CREDIT RATINGS AND THE BIS REFORM AGENDA

by

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Introduction

In an earlier paper, Altman and Saunders (2000, 2001) analyzed the initial reform proposal of the BIS released in June 1999. The initial BIS proposal put forward a three-stage plan towards reforming the 8% risk-based capital rule for credit assets of banks. Specifically, a first stage standardized model, with risk-weights based on credit rating agency buckets, was envisaged to be followed by the adoption of internal rating based models (using bank's own risk weighting/grading systems) and potentially, in the future, transition to internal models based on (default) correlations among credit risky assets.

In our earlier commentary, we found fault with two aspects of the standardized model. The first was the inherently lagging nature of agency ratings that could result in capital ratios moving too slowly in cyclical recessions e.g., required capital ratios reaching a peak *after* a recession when loan default increases had already occurred. The second problem involved the broad degree of granularity in the corporate loan risk weightings in that only three buckets for rated *corporate* loans were envisaged with one additional bucket for unrated loans. We showed that the proposed relative risk weightings of 20% (AAA to AA-), 100% (A+ to B-) and 150% (below B-), along with the 100% for unrated borrowers, were simply to broad and did not reflect the relative risk of unexpected losses on loans in each bucket. In order to show this we utilized data on corporate bond defaults (including prices one year prior to default as well as on default) in the US over the period 1981-1999 (September).

These data, along with different assumptions regarding the shape of loss distributions on loans (bonds), including the normal, actual and Poisson distributions (as

well as using Monte-Carlo experiments),[1] showed that the proposed BIS corporate loan risk weights did not differentiate sufficiently with respect to both the expected and unexpected loss rates in these buckets. Based on these findings we recommended a revised weighting scheme that included splitting the A+ to B- 100% bucket, into two separate buckets, A+ to BBB- and BB+ to B-, with the split reflecting the division between investment and non-investment grade borrowers. Our proposed risk weightings on the revised investment and non-investment grade buckets are listed in Table 1. The rationale for the lower 10% weight for AAA to AA- rated corporate credits is the observation that there has never been a default, within one year, of bonds rated in these two top categories and our updated results (below), continue to show this. We agree, however, that in some unusual cases, a AAA or AA bond could default in one year.[2] As such, we believe a non-zero risk-weight is prudent but are not convinced that the 20% weight in the 1999 BIS proposal, and in their new draft, is appropriate. We still prefer the lower 10% owing to the empirical evidence to date.

We also found that the ratio of unexpected losses between investment grade A+ to BBB- bonds, versus non-investment grade BB+ to B- bonds, was roughly between 3 to 5 times greater for the latter. We therefore specified a 30% and 100% weighting for the two new buckets, respectively. Also, recognizing that below B- bonds were far more riskier than those at B or above, we selected a 150% weight, although we felt that this was perhaps too low. Finally, we explored the total elimination of the unrated class and its attendant 100% weight and suggested that wherever possible, internal credit ratings be

[1] See, Saunders (1999) for a description of alternative loss distribution models.
[2] For example, Southern California Edison's bonds were rated AA- as of December 31,2000 and there is, at the time of this writing, a non-trivial probability that the firm could default sometime in the year 2001 due to the regulatory debacle and the sudden increase in fuel cost and lack of energy in California.

utilized. We continue to strongly suggest this approach, especially since the subsequent BIS documents of January 2000 and January 2001, emphasize the eventual need for internal ratings based (IRB) systems for all banks. We cannot see any economic or statistical rationale for clinging to an unrated class with risk-weights that are lower than some of the rated categories.

In the newly amended proposal, released in January 2001, the BIS now proposes a revised standardized model in which an additional bucket is added for corporate loans – see Table 2. Moreover, stage two is replaced by two alternative internal ratings based (IRB) schemes; one called the "foundation" approach, the other the "advanced" approach. The "foundation" scheme requires a default probability (PD) to be mapped into a bank's granular rating system, based in part on the historical default experience of the bank. This PD number is then adjusted to reflect both the expected and unexpected probabilities of default, and multiplied by a *standardized* loss given default (LGD) factor and a maturity (M) factor. The principal difference between the "foundation" and "advanced" approaches is in the bank's internal calculation of LGD, and M, as well as the exposure at default (EAD) in the latter approach.[3]

