

June 9, 2000

## **The Effects of Term on Economic Capital Allocations for Credit Risk**

RMA Capital Working Group<sup>1</sup>

As part of the RMA Capital Group's response to the Basel Committee's Consultative Paper on a New Capital Adequacy Framework (RMA response dated March 31, 2000), we included the results of a survey of our members regarding economic capital allocations for commercial credits. At that time, we promised to conduct additional survey work regarding the effect on economic capital of the term (duration) of a loan facility.

In the original survey, our 11 members provided economic capital estimates (for credit risk only) for various combinations of EDF range and LGD range within their commercial loan portfolios. Appendix 1 of the March 31 RMA response details the assumptions and issues surrounding the original survey, and that Appendix is reproduced in its entirety below (with only the Table numbers changed).

In this latest survey, 7 of our 11 members provided estimates of economic capital for credit risk on loans of varying duration (bullet loans of 1 year, 3 year, and 5 year terms). The capital allocations were computed on a consistent basis with, and using the same assumptions as, our original survey. These latest results are presented in Tables 3, 4, and 5 in Appendix 2.<sup>2</sup> Table 3 in Appendix 2 is similar in construction to Table 1 in Appendix 1, except that only 7 of the original banks have provided data. Thus, there are slight differences in, for example, the median capital allocations for a particular EDF-LGD bucket between the two tables.

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<sup>1</sup> Some of the banks participating in the RMA Group may provide individual responses that may include issues not addressed within this response or which vary from the positions taken in this response. See Appendix 3 for a listing of all RMA participants.

<sup>2</sup> Please note that 4 of our members did not provide economic capital estimates in Appendix 2 either because the bank uses a "default-mode" economic capital model (which generally will not be sensitive to term effects) or because short-term resource limitations precluded the bank's participation in this survey.

In general, the 7 banks responding to this latest survey use some form of "mark-to-market" (MTM) model for estimating portfolio economic capital and allocating such capital down to the individual facility level. In such models, "credit risk" is more broadly defined than in "default mode" (DM) models. In the latter case, a credit loss can occur only if the loan defaults. In the case of an MTM model, however, a loss (or gain) can occur even if the loan does not default. One such event occurs when the obligor is downgraded (upgraded) -- that is, is assigned a higher (lower) EDF -- and, therefore, the loan loses (gains) market value. Another such event occurs when the loan's inherent (unconditional) riskiness (as measured by EDF, LGD, etc.) remains unchanged but the credit spread curve changes. That is, if credit spreads in general widen (narrow), then all loans of all grades become worth less (more).<sup>3</sup>

Term of the loan facility becomes vitally important within MTM models because the change-in-value of, say, a downgraded loan is magnified as the loan's term is longer. This effect is analogous to the relative change in value of a Treasury bond, for a given shift in the yield curve, depending on the term of the Treasury bond -- that is, long bonds will fall (rise) in value more than short bonds for a given rise (fall) in interest rates. Similarly, the effect of a downgrade (from, say, an EDF of 0.32% to an EDF of 0.64%) will result in a greater value decline for the 3 year loan than for the 1 year loan (assuming a "normally" upward-sloped yield curve).

Examples of credit risk models that include the effects of term include PortfolioManager™, CreditMetrics™, CreditPortfolioView™, and various internally constructed MTM models. However, the various models may differ quite dramatically as to which specific stochastic events are modeled and have term effects. In the simplest MTM models, a deterministic but upward sloping yield curve is assumed. Even in this case, if the loan is downgraded, the longer its term the greater its value decline. In other models, stochastic Treasury term structures and/or stochastic credit spreads are modeled.

The reader should note that the economic capital allocations shown in Tables 3-5 rise dramatically as the term rises, and this effect is greater when going from 1 to 3 years

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<sup>3</sup> It is the source of some debate whether value-change effects associated with changes in the credit spread curve should be labeled "credit effects" or "market effects." In most of our banks' models, however,

than when going from 3 to 5 years. For example, in Tables 3-5 look at the EDF-LGD cell in row 3, column 5 -- EDF range of 0.08% to 0.16% and LGD range of 40% to 50%. Median economic capital is 0.85 percent for a 1 year loan, 1.65 percent for a 3 year loan, and 1.90 percent for a 5 year loan. Similar relationships hold throughout the 110 cell EDF-LGD tables.

