.

For any other bank holding a subordinated or senior position in excess of K_{IRB}, the presumption is that, while the first dollar holder has eliminated all risk except "tail" risk associated with the pool, such risk is still positive – the tranche holder faces a determinable credit loss distribution. Further, the Basel WP states that such a tranche, because it's performance is tied to that of an entire pool of underlying assets, should be considered to have a high performance correlation with the rest of the purchasing bank's portfolio (consisting of other pools of similar assets or other tranches associated with similar pools). Additionally, the WP states that the absolute economic capital that might be attributed to all of the tranches in excess of K_{IRB} should be "concentrated" in those mezzanine tranches immediately "after" the loss level of K_{IRB}. That is, the probability of incurring any loss whatsoever is greater the more subordinated is the tranche. Finally, mezzanine tranches often are "thin", representing, say, 1% of the amount of the underlying pool. For such tranches, effective LGDs are high which, when coupled with high performance correlation with the rest of the purchasing bank's portfolio, imply very high percentage capital allocations for such tranches.

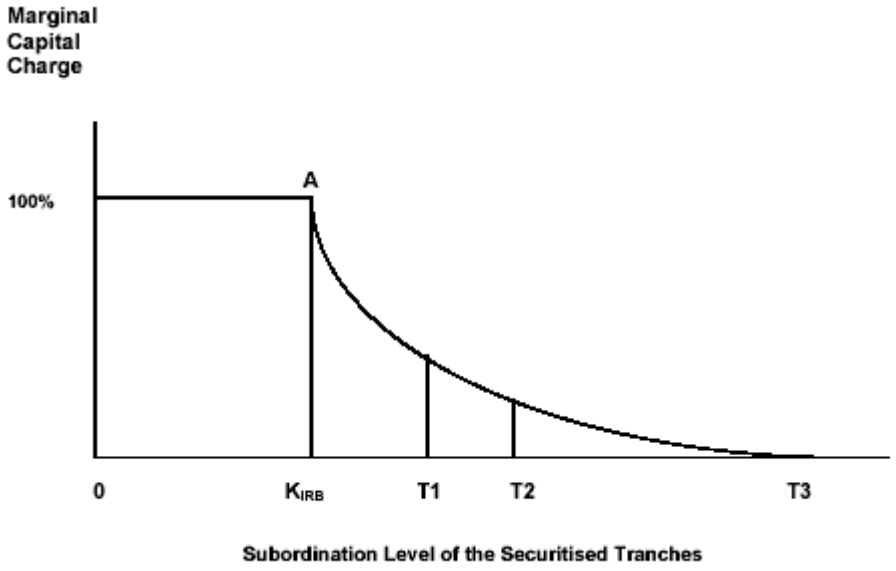
We believe that this view is essentially consistent, at least in principle, with best-practice estimation of credit risk. If so, two questions need to be answered: First, what is the appropriate amount of the additional capital attributed to all the tranches above K_{IRB}, expressed as a percentage of K_{IRB}. As indicated above, the WP calls this *percentage* additional capital "β". Second, what kind of mathematical function should regulators use to approximate the degree to which the additional absolute capital -- βK_{IRB} -- should be apportioned to the very most subordinated tranches? The Basel Securitization Group does not attempt an answer to the question of what should be β, but establishes a specific method of apportioning additional regulatory capital to all the tranches in excess of K_{IRB} , assuming that β is known. This Supervisory Formula is expressed as follows.

(1) Required capital beyond $K_{IRB} = 1/\delta [e^{(Kirb - T1)\delta} - e^{(Kirb - T2)\delta}]$

where:
T1 = lower bound of the securitization tranche;
T2 = upper bound of the securitization tranche;
K_{IRB} = reference capital level on the underlying pool;
β = premium factor; and
δ is set so that $1/\delta [1 - e^{(Kirb - 1)\delta}] = \beta K_{IRB}$.[3]

This formula can be shown in graphical form as follows:

[3] In the formula, T1, T2, $K_{IRB,}$ and the required capital for the tranche are measured relative to the pool size as decimals.



3. A process for estimating β. It is possible to estimate the level of β, assuming that the risk characteristics of the underlying asset pool are known or estimated. Indeed, Basel proposes that the Supervisory Formula is to be used only in those circumstances where the bank holds an unrated position and can estimate these pool risk characteristics. To show how β might be estimated, we deal with a commercial loan portfolio with a specific set of risk characteristics. Later we broaden the analysis to show how other pools lead to other β's.