In Section 2 of this paper we conduct a revised empirical analysis of the new proposed standardized bucket weights using the same period data (1981-1999 September) from our earlier study and then updating the results for year 2000 experience. We next examine the stability of default and loss predictions over time. In particular, we examine

[3] There is very little discussion of loan default correlations. Indeed, the standardized as well as the internal rating based schemes appear to ignore internal diversification via correlations. Whether this means that the idea of eventually moving to internal models based on correlations for risk-based capital purposes has been abandoned is unclear. Correlations of default incidence is discussed in the BIS report's section "credit mitigation," especially with respect to credit guarantees and derivatives (see p. 32 of that section). Basically, the use of the "double-default" joint probability correlation argument is rejected.

the extent to which historical data on PD and LGDs for the 1981-1999 (September) period could predict the PD and LGDs (and hence losses) over a one-year horizon (*i.e.*, the actual default experience of the year 2000[4]). In section 2, we also update the results for our own proposed buckets. The year 2000 data is a particularly important period since the default rate on corporate bonds was relatively high (see our discussion below). Finally in Section 3 we present a summary and conclusions.

Section 2-Analysis of the BIS and our proposals

2.1 Standardized Risk Weights

Table 2 shows the revised risk weights of the standardized model as proposed by the Basel Commission on Bank Supervision. The risk weight for AAA to AA- remains at 20%, even though we could find no corporate bond that had defaulted with such a rating over a one-year horizon for the 1981-1999 (September period) and in 2000. The second original bucket of 100% for A+ to B- has been split into three, as we and perhaps others, had recommended. However, the split chosen is A+ to A-, BBB+ to BB- and below BB-, rather than the more logical investment grade versus non-investment grade split of A+ to BBB-, BB+ to B- and below B- that we suggested in our original commentary article. The relative risk weightings of these three new buckets are 50%, 100%, and 150%. Note that the most risky "rated" bucket starts at below BB- whereas under the original proposal it started at below B-. It should also be noted that unrated corporate borrowers remain with a 100% risk weight as under the original proposal.

The revised BIS buckets, therefore, combine the dominant "junk bond" rating (single B) with the lowest and far less common rating, (triple-C/or Caa), and weight this

[4] In actual practice the horizon is one quarter longer than a year since our original sample period ended in September of 1999 and we are predicting annual probability of loss experience for the year 2000 (excluding the last quarter of 1999).

bucket at 150%. This combination is somewhat odd since all the empirical evidence that we have seen shows that the default probability of a triple C bond is much greater, perhaps 10 times as great, than a single B issue.[5] We can find no *a priori* rationale for the revised bucket weights other than they are less granular than the original proposal's and that the Commission is responding positively toward the many commentators who advocated increasing the number of buckets.

In order to evaluate the relative accuracy of the "risk weights" under the new proposed BIS model, we use the same data and methodology as in Altman and Saunders (2001), on bond defaults and loss given default calculations to generate loss distributions and to calculate the expected (mean) and unexpected loss rates (at various percentiles, *i.e.*, 95%, 99%, and 99.97%). Importantly, the BIS now explicitly interprets capital as that equity being sufficient to withstand both expected *and* unexpected losses.[6] The justification for including expected losses in the capital calculation is that loan loss reserves and provisions (up to a maximum of 1.25%) are counted as Tier II Capital as part of the current BIS 8% minimum required capital ratio.

In the analysis that follows we concentrate on the mean (expected) loss rate of each standardized category and the extreme 99.97% (unexpected) loss rate. In Table 3 the relevant expected and unexpected loss rates are shown. As discussed earlier for the AAA to AA- bucket, both the expected and unexpected loss rates are zero over the 1981-1999 (September) period, indicating that a 20% risk weight, and implicity a 20% x 8% = 1.6% capital requirement, exaggerates the risk of default losses for the highest quality

[5] See (Caouette, Altman and Narayanan, 1998, Chapter 15) who compare S&P, Moody's and Altman's one year and cumulative default rates.)