The greater effect on economic capital of going from 1 to 3-year terms (as opposed to going from 3 to 5-year terms) is consistent with yields in financial markets generally. That is, in most circumstances, markets appear to attribute lower marginal risk to increasing term, with the result that investors are not paid that much more for term risk in the 3-5 year range. Additionally, with respect to commercial loan facilities, longer term facilities (those in the longer-than-3-year range) are likely to incorporate meaningful financial covenants that would essentially terminate the facility once credit rating (or some other indicator of obligor soundness) declines below some threshold.

The conclusion associated with the tables in Appendix 2 is that, for many advanced-practice banks, term is vitally important to capital allocation. Nevertheless, an argument can be made that, for the banking book, default mode capital models are quite relevant (since mark-to-market asset value-changes are not fully incorporated within the banking book). Thus, we continue to believe that, as a first approximation, Basel should base its capital charges on a two-dimensional grid, with internally-estimated EDFs and LGDs representing the two dimensions. Later, as more advanced-practice banks migrate to MTM credit risk models, or as accounting within the banking book migrates to mark-to-market, the third dimension -- duration -- should also be incorporated within the capital standards.

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"grade" changes as well as credit spread changes are explicitly modeled and the resulting loss distribution is labeled a "credit loss" distribution (and associated economic capital included in Tables 3-5 in Appendix 2).

Appendix 1:  
Details of the (Original) RMA Capital Survey

Table 1 below shows the mean, median, and quartile breakpoints for capital allocations of the 11 members responding to the survey. The table shows economic capital for *credit risk* only; each of the respondents allocates capital for operational risk as well. The time horizon for the table is one year and each respondent calculated capital for credit risk by covering 99.5 percent of the estimated cumulative credit loss distribution (see discussion in text). Within each EDF/LGD cell the bank calculated economic capital for a hypothetical commercial loan under two critical assumptions:

- The asset is a *commercial loan* in bullet form with a one-year term.<sup>4</sup>
- The asset resides within a commercial loan portfolio that reflects the current portfolio's makeup in terms of the size, country, industrial sector, and internal ratings distribution of loans.

For all respondents, the actual internal economic capital allocation (for credit risk) for the hypothetical asset would be equal to or higher than the number shown in the table, either because the bank internally uses a higher coverage target than 99.5 percent or because the bank uses a longer time horizon, or both. In cases where the internal method uses a higher confidence interval than 99.5 percent, the economic capital modeling process typically permitted the bank to use the lower confidence level (or, in some cases, a lower multiple of the estimated portfolio loss standard deviation).

Across the 11 respondents the actual internal economic capital estimation process differed widely. Some banks used a single equation "default mode" model, some used commercially vended or internally-developed "mark to market" models based on the loan's internal rating (and for which credit losses could be incurred short of default, as when a loan is downgraded), and some used KMV's Portfolio Manager (which requires EDF™ estimates specific to each "name" in the portfolio, as well as pairwise default correlations for each pair of names in the portfolio).

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<sup>4</sup> For the banks in the sample, the EDF/LGD bucketing process is essentially the same for commercial loans and commercial real estate loans, with correspondingly similar or identical economic capital allocations.

In most cases, the banks bucketed an asset into an LGD range according to facility characteristics such as the degree and type of collateralization, the degree of subordination, etc. Most banks used 5-8 LGD ranges for internal purposes, although one bank used only a single expected LGD assumption (and accordingly calculated the same economic capital allocation for any asset within a particular EDF row in the table). While the definition of "default" differed somewhat across the banks, in all cases the definition was used consistently both when estimating EDFs and within the economic capital estimation process. Nevertheless, within an IRB system for Basel, it might be appropriate to apply a standardized definition of default. Each of the respondent banks would be able to express their estimated EDFs and LGDs in terms of some appropriately specified standard default definition.