Assume we are dealing with a $100 pool of loans in which the average weighted PD (one-year horizon) is 1.2%, the expected LGD is 40%, and the obligor-asset-value (OAV) correlation, rho_A, is 20%. Using a Merton-type model similar to the regulatory model, we calculate the following statistics of the resulting credit loss distribution for the asset pool:[4]

- Loss at the 99.5% confidence interval = 4.33%
- Expected Loss (EL) = 0.48%
- Economic Capital = 3.85%

[4] For purposes of this discussion we use the Dev/Pykhtin model described elsewhere (Ashish Dev and Michael Pykhtin, KeyCorp, 2001, "Credit Risk Modeling: Analytical Results," working paper). This model is very similar to the Merton model underlying Basel's IRB approach, see Gordy, Michael, FRB, 2001, "A Risk-Factor Model Foundation for Ratings-Based Bank Capital Rules," working paper).

Assume further that the structure of the CLO transaction is such that EL on the pool is covered by spreads between the assets and the liabilities funding the assets in the securitization Trust (via a fully-funded spread account in the Trust). The originating bank provides credit enhancement equal to losses in excess of EL (i.e., in excess of 0.48% of the underlying) up to 4.33% of the underlying assets. This "first-dollar" credit enhancement might be in the form of a subordinated cash loan to the Trust or an equity position. Leaving aside for the moment the correct capital to be held by the first-dollar bank, we examine the question of how to estimate β; i.e., how to estimate the capital allocations for all the tranches above the 4.33% level. To do this, we assume that these post-4.33% tranches are infinite in number and each infinitely "thin." The tranches taken together add up to 95.67% of the underlying pool.

For each such tranche, capital can be estimated by using a Merton model in which the following assumptions are made:

- PD for the tranche is 1 minus that confidence interval applied to the underlying loss distribution that produces a loss equal to the lower bound for the tranche (T1 in the Supervisory Formula). For example, for the first tranche above 4.33%, the PD for the tranche is 0.5% -- because we used a 99.5% confidence interval to arrive at the 4.33% level in the example.
- LGD for the tranche is 100% -- this flows from the use of infinitely thin tranches. If there were a default on such a thin tranche, the investor would lose everything.
- The OAV correlation in the Merton model to be applied to the tranche is ρ, and is very high (0.9 say) as per the discussion above. That is, the bank purchasing the tranche should account for high performance correlation between that tranche and the bank's own portfolio of commercial loans.

For each such tranche, using the Merton model with the inputs immediately above, we can calculate a loss at the 99.5% confidence interval (the common soundness standard applied for regulatory purposes to all bank investments). This "loss at the confidence interval" we call the *tranche's* $LCI_{99.5\%}$. Notice that the bank purchasing this tranche does not have benefit of the spreads on the underlying assets to provide

protection. That is, the spread account, the first-dollar protection of the originator, and any other intervening tranches, already have absorbed losses. Thus, from the point of view of the bank purchasing the tranche, Economic Capital should equal the full $LCI_{99.5\%}$ (on the distribution computed with the PD, LGD, and ρ immediately above), not [$LCI_{99.5\%}$ minus EL] as would be the case with an on-balance-sheet asset.[5]

It is now an easy matter to measure all of the absolute capital that should be attributed to all of the tranches above 4.33%. We simply integrate over all the tranches' $LCI_{99.5\%}$'s to obtain this aggregate capital amount. Call this amount Aggregate Tranche Capital, where "tranche" refers to any and all positions senior to 4.33%. Then the ratio of Aggregate Tranche Capital to 4.33% in our example is our estimate of β. Note that the estimate of β is derived in relationship to $LCI_{99.5\%}$ *on the underlying pool* (4.33% in our example), not EC on the underlying pool (3.85% in our example). Nor is β estimated in relation to K_{IRB}, the regulatory capital requirement on the underlying pool – since the regulatory true capital requirement (Tier 1), at least for the current iteration of Basel II – is not systematically related to any particular confidence interval applied to the regulatory model (i.e., too much "manipulation" of the output of the regulatory model goes on).

As indicated above, all Advanced banks should have the tools to estimate the PD's and LGD's associated with the underlying assets. If the regulator provides a spreadsheet version of its (unmanipulated) credit risk model, including the rho_A that is being applied, the originating bank can produce the estimate of β. To provide the reader with a view of how β is determined by the risk characteristics of the underlying assets, Table 1 below computes β for each of 5 types of assets, using each of 3 assumptions regarding the OAV correlation between the purchased tranche and the rest of the purchasing bank's portfolio.

[5] It is true that the tranche has a yield of its own, but this yield is dependent solely on the performance of the underlying asset pool. Furthermore, for even the most junior tranches (above pool $LCI_{99.5\%}$), the EL on the tranche is 5 b.p. or less. Thus, the issue of whether the definition of EC should exclude EL on the tranche is not of the same order of magnitude as for a whole loan.