[6] Most analytical work has equated expected losses with loss provisions or reserves, with unexpected losses being insulated by bank capital.

corporate borrowers. For the new second bucket (A+ to A-), the expected loss rate is 0.012% and the unexpected losses under the normal and actual loss distributions at the 99.97% confidence level, are respectively 2.142% (normal) and 14.988% (actual). This compares with the new third bucket's (BBB+ to BB-) expected loss rate of 0.163% and unexpected loss rates of respectively 7.369% (normal) and 54.837% (actual). Thus the expected loss rate of the new bucket 3 is 13 times larger than bucket 2, while the unexpected loss rate is between *3.4* and *3.6* times larger. Hence, the relative risk weighting in the standardized model of 100% versus 50%, or 2 times higher for bucket 3, appears to underestimate the relative riskiness of the two classes.[7]

Comparing bucket 4 (below BB-) to bucket 3 (BBB+ to BB-) we see that the expected loss rate of bucket 4 was 2.772% versus 0.163% for bucket 3, and the unexpected loss rates were 35.434% versus 7.36% (normal distribution) and 97.228% versus 54.837% (actual distribution). Thus the expected loss rate of bucket 4 is 16 times larger than bucket 3, and the unexpected loss rates are between *4.8* and *1.8* times larger. Again, the risk weighting difference of 150% versus 100%, or 1.5 times larger, implied by the BIS proposed model appears to underestimate the relative riskiness of below BB- borrowers relative to BBB+ to BB- borrowers. That is, the revised standardized BIS capital requirement continues to penalize higher quality relative to lower quality borrowers.

As in our earlier model we re-estimated these loss rates distributions looking at the loss rate experience on only the most senior bond of a defaulted issuer. Arguably,

[7] Interestingly, in our original paper (Altman and Saunders (2001)), we had proposed a relative risk weighting between buckets 2 and 3 of 30% versus 100% or bucket 3's risk weighting should be 3.3 times higher. Our buckets were investment grade vs. non-investment grade, however, while the revised BIS buckets combine the two in their third bucket.

these bond loss rates better reflect the loss rates to be expected on bank loans, since in most cases bankers have considerable seniority compared to other creditors when borrowers default. These results, on fewer default observations, are shown in Table 4 and again reflect a similar pattern, *i.e.*, the AAA to AA- risk weight is too high in absolute value, the relative risk weights (risk differences) between A+ to A- versus BBB+ to BB- and BBB+ to BB- versus BB- and below are simply to small. This reinforces the impression that the new proposal, if adopted, will retain the incentive banks currently have of risk shifting away from relatively safe loans towards relatively risky loans. Since the reduction of this regulatory arbitrage phenomenon was one of the prime objectives of the revised BIS guidelines, we are concerned that this goal will not be achieved.

2.2 Adding the Year 2000 Results

Our earlier study included default data through the third quarter of 1999. We are now in a position to add a relatively large number of observations since 2000 was an extremely high default year. Indeed, the defaulted amounts of corporate bonds in the U.S. exceeded $30 billion, which was almost $7 billion more than the previous record year, 1999, and almost $12 billion more than the early 1990's record years (Table 5). And, the default rate climbed to over 5%. We can add roughly 60 new observations where we were able to gather data on prices and ratings one year prior to default – an increase of almost 10% (comparing Tables 3 and 6).

The mean expected loss rates for the updated, larger sample shown in Table 6 are very similar for the A+ to A- and below BB- buckets compared to data through September 1999. (Table 3), but the BBB+ to BB- category had a sizeable increase in both its expected and unexpected loss rates – from 0.163% to 0.251% (expected) and from

7.34% to 11.75% (unexpected). This reflects a higher vulnerability to default of the somewhat better quality credits – at least in 2000.

We also updated the loss distributions of our proposed buckets (see Table 1). These are shown in Table 7. The results are quite similar to those found in our earlier paper, except most of the average loss rates are higher. For example, the expected issuer based loss for the A to BBB bucket increased slightly from 0.036% to 0.043% while the BB to B category decreased slightly.

2.3 Default and Loss Rate Stability

The next issue we address is one of stability. Suppose a bank adopts either the foundation or advanced internal ratings based (IRB) approaches towards capital requirement calculations and that it maps its internal ratings to the rating agencies results, thus using the historic default experience of those rating classes to estimate its expected losses (default rates) over a forthcoming (one-year) horizon. While the IRB approach requires more rating classes than the four classes under the BIS standardized model (over ten including both performing and non-performing loans), it is of some interest to see the ability of the loss rates over the relatively long 1981-1999 period to predict the loss rates that occurred in the year 2000.