Other than a specification of the EDF/LGD cells, and a requirement that each respondent provide economic capital for a one-year bullet loan over a one-year horizon, the RMA survey allowed the participating banks to specify each of the other parameters that go into their economic capital models. Thus, some banks assumed a constant LGD volatility across all assets while others assigned varying LGD volatilities depending on characteristics of the facilities. In some cases, the LGD volatility was assumed to be zero. The assumptions regarding LGD volatility play an especially important role in determining the capital allocations, if any, for Defaulted loans -- the last row in the table. Two of the 11 banks assigned zero capital for defaulted loans either because of the zero LGD volatility assumption or because of an internal policy in which defaulted loans are written down in such conservative fashion that no economic capital is thought to be needed against the remaining value. The other banks explicitly assume some LGD volatility and thus explicitly allocate capital against the loan value, post-write-down. In some cases, the economic capital assigned to the remaining value rises as LGD rises, then declines as the expected LGD category rises to very high levels. This treatment is based on the argument that for very high expected LGDs (where most of the loan is written off) there is correspondingly less need to hold capital against the remaining value.

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For purposes of the Tables, all 11 banks computed economic capital for a hypothetical loan for which there was no country risk (i.e., a loan in their home country).

The LGD volatility factor represents one reason why the Group's members believe that Expected Loss should be broken into its component parts -- EDF and LGD -- for purposes of setting up a risk-characteristic-based capital standard. That is, for expected LGD ranges most in use at the banks (0-10% up to about 50-60%), the higher the expected LGD the higher the assumed LGD volatility. Thus, two loans having the same EL could have very different economic capital allocations (the loan with the higher LGD having the higher capital allocation). This relationship tends to hold throughout the middle EDF ranges (i.e., except for the very lowest and highest EDF ranges) and for LGD ranges up to about the 50-60% range. But as the LGD range gets very large (above about 50-60%) some of the respondent banks assume that LGD volatility falls again. In this case, when two assets have the same EL, the asset with the higher LGD gets the lower capital allocation (because LGD volatility is lower).<sup>5</sup>

In order to arrive at their respective economic capital allocations in the survey, the banks assumed that the reference loan was part of their existing portfolio. Thus, the respondents used diverse assumptions regarding loss correlation coefficients. In some cases, depending on the particulars of the bank's economic capital model, the correlation coefficients were assumed everywhere equal. In other cases, the correlation coefficients were taken to be "typical" of the EDF/LGD cell for which economic capital was being estimated.

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<sup>5</sup> It is also the case that in some single equation capital allocation models, for any fixed LGD volatility, the mathematics of the equation (within relevant parameter ranges) serves to reduce allocated capital (for a given EL) as EDF falls and LGD rises.

Table 1  
 [Original Survey, 11 banks, Economic Capital for 1-year Bullet Loan]  
 LGD Cells

EDF Range	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	
0-0.04%	0.097	0.154	0.217	0.270	0.334	0.392	0.458	0.524	0.586	0.648	Mean
	0.050	0.150	0.170	0.200	0.230	0.270	0.310	0.350	0.400	0.430	Median
	0.020	0.050	0.086	0.111	0.121	0.131	0.141	0.151	0.177	0.197	25th%ile
	0.140	0.215	0.320	0.430	0.530	0.635	0.740	0.845	0.950	1.050	75th%ile
0.04-0.08	0.199	0.306	0.408	0.516	0.627	0.734	0.844	0.964	1.074	1.184	Mean
	0.080	0.250	0.340	0.420	0.530	0.650	0.700	0.820	0.920	1.040	Median
	0.045	0.125	0.205	0.281	0.367	0.438	0.510	0.536	0.562	0.588	25th%ile
	0.235	0.450	0.660	0.750	0.865	1.035	1.200	1.370	1.535	1.705	75th%ile
0.08-0.16	0.321	0.491	0.656	0.835	1.012	1.203	1.377	1.557	1.748	1.932	Mean
	0.170	0.390	0.650	0.910	1.170	1.200	1.220	1.400	1.590	1.770	Median
	0.085	0.220	0.356	0.462	0.574	0.685	0.796	0.913	0.994	1.040	25th%ile
	0.335	0.620	0.925	1.180	1.450	1.725	1.945	2.165	2.435	2.705	75th%ile
0.16-0.32	0.446	0.694	0.950	1.213	1.479	1.745	2.009	2.285	2.549	2.824	Mean
	0.230	0.590	0.990	1.380	1.500	1.770	2.090	2.400	2.710	3.020	Median
	0.150	0.385	0.543	0.704	0.875	1.046	1.222	1.358	1.439	1.520	25th%ile
	0.465	0.850	1.285	1.635	2.045	2.415	2.735	3.105	3.425	3.825	75th%ile
0.32-0.64	0.634	1.010	1.390	1.771	2.171	2.562	2.962	3.362	3.768	4.168	Mean
	0.370	0.920	1.450	1.970	2.460	3.000	3.550	4.090	4.640	5.180	Median
	0.225	0.600	0.820	1.065	1.321	1.585	1.854	2.068	2.347	2.621	25th%ile
	0.655	1.185	1.800	2.315	2.895	3.395	3.885	4.375	4.865	5.350	75th%ile