Table 1

Premium beta for different PD and asset correlations

PD	rho_A	β		
		ρ = 80%	ρ = 90%	ρ = 95%
1.50%	5%	3.82%	3.57%	2.98%
1.50%	15%	6.15%	5.70%	4.74%
1.20%	20%	7.32%	6.75%	5.60%
0.40%	20%	9.43%	8.57%	7.02%
0.15%	20%	11.34%	10.18%	8.26%

Note that the calculations of the β's in the table are independent of the expected LGD on the underlying assets. This is because, in the model determining the underlying asset loss distribution, LGD enters in linear fashion, in effect "scaling" the underlying loss distribution. Changing this scale changes the $LCI_{99.5\%}$ on the underlying loss distribution but does not change the relationship between aggregate *tranche* $LCI_{99.5\%}$ and underlying *pool* $LCI_{99.5\%}$[6]

The β's in the table range from about 3% to about 11% depending on the underlying asset pool characteristics. One can view the first pool (with PD of 1.5% and rho_A of 5%) as a pool of prime credit cards; the second pool can be viewed as a pool of first mortgages; the last three pools can be viewed as commercial loans with "ratings" or PD's that vary from 1.2% down to 0.15%. If the regulators wished to simplify things, a β of about 3-5% for retail product securitizations and a β of 7-10% for commercial loan securitizations might be appropriate. Nevertheless, Advanced banks could easily compute their own β, and this approach would be most accurate, resulting in the least need for regulatory capital arbitrage.

[6] The reader should also note that, as ρ rises from 0.8 to 0.95, the calculated sum of the capital for the tranches above pool $LCI_{99.5\%}$ actually declines. This is an anomaly associated with using an asymptotic form of a single-factor model for capital allocation. Under this specification, the capital for a portfolio exactly equals the sum of the marginal capital allocations for the individual assets composing this portfolio. This means that the marginal capital for any asset in the portfolio depends only on the risk characteristics of that asset, not on the characteristics of the rest of the portfolio. More specifically, the marginal capital for an asset is proportional to the asset's PD conditioned on the realization of the risk factor at a percentile equal to one minus the chosen insolvency probability (i.e. 0.5% in our example). As ρ asymptotically approaches 1, any uncertainty (conditional on the realization of the risk factor) whether the asset will default disappears. Therefore, the conditional PD can only be either 0 or 1. In the case when the asset in

Note also that, for the retail products with identical PD's, as the tail of the underlying distribution thickens (rho_A rises), β also rises. There are two effects of increasing rho_A. First, $LCI_{99.5\%}$ on the underlying pool increases (the denominator of the ratio used to compute β rises). Second, the increased thickness of the tail of the underlying loss distribution leads to an increase in the absolute amount of aggregate capital attributed to the tranches above $LCI_{99.5\%}$. This latter effect dominates the former effect. That is, as shown in the table, for retail products this results in an increase in β as rho_A increases.

For the commercial loan products, the first of the two effects described above dominates. That is, holding rho_A constant at 20%, as the PD of the underlying commercial loans falls, β rises. In effect, the denominator of the ratio of Aggregate Tranche Capital to pool $LCI_{99.5\%}$ falls as the PD of the underlying assets falls – and this effect on the denominator dominates the effect on the numerator.

The method described above can be used to estimate not only the Aggregate Tranche Capital but also the tranche $LCI_{99.5\%}$ for any specific tranche. When we do this for the examples of pools in the table, we find that application of the Supervisory Formula is somewhat conservative, once β has been properly determined, in allocating the Aggregate Tranche Capital to the tranches closest to pool $LCI_{99.5\%}$. In the first pool example where $LCI_{99.5\%} = 4.33\%$ this means that the tranche covering losses from, say, 4.33% to 5.33% should have slightly less capital allocated to it than via the application of the Supervisory Formula. Correspondingly, the more senior tranches should have slightly more capital allocated to them than via the Supervisory Formula. To provide specific examples, the table below shows how the Merton-type model would allocate EC to the "first 1% piece" beyond pool $LCI_{99.5\%}$ for each of the 5 types of pool shown in Table 1 above. In the examples, the EC for the thin mezzanine tranche is computed using the Dev/Pykhtin model directly, rather than by applying the Supervisory Formula with a β as derived in Table 1. In this sense, the EC calculations in Table 2 (in column 6) are

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question has an unconditional PD of less than one minus the confidence interval, the conditional PD is 0, and the asset requires zero capital.

the “true” ECs, given the PDs and rho_A’s actually associated with the underlying asset pool.