The year 2000 results are shown in Table 8 and can be compared to Table 3 for the 1981-1999 (September) period. It is clear that historical data over-predicted both the expected and unexpected loss rates for the second standardized bucket (A+ to A-) and under-predicted the losses for the third standardized bucket (BBB+ to BB-). Specifically, both the mean (expected) and unexpected loss rates for bucket two were zero for year 2000, but were respectively 0.012% and 2.142% (normal) for 1981-1999 (September).

By comparison, for bucket three, the mean and unexpected loss rates (normal) were 0.813% and 25.578% for the year 2000 versus 0.163% and 7.369% for 1981-1999 (September). That is, the year 2000 showed a significant jump in loss rates relative to the average "across cycle" long-term experience reflected in the historical data. This difference is non-trivial and is of the order of being 4 to 5 times larger for standardized bucket three. Clearly, 2000 was a relatively bad year for BBB+ to BB- issuers with 23 defaults out of 2022 issues and, based on historical average experience, banks using an IRB approach may have been significantly under reserved and undercapitalized to meet such losses (and probably would have been in even more trouble using the standardized model). This suggests the need for stress testing and perhaps selection of historically "bad" years rather than average years in calibrating default probabilities and loss rates under the proposed IRB approach.[8] Finally, the 1981-1999 (September) expected and unexpected loss rates for bucket four (below BB-) are quite close to those that actually materialized in the year 2000.

3.0 The Unrated Bucket

The unrated bucket with its controversial 100% risk weight remains an unfortunate vestige from the 1988 accord. We can find no economic rationale for this category and since the vast majority of credits in the world's banking systems are not rated by rating agencies, this category could dominate the overall required capital held by many banks.

Data for comparing loss rates on unrated bonds, or loans, is almost impossible to get since the "class"is fairly ambiguous and probably encompasses securities of very different quality ratings. Figure 1 does show that unrated (NR) institutional, publicly filed loans had a cumulative default rate over the 1996-2000 (Q3) period that was higher than

[8] See Saunders (1999) for a discussion of stress testing.

BB but lower than B rated loans. And, the default rate was higher than the average leveraged ("junk") loan. This data is interesting since there was a significant number of non-rated loans (276) compared to all leveraged loans issued (542) in the five year period 1995-1999. It should be pointed out that this data is related to the expected probability of default and not the expected or unexpected loss rates. The data also is for a relatively short period of time.

Our proposal is a fairly simple one to deal with this thorny problem. It is to insert the bank's own internal rating system (of course one that is sanctioned by the Central Banks), as the determinant of the rating of all credits which are not rated by the agencies. The BIS has made a major effort in both encouraging and specifying best practice in banks for constructing, testing and mapping internal rating systems so that they can be used in a comprehensive and effective manner. Of course, this recommendation puts a great deal of responsibility on the Central Banks of the world who need to assess and monitor the development and utility of these systems. Hence, we suggest that the "unrated" bucket be reduced as much as possible, indeed eliminated if possible, and that the entire spectrum of credits be placed on a more rational and economic basis.

4.0 Summary and Conclusions

In this paper we have updated our first study to analyze the most recent draft of the BIS's proposed reforms of bank capital requirements. We focused on two aspects of the reform proposal: (i) the standardized model for corporate loans and (ii) the calculation of default and loss rates for inclusion in the IRB models. With respect to the standardized model we continue to find it problematic. While the addition of an extra risk bucket is a positive development, the size of the relative risk weights will continue to induce banks

to risk-shift towards more risky borrowers. We reiterate our recommendation that a more logical bucketing approach would be to separate the "lower" investment grade ratings (A+ and BBB-) from the upper, main strata of lower grade credits (BB and B) rather than create a hybrid-approach that combines BBB and BB, and also lumps all below BB- credits together. We also fail to see the economic logic of clinging to an "unrated" class with an arbitrary 100% weight. We prefer to eliminate this very large class through a hybrid system that allows banks to risk weight those loans unrated by the agencies.

With respect to the use of historical data in calibrating PD's and loss rates, great care needs to be taken in choosing the appropriate numbers. As was shown, the historical data for 1981-1999 significantly over-predicted the loss rates for the relatively bad bucket three in 2000. Since the year 2000 was viewed as a poor year for below investment grade (junk bond) defaults, these results are not surprising. What it does suggest is that conservative banks, in calibrating their loss rates for their lowest quality grades, might weight bad years higher than good years rather than relying on simple averages over the cycle.