1.005	1.576	2.163	2.755	3.356	3.972	4.575	5.187	5.801	6.426
0.590	1.300	2.200	3.050	3.710	4.530	5.320	6.000	6.670	7.340
0.375	0.915	1.260	1.680	2.142	2.610	3.078	3.551	3.818	4.051
0.920	1.780	2.735	3.545	4.125	4.900	5.625	6.400	7.180	8.040
Mean									
Median									
25th%ile									
75th%ile									

1.466	2.398	3.333	4.297	5.260	6.233	7.207	8.190	9.176	10.161
0.990	2.300	3.590	4.590	5.570	6.540	7.490	8.440	9.390	10.340
0.645	1.440	2.114	2.902	3.690	4.442	4.820	5.238	5.896	6.548
1.290	2.885	4.415	5.300	6.450	7.650	8.925	10.290	11.660	13.030
Mean									
Median									
25th%ile									
75th%ile									

2.174	3.605	5.038	6.491	7.966	9.443	10.932	12.427	13.934	15.440
1.540	3.250	5.050	6.450	7.610	9.170	10.510	11.840	13.170	14.490
0.975	2.345	3.755	5.045	6.200	6.745	7.730	8.838	9.947	11.040
2.040	4.770	6.575	7.450	9.125	10.800	12.525	14.370	16.290	18.210
Mean									
Median									
25th%ile									
75th%ile									

3.317	5.591	7.828	10.105	12.398	14.709	17.043	19.392	21.757	24.128
2.340	4.870	7.250	9.630	11.900	13.600	15.400	17.300	19.200	21.100
1.635	3.920	6.260	8.330	9.970	11.070	12.776	14.671	16.446	18.217
3.340	7.945	9.470	10.550	12.950	15.710	18.525	21.345	24.215	27.080
Mean									
Median									
25th%ile									
75th%ile									

5.818	9.737	13.576	17.438	21.344	24.724	28.152	31.625	35.143	38.534
4.000	8.630	13.450	17.610	20.790	25.080	28.540	28.540	29.300	32.200
3.015	8.075	11.965	15.185	17.780	19.660	21.060	22.445	24.057	25.331
5.775	12.300	17.595	20.765	26.345	29.020	32.640	37.355	42.390	47.635
Mean									
Median									
25th%ile									
75th%ile									

13.474	20.729	26.347	31.310	35.831	38.837	40.342	41.031	40.538	38.466
8.840	18.590	26.200	29.250	29.250	31.510	36.420	29.250	29.250	26.200
6.250	15.610	20.630	22.730	26.070	26.200	26.200	26.010	15.610	8.840
21.790	26.200	29.250	36.420	46.820	49.750	47.700	43.390	49.900	56.770
Mean									
Median									
25th%ile									
75th%ile									



The EDF ranges for Table 1 were chosen not only for convenience (a doubling of the EDF range from grade to grade) but also because such EDF distinctions result in significant economic capital differences between "grades." For example, look at the 40-50% LGD range in Table 1. Note that median economic capital starts out at 0.23% in the lowest EDF range, then rises steadily to 20.79% in the worst non-default grade (EDFs greater than 10 percent). The EDF ranges chosen for Table 1, and those in use internally at the respondent banks, tend to have much finer distinctions of risk than some of the letter grades of the major rating agencies. This is one reason why we recommend that *numerical* EDF ranges, rather than rating-agency-equivalent letter grades, be used by the regulators. Nevertheless, to provide a frame of reference, Table 2 below shows the correspondence between our proposed EDF ranges and Moody's letter ranges (based on Moody's historical corporate bond default studies).<sup>6</sup>

Table 2

Moody's Letter Grades	Historical default freq.	RMA Group EDF ranges
Aaa-Baa1	0.00% <sup>a</sup>	0 - 0.04%
Baa2	0.07%	0.04 - 0.08%
Baa3	0.31%	0.08-0.16%; 0.16-0.32%
Ba1 - Ba2	0.52 - 0.62%	0.32 - 0.64%
Ba3	2.53%	0.64-1.28%; 1.28-2.56%
B1	3.46%	2.56 - 5.12%
B2	6.88%	5.12 - 10.00%
B3	12.23%	10.00% +
Caa1 - C	19.09%	10.00% +

<sup>a</sup> Only ratings of Aa3 and Baa1 have positive default frequencies at the one-year horizon - Aa3 at 0.07% and Baa1 at 0.04%.