Table 2

Col.1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col.7	Col. 8
PD	rho_A	E[LGD]	pool LCI@99.5%	upper bound to "first mezz. tranche"	EC for first mezz.(%)	EC for first mezz. piece, as per S.F. (%)	EC for first mezz. piece, as per S.F. / 2.5 (%)
1.50%	5%	90%	4.59%	5.59%	15.08%	16.32%	14.94%
1.50%	15%	20%	2.04%	3.04%	11.31%	11.59%	11.22%
1.20%	20%	40%	4.33%	5.33%	21.15%	28.29%	21.80%
0.40%	20%	40%	1.87%	2.87%	14.59%	15.99%	14.70%
0.15%	20%	40%	0.85%	1.85%	8.53%	8.62%	8.54%

In table 2, the first pool can be thought of as a pool of card receivables, the next pool can be thought of as a pool of mortgages, and the last three pools can be thought of as commercial loan pools (with varying PDs). In the table, column 6 shows the "true" ECs that should allocated to the thin mezzanine piece, while column 7 shows the ECs that would be allocated by the Supervisory Formula (assuming the SF uses our estimated β at a ρ of 0.90). The differences between the Supervisory Formula as proposed and the "true" EC estimates in Table 2 could be reduced by slightly altering the Supervisory Formula as follows:

(2) Required capital beyond K_{IRB} = $1/(2.5\delta) [e^{(Kirb - T1)\delta} - e^{(Kirb - T2)\delta}]$

where:
T1 = lower bound of the securitization tranche;
T2 = upper bound of the securitization tranche;
K_{IRB} = reference capital level on the underlying pool;
β = premium factor; and
δ is set so that $1/(2.5\delta) [1 - e^{(Kirb - 1)\delta}] = \beta K_{IRB}$.

Note that both in our suggested formula and in the proposed Supervisory Formula, the correct way to estimate β is by replacing the term K_{IRB} with *pool* $LCI_{99.5\%}$, or loss at some other appropriate confidence interval. The actual regulatory capital, K_{IRB}, due to political considerations, may not be close to pool $LCI_{99.x\%}$. The last column (col. 7) in Table 2 represents the EC applied to the tranche through application of this revised Supervisory Formula (again, assuming that β is properly estimated).

4. <u>What if the regulatory confidence interval exceeds 99.5%</u>? Tables 1 and 2 were calculated assuming that the calculation of the underlying capital charge for the on-balance-sheet assets was determined by using a 99.5% confidence level (since industry observers have complained that the 99.9% confidence interval used within recent Basel papers[1] is too high – i.e., may result in additional, unnecessary capital arbitrage). Regulators may be concerned that if a higher confidence interval than 99.5% is actually

chosen by Basel, the effective $'s calculated in Table 1 may be too low. To examine this concern, we ran the analytics again, this time using a 99.9% confidence interval for both the calculation of K_{IRB} and the calculation of $\$K_{IRB}$ (the sum of the capital charges for all positions in excess of K_{IRB}). The results are shown in Table 3 below.

Table 3

Premium beta for different PD and asset correlations

Confidence Level 99.9%

PD	rho_A	β		
		ρ = 80%	ρ = 90%	ρ = 95%
1.50%	5%	2.94%	2.96%	2.60%
1.50%	15%	4.40%	4.42%	3.86%
1.20%	20%	5.06%	5.09%	4.44%
0.40%	20%	6.62%	6.56%	5.67%
0.15%	20%	8.04%	7.88%	6.74%

The results in Table 3 indicate that $ actually declines as the confidence interval rises. Aggregate *absolute* capital for all the tranches above K_{IRB} still rises, of course, because absolute K_{IRB} rises (that is, even though $ declines, $\$K_{IRB}$ rises). Beta declines, because, as the already high confidence interval is raised further, the effective PDs for tranches above K_{IRB} decline to very small levels. Thus, for the range of possible confidence intervals that Basel may be considering, we can be comfortable in concluding that $ should range well below 10%, even below 3%, depending on the nature of the underlying asset pool.

[1] For example, see the January, 2002 Basel release, " Summary of Current MTF Proposals on the IRB Treatment of Retail Exposures."

Appendix 3

Institutions in the RMA Working Capital Group

Bank of America	Bank of Montreal
Bank of New York	Bank One
FleetBoston Financial	JPMorganChase & Co.
KeyCorp	PNC Financial Services Group
Providian Financial	Royal Bank of Canada
Union Bank of California	Wachovia
Washington Mutual Bank	Wells Fargo

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Union Bank of California: Philip B. Flynn, Executive Vice President, Head of Credit Management Group; David I. Matson, Executive Vice President & Chief Financial Officer; Paul C. Ross, Senior Vice President, Portfolio Risk Management; John Chittenden, Senior Vice President, Financial Planning & Analysis; Desta G. Medhin-Huff, Vice President, Portfolio Management
Wachovia: James V. Johnson, III, Senior Vice President, Treasury Risk Management; Kim S. Zweier, Vice President, Liquidity & Capital Planning; Robert C. Zerbe, Vice President, Liquidity & Capital Planning; Robert A. Gray, Vice President, Treasury Support
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Wells Fargo: George Wick, Senior Vice President, Portfolio Strategies
RMA - The Risk Management Association: Pamela Martin, Director of Regulatory Relations & Communications
Mingo & Co.: John Mingo, Managing Director