References

1. E. Altman and B. Karlin, "Defaults and Returns in the High Yield Bond Market: Analysis Through 2000 and Default Outlook," **NYU Salomon Center Special Report**, January 2001.

2. E. Altman and A. Saunders, "The BIS Proposal on Capital Adequacy and Ratings: A Commentary," **Journal of Lending & Credit Risk Management**, February 2000.

3. E. Altman and A. Saunders, "An Analysis and Critique of the BIS Proposal on Capital Adequacy and Ratings," submitted to the BIS (March 2000) and published in **The Journal of Banking & Finance**, Vol. 25, #1, January, 2001.

4. **Basel Committee on Banking Supervision**, "A Proposal for a New Basel Capital Accord," BIS, Basel Switzerland, January 16, 2001.

5. **Basel Committee on Banking Supervision, "**A New Capital Adequacy Framework," BIS, June 1999.

6. **Basel Committee on Banking Supervision,** "Range of Practice in Banks Internal Ratings Systems," BIS, January 2000.

7. J. Caouette, E. Altman and P. Narayanan, **Managing Credit Risk: The Next Great Financial Challenge**, John Wiley & Sons, N.Y. 1998.

8. A. Saunders, **Credit Risk Measurement: New Approaches to Value at Risk and Other Paradigms**, John Wiley & Sons, NY, 1999.

Table 1

An Alternative Risk Weighting Proposal for Bank Corporate Loans*

	AAA to AA-	**A+ to BBB-**	**BB+ to B-**	**Below**
Corporates	10%	30%	100%	150%

* From Altman & Saunders (2000, 2001)

Table 2

Proposed BIS Standardized Model for Corporate Loans, January 2001

Credit Assessment	**AAA to AA-**	**A+ to A-**	**BBB+ to BB-**	**Below BB-**	**Unrated**
Risk Weights	20%	50%	100%	150%	100%

Source: BIS, 2001

Table 3
FREQUENCY DISTRIBUTION OF LOSSES
(PRINCIPAL AND COUPON), (1981 - 9/1999)
BY RATING ONE YEAR BEFORE DEFAULT
(NORMAL AND ACTUAL LOSS DISTRIBUTIONS)

Range of Default Losses	Mid point	AAA to AA-	A+ to A-	BBB+ to BB-	Below BB-	Total
0	0	11041	12115	12840	5291	41287
0.01 - 0.10	0.05	0	2	37	124	163
0.11 - 0.20	0.15	0	2	31	107	140
0.21 - 0.30	0.25	0	2	22	117	141
0.31 - 0.40	0.35	0	0	9	86	95
0.41 - 0.50	0.45	0	0	8	53	61
0.51 - 0.60	0.55	0	1	3	35	39
0.61 - 0.70	0.65	0	0	1	31	32
0.71 - 0.80	0.75	0	0	0	7	7
0.81 - 0.90	0.85	0	0	0	10	10
0.91 - 0.94	0.92	0	0	0	0	0
0.95 - 0.98	0.96	0	0	0	1	1
0.99	0.99	0	0	0	0	0
1	1	0	0	0	3	3
Total Default		**0**	**7**	**111**	**574**	**692**
Total Non-Default		**11041**	**12115**	**12840**	**5291**	**41287**
Total		**11041**	**12122**	**12951**	**5865**	**41979**
Mean		**0.000%**	**0.012%**	**0.163%**	**2.772%**	**0.598%**
Median		**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**
St.Dev		**0.000%**	**0.628%**	**2.195%**	**11.133%**	**5.001%**
3.43192sigma-E(L)		**0.000%**	**2.142%**	**7.369%**	**35.434%**	**16.566%**
2.32634sigma-E(L)		**0.000%**	**1.448%**	**4.943%**	**23.126%**	**11.037%**
1.64485sigma-E(L)		**0.000%**	**1.021%**	**3.447%**	**15.540%**	**7.628%**
99.97%		**0.000%** **0**	**14.988%** **3.6**	**54.837%** **3.9**	**97.228%** **1.8**	**84.402%** **9.3**
99.00%		**0.000%** **0**	**0.000%** **121.2**	**0.000%** **129.5**	**52.228%** **58.7**	**24.402%** **309.4**
95.00%		**0.000%** **0**	**0.000%** **606.1**	**0.000%** **647.6**	**22.228%** **293.3**	**0.000%** **1546.9**