<sup>6</sup> See Exhibit 31, Moody's 1999 bond default study, for one-year horizons.

From this table one sees that, although Moody's has 8 letter grades from Aaa-Baa1, their grades do not provide for much distinction in terms of actual default probabilities. By contrast, the RMA example provides for two EDF ranges (0.08-0.16% and 0.16-0.32%) covering the equivalent of Moody's lowest investment grade category (Baa3). Similarly, the RMA suggested EDF ranges provide for two more EDF categories (0.64-1.28% and 1.28-2.56%) covering the equivalent of Moody's Ba3 category. Only at the very lowest EDF levels -- assets in the equivalent of Moody's B3 and C categories -- does the RMA suggested matrix provide less detail (because such assets would comprise a very small fraction of a typical, sound bank's portfolio).

## Appendix 2

The 7 banks responding to this survey provided estimates of economic capital for credit risk for *bullet* loans of terms of 1 year, 3 years, and 5 years. In this manner, "term" and "duration" are identical. All other techniques, assumptions, etc. are consistent (for any given survey bank) with the descriptions provided in Appendix 1 for the original survey. Tables 3-5 below provide the median (75<sup>th</sup> percentile and 25<sup>th</sup> percentile) economic capital calculations of the 7 banks within each of the 110 EDF-LGD cells for each of the three durations.

Table 3  
7 Banks, Economic Capital for 1-year Bullet Loan, MTM Models

EDF Range	LGD Cells										
	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	
0-0.04%	0.075	0.155	0.220	0.305	0.390	0.475	0.565	0.650	0.740	0.820	75th%ile
	0.030	0.100	0.170	0.210	0.240	0.280	0.320	0.360	0.410	0.450	median
	0.020	0.050	0.085	0.120	0.155	0.180	0.215	0.250	0.290	0.315	25th%ile
0.04-0.08	0.115	0.265	0.380	0.510	0.635	0.780	0.915	1.060	1.200	1.310	75th%ile
	0.070	0.180	0.290	0.410	0.530	0.620	0.720	0.820	0.920	1.040	median
	0.045	0.125	0.205	0.280	0.365	0.440	0.515	0.600	0.675	0.755	25th%ile
0.08-0.16	0.185	0.405	0.675	0.930	1.185	1.440	1.720	1.950	2.180	2.330	75th%ile
	0.130	0.390	0.510	0.670	0.850	1.040	1.220	1.400	1.590	1.770	median
	0.085	0.220	0.355	0.475	0.590	0.705	0.825	0.940	1.060	1.185	25th%ile
0.16-0.32	0.240	0.595	0.970	1.365	1.740	2.085	2.480	2.805	3.125	3.385	75th%ile
	0.200	0.580	0.840	1.150	1.450	1.770	2.090	2.400	2.710	2.950	median
	0.150	0.385	0.570	0.735	0.915	1.095	1.280	1.470	1.655	1.845	25th%ile
0.32-0.64	0.360	0.885	1.425	1.960	2.505	3.045	3.585	4.100	4.640	5.185	75th%ile
	0.330	0.820	1.360	1.910	2.460	3.000	3.550	3.950	4.300	4.350	median
	0.225	0.635	0.880	1.150	1.425	1.710	1.995	2.285	2.585	2.880	25th%ile
0.64-1.28	0.630	1.420	2.285	3.150	4.010	4.870	5.745	6.615	7.490	8.355	75th%ile
	0.410	1.170	1.850	2.550	3.250	4.000	4.650	5.150	5.550	5.650	median
	0.370	0.955	1.380	1.800	2.235	2.680	3.135	3.595	4.060	4.525	25th%ile