Sources: Standard & Poor's. NYU Salomon Center Default Data Base

Table 4
FREQUENCY DISTRIBUTION OF LOSSES
(PRINCIPAL AND COUPON), (1981 - 9/1999)
BY RATING ONE YEAR BEFORE DEFAULT
(NORMAL AND ACTUAL LOSS DISTRIBUTIONS)
(Based on Number of issuers)

Range of Default Losses	Mid point	AAA to AA-	A+ to A-	BBB+ to BB-	Below BB-	Total
0	0	11041	12115	12840	5291	41287
0.01 - 0.10	0.05	0	0	0	18	18
0.11 - 0.20	0.15	0	2	1	19	22
0.21 - 0.30	0.25	0	0	2	29	31
0.31 - 0.40	0.35	0	0	6	30	36
0.41 - 0.50	0.45	0	0	3	33	36
0.51 - 0.60	0.55	0	0	6	41	47
0.61 - 0.70	0.65	0	0	3	50	53
0.71 - 0.80	0.75	0	0	5	40	45
0.81 - 0.90	0.85	0	0	1	26	27
0.91 - 0.94	0.92	0	0	2	12	14
0.95 - 0.98	0.96	0	0	1	3	4
0.99	0.99	0	0	1	0	1
1	1	0	0	0	0	0
Total Default		**0**	**2**	**31**	**301**	**334**
Total Non-Default		**11041**	**12115**	**12840**	**5291**	**41287**
Total		**11041**	**12117**	**12871**	**5592**	**41621**
Mean		**0.000%**	**0.002%**	**0.138%**	**2.815%**	**0.422%**
Median		**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**
St.Dev		**0.000%**	**0.193%**	**3.012%**	**13.100%**	**5.173%**
3.43192sigma-E(L)		**0.000%**	**0.659%**	**10.200%**	**42.143%**	**17.333%**
2.32634sigma-E(L)		**0.000%**	**0.446%**	**6.870%**	**27.660%**	**11.613%**
1.64485sigma-E(L)		**0.000%**	**0.314%**	**4.817%**	**18.732%**	**8.088%**
99.97%		**0.000%**	**0**	**0.000%**	**3.6**	**91.862%**	**3.9**	**93.185%**	**1.7**	**91.578%**	**12.5**
99.00%		**0.000%**	**0**	**0.000%**	**121.2**	**0.000%**	**128.7**	**72.185%**	**55.9**	**0.000%**	**416.2**
95.00%		**0.000%**	**0**	**0.000%**	**605.9**	**0.000%**	**643.6**	**12.185%**	**279.6**	**0.000%**	**2081.1**

Sources: Standard & Poor's. NYU Salomon Center Default Data Base

Table 6
FREQUENCY DISTRIBUTION OF LOSSES
(PRINCIPAL AND COUPON), (1981 - 2000)
BY RATING ONE YEAR BEFORE DEFAULT
(NORMAL AND ACTUAL LOSS DISTRIBUTIONS)

Range		AAA to AA-	A+ to A-	BBB+ to BB-	Below BB-	Total
0	0	11887	13330	14861	6304	46382
0.01 - 0.10	0.05	0	2	37	124	163
0.11 - 0.20	0.15	0	2	31	109	142
0.21 - 0.30	0.25	0	2	22	119	143
0.31 - 0.40	0.35	0	0	9	90	99
0.41 - 0.50	0.45	0	0	9	53	62
0.51 - 0.60	0.55	0	1	5	37	43
0.61 - 0.70	0.65	0	0	3	35	38
0.71 - 0.80	0.75	0	0	16	13	29
0.81 - 0.90	0.85	0	0	1	11	12
0.91 - 0.94	0.92	0	0	1	8	9
0.95 - 0.98	0.96	0	0	0	6	6
0.99	0.99	0	0	0	0	0
1	1	0	0	0	3	3
Total Default		**0**	**7**	**134**	**608**	**749**
Total Non-Deftiult		**11887**	**13330**	**14861**	**6304**	**46382**
Total		**11887**	**13337**	**14995**	**6912**	**47131**
Mean		**0.000%**	**0.011%**	**0.251%**	**2.691%**	**0.478%**
Median		**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**
St.Dev		**0.000%**	**0.598%**	**3.498%**	**10.992%**	**4.788%**
3.43192sigma-E(L)		**0.000%**	**2.042%**	**11.753%**	**35.032%**	**15.955%**
2.32634sigma-E(L)		**0.000%**	**1.381%**	**7.886%**	**22.880%**	**10.662%**
1.64485sigma-E(L)		**0.000%**	**0.973%**	**5.502%**	**15.389%**	**7.398%**
99.97%		**0.000%**	**0.0**	**14.989%**	**4.0**	**74.749%**	**4.5**	**97.309%**	**2.1**	**91.522%**	**14.1**
99.00%		**0.000%**	**0.0**	**0.000%**	**133.4**	**0.000%**	**150.0**	**62.309%**	**69.1**	**14.522%**	**471.3**
95.00%		**0.000%**	**0.0**	**0.000%**	**666.9**	**0.000%**	**749.8**	**22.309%**	**345.6**	**0.000%**	**2356.6**

Sources: Standard & Poor's. NYU Salomon Center Default Data Base

Table 7

FREQUENCY DISTRIBUTION OF LOSSES

(1981-2000) by ISSUERS

BY RATING ONE YEAR BEFORE DEFAULT

(NORMAL AND ACTUAL LOSS DISTRIBUTIONS)

(as per PROPOSED BUCKETS in ALTMAN-SAUNDERS (2001))

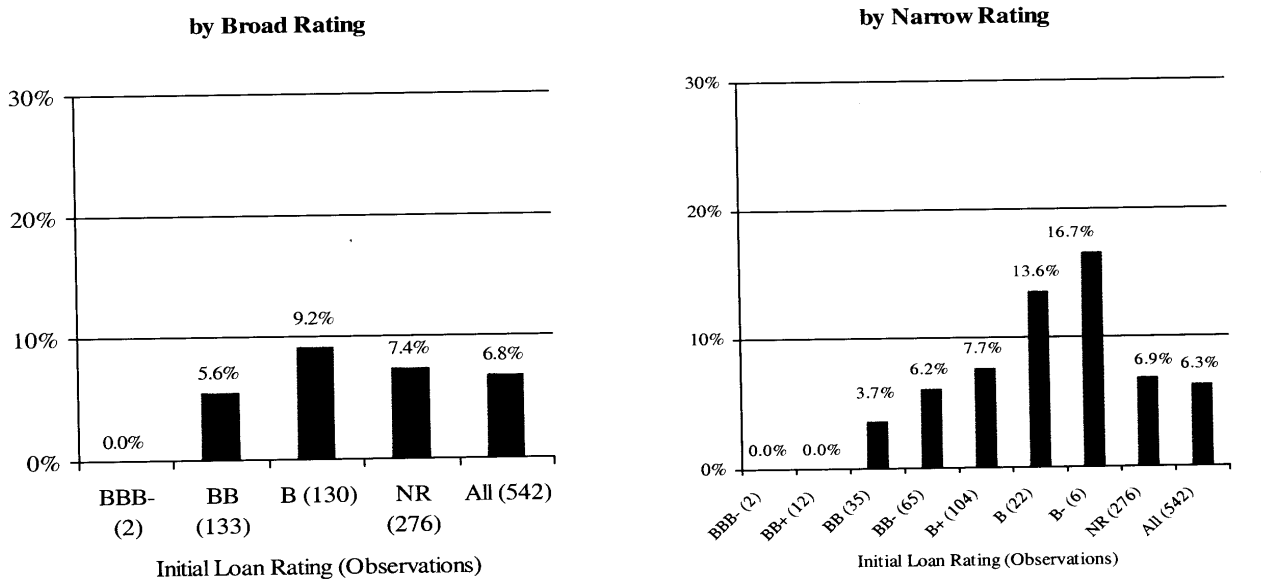
Range of Default Losses	Mid point	AAA to AA-	A+ to BBB-	BB+ to B-	Below B-	Total
0	0	11887	21998	12129	368	46382
0.01 - 0.10	0.05	0	0	14	4	18
0.11 - 0.20	0.15	0	3	12	9	24
0.21 - 0.30	0.25	0	1	20	12	33
0.31 - 0.40	0.35	0	1	27	11	39
0.41 - 0.50	0.45	0	1	26	11	38
0.51 - 0.60	0.55	0	3	36	9	48
0.61 - 0.70	0.65	0	1	38	18	57
0.71 - 0.80	0.75	0	5	31	14	50
0.81 - 0.90	0.85	0	1	21	7	29
0.91 - 0.94	0.92	0	0	18	1	19
0.95 - 0.98	0.96	0	0	2	4	6
0.99	0.99	0	1	0	0	1
1	1	0	0	0	0	0
Total Default		**0**	**17**	**245**	**100**	**362**
Total Non-Default		**11887**	**21998**	**12129**	**368**	**46382**
Total		**11887**	**22015**	**12374**	**468**	**46744**
Mean		**0.000%**	**0.043%**	**1.073%**	**10.942%**	**0.414%**
Median		**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**
St.Dev		**0.000%**	**1.691%**	**8.305%**	**23.923%**	**5.183%**
3.43192sigma-E(L)		**0.000%**	**5.761%**	**27.429%**	**71.159%**	**17.374%**
2.32634sigma-E(L)		**0.000%**	**3.892%**	**18.247%**	**44.711%**	**11.644%**
1.64485sigma-E(L)		**0.000%**	**2.739%**	**12.588%**	**28.407%**	**8.112%**
99.97%		**0.000%**	**0** **74.957%**	**6.6** **90.927%**	**3.7** **85.058%**	**0.1** **91.586%**	**14.0**
99.00%		**0.000%**	**0** **0.000%**	**220.2** **53.927%**	**123.7** **81.058%**	**4.7** **0.000%**	**467.4**
95.00%		**0.000%**	**0** **0.000%**	**1100.8** **0.000%**	**618.7** **64.058%**	**23.4** **0.000%**	**2337.2**