Table 4  
7 Banks, Economic Capital for 3-year Bullet Loan, MTM Models

EDF Range	LGD Cells										
	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	
0-0.04	0.115	0.245	0.365	0.485	0.610	0.735	0.875	1.010	1.140	1.275	75th%ile
	0.050	0.160	0.270	0.370	0.480	0.580	0.670	0.770	0.860	0.960	Median
	0.025	0.070	0.115	0.150	0.190	0.235	0.265	0.305	0.345	0.375	25th%ile
0.04-0.08	0.200	0.415	0.635	0.885	1.130	1.380	1.620	1.870	2.110	2.350	75th%ile
	0.120	0.370	0.550	0.760	0.980	1.200	1.420	1.630	1.850	2.070	Median
	0.090	0.255	0.410	0.535	0.655	0.780	0.905	1.030	1.155	1.285	25th%ile
0.08-0.16	0.300	0.725	1.170	1.600	2.060	2.495	2.920	3.305	3.630	3.855	75th%ile
	0.270	0.600	0.910	1.280	1.650	2.010	2.380	2.740	3.110	3.480	Median
	0.155	0.450	0.655	0.850	1.050	1.250	1.450	1.650	1.850	2.050	25th%ile
0.16-0.32	0.425	1.070	1.755	2.435	3.110	3.760	4.430	4.995	5.515	5.890	75th%ile
	0.350	0.850	1.270	1.780	2.290	2.800	3.310	3.820	4.330	4.840	Median
	0.245	0.700	1.045	1.360	1.675	1.995	2.315	2.635	2.950	3.270	25th%ile
0.32-0.64	0.670	1.460	2.445	3.410	4.375	5.340	6.305	7.140	7.930	8.520	75th%ile
	0.500	1.190	1.840	2.480	3.120	3.810	4.510	5.200	5.890	6.590	Median
	0.400	1.110	1.630	2.175	2.715	3.235	3.755	4.270	4.785	5.290	25th%ile
0.64-1.28	1.145	2.440	3.965	5.455	6.930	8.390	9.835	11.275	12.705	14.130	75th%ile
	0.810	1.670	2.650	3.750	4.750	5.800	6.850	7.600	8.620	9.630	Median
	0.555	1.560	2.330	3.110	3.910	4.725	5.545	6.340	6.985	7.360	25th%ile

1.28-2.56

1.765	4.360	7.055	9.690	12.290	14.860	17.410	19.935	22.445	24.935
1.490	2.650	4.400	6.150	7.900	9.650	11.400	12.550	13.550	13.650
0.885	2.225	3.315	4.545	5.765	6.990	8.210	9.430	10.640	11.825

75th%ile  
Median  
25th%ile

2.56-5.12

2.800	7.390	11.930	16.360	20.725	25.030	29.290	33.520	37.715	41.885
2.310	3.700	6.150	8.650	11.100	13.550	16.000	17.650	19.050	19.150
1.420	3.330	4.945	6.735	8.515	10.300	12.085	13.865	15.645	17.380

75th%ile  
Median  
25th%ile

5.12-10.00

3.745	9.955	16.170	22.275	28.295	34.270	40.185	46.070	51.835	56.080
3.210	6.140	9.140	12.400	15.950	19.500	23.050	25.300	27.250	30.190
2.330	4.825	7.310	10.050	12.675	15.315	17.975	20.655	23.340	24.520

75th%ile  
Median  
25th%ile

>10.00

5.460	14.330	23.120	31.695	39.855	44.220	48.585	53.750	61.055	68.325
4.700	10.580	16.490	23.090	29.690	30.860	36.330	40.430	45.600	51.000
3.830	8.975	14.510	19.665	24.880	29.595	32.295	34.970	35.060	35.060

75th%ile  
Median  
25th%ile

Default

9.880	23.235	34.820	46.360	54.625	64.000	72.863	83.048	89.620	91.525
7.300	17.885	29.150	40.815	49.225	49.225	45.745	47.120	47.095	43.945
5.620	16.428	22.235	27.928	35.185	39.963	39.358	31.113	21.100	9.505

75th%ile  
Median  
25th%ile

Table 5  
7 Banks, Economic Capital for 5-year Bullet Loan, MTM Models

EDF Range	LGD Cells										
	0-10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%	
0-0.04	0.150	0.295	0.440	0.590	0.740	0.895	1.050	1.215	1.375	1.535	75th%ile
	0.070	0.190	0.320	0.450	0.570	0.700	0.830	0.950	1.060	1.180	Median
	0.045	0.130	0.210	0.280	0.350	0.425	0.485	0.555	0.625	0.685	25th%ile
0.04-0.08	0.260	0.565	0.935	1.290	1.660	2.015	2.375	2.745	3.100	3.460	75th%ile
	0.180	0.530	0.730	1.020	1.310	1.600	1.900	2.190	2.480	2.770	Median
	0.135	0.380	0.585	0.760	0.935	1.110	1.290	1.475	1.650	1.830	25th%ile
0.08-0.16	0.435	1.000	1.635	2.300	2.935	3.570	4.205	4.730	5.290	5.615	75th%ile
	0.350	0.740	1.060	1.480	1.900	2.330	2.750	3.170	3.590	4.020	Median
	0.190	0.535	0.820	1.065	1.310	1.565	1.815	2.065	2.315	2.565	25th%ile
0.16-0.32	0.580	1.470	2.395	3.330	4.230	5.145	6.075	6.840	7.610	8.145	75th%ile
	0.500	1.050	1.450	2.030	2.610	3.190	3.770	4.350	4.930	5.510	Median
	0.300	0.840	1.310	1.700	2.100	2.500	2.900	3.300	3.695	4.095	25th%ile
0.32-0.64	0.885	2.075	3.460	4.845	6.205	7.590	8.975	10.160	11.320	12.155	75th%ile
	0.650	1.470	2.120	2.850	3.550	4.290	5.070	5.860	6.640	7.420	Median
	0.450	1.260	1.910	2.540	3.190	3.825	4.440	5.045	5.655	6.255	25th%ile
0.64-1.28	1.430	3.045	5.055	7.045	9.055	11.070	13.060	14.845	16.560	17.870	75th%ile
	0.860	2.250	3.530	4.750	5.920	7.070	8.190	9.280	10.370	11.430	Median
	0.680	1.860	2.695	3.590	4.505	5.440	6.380	7.325	8.275	9.225	25th%ile



1.28-2.56

2.120	4.995	8.115	11.175	14.200	17.195	20.165	23.115	26.050	28.965
1.620	3.400	5.650	7.900	10.150	12.400	14.600	16.200	17.500	17.600
1.055	2.555	3.695	4.995	6.340	7.690	9.035	10.375	11.710	13.015

75th%ile  
Median  
25th%ile

2.56-5.12

3.070	8.375	13.580	18.400	23.195	27.990	32.810	37.665	42.515	47.280
2.970	3.880	6.150	8.650	11.100	13.550	16.000	17.650	19.050	19.590
1.485	3.710	5.375	7.335	9.295	11.250	13.215	15.175	17.130	18.815

75th%ile  
Median  
25th%ile

5.12-10.00

4.555	10.960	16.910	22.815	28.775	34.875	41.130	47.570	54.160	59.435
3.210	6.630	9.950	13.230	16.550	19.920	23.360	26.860	30.380	33.760
2.415	5.195	7.505	10.360	13.320	16.285	19.245	21.560	23.725	24.935

75th%ile  
Median  
25th%ile

>10.00

5.775	15.280	24.705	33.910	42.705	47.705	52.700	60.585	69.000	77.405
5.000	11.150	17.130	23.980	30.830	33.470	39.670	40.430	45.600	51.000
4.215	9.165	15.000	20.390	25.875	30.165	32.865	35.540	35.630	35.630

75th%ile  
Median  
25th%ile

Default

9.880	20.693	31.123	42.895	50.593	59.083	67.950	80.703	90.770	92.938
7.300	17.885	29.415	39.830	50.160	50.160	47.160	48.940	49.395	46.770
5.778	16.900	22.495	29.160	36.655	41.845	41.153	31.893	21.573	9.663

75th%ile  
Median  
25th%ile

Appendix 3:  
Participants in the RMA Survey and Response

Institutions providing economic capital data for the EDF/LGD matrix.

Bank of America	Bank of Montreal
Bank One	Citigroup
First Union	FleetBoston Financial
KeyCorp	PNC Financial Services Group
Royal Bank of Canada	Union Bank of California
Wells Fargo	

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