Sources: Standard & Poor's. NYU Salomon Center Default Data Base

Figure -1

Cumulative Institutional Loan Defaults Rate by Initial Loan Rating

Comprises Institutional Loans closed between 1995-1999 for Issuers that File Publicly



Source : Portfolio Management Data, Standard and Poor's Corporation, "Q3 00 Institutional Loan Default Review", December 11,2000

TABLE 5

HISTORICAL DEFAULT RATES - STRAIGHT BONDS ONLY

EXCLUDING DEFAULTED ISSUES FROM PAR VALUE OUTSTANDING

1971 - 2000 ($ MILLIONS)

YEAR	PAR VALUE OUTSTANDING (a)	PAR VALUE DEFAULTS	DEFAULT RATES
2000	$597,200	$30,248	5.065%
1999	$567,400	$23,532	4.147%
1998	$465,500	$7,464	1.603%
1997	$335,400	$4,200	1.252%
1996	$271,000	$3,336	1.231%
1995	$240,000	$4,551	1.896%
1994	$235,000	$3,418	1.454%
1993	$206,907	$2,287	1.105%
1992	$163,000	$5,545	3.402%
1991	$183,600	$18,862	10.273%
1990	$181,000	$18,354	10.140%
1989	$189,258	$8,110	4.285%
1988	$148,187	$3,944	2.662%
1987	$129,557	$7,486	5.778%
1986	$90,243	$3,156	3.497%
1985	$58,088	$992	1.708%
1984	$40,939	$344	0.840%
1983	$27,492	$301	1.095%
1982	$18,109	$577	3.186%
1981	$17,115	$27	0.158%
1980	$14,935	$224	1.500%
1979	$10,356	$20	0.193%
1978	$8,946	$119	1.330%
1977	$8,157	$381	4.671%
1976	$7,735	$30	0.388%
1975	$7,471	$204	2.731%
1974	$10,894	$123	1.129%
1973	$7,824	$49	0.626%
1972	$6,928	$193	2.786%
1971	$6,602	$82	1.242%

			Standard Deviation
ARITHMETIC AVERAGE DEFAULT RATE	1971 TO 2000	2.713%	2.484%
	1978 TO 2000	2.948%	2.683%
	1985 TO 2000	3.719%	2.829%
WEIGHTED AVERAGE DEFAULT RATE (b)	1971 TO 2000	3.482%	2.558%
	1978 TO 2000	3.503%	2.563%
	1985 TO 2000	3.582%	2.565%
MEDIAN ANNUAL DEFAULT RATE	1971 TO 2000	1.656%	

Notes

(a) As of mid-year.

(b) Weighted by par value of amount outstanding for each year.

Source: Authors' Compilation and Salomon Smith Barney Estimates

This table is part of a Special NYU Salomon Center Report on "Defaults and Returns in the High Yield Bond Market : Analysis Through 2000 and Default Outlook", January, 2001, by E. Altman and B. Karlin.