Special Comment

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Rating Transitions and Defaults Conditional on Watchlist, Outlook and Rating History

Summary

This report documents global corporate credit rating transition and default rates during the 1995-2003 period conditional on the *full* information in Moody's published credit opinions, which, in addition to the current credit rating, include prior rating actions and current rating outlooks and reviews. The primary findings of this study are:

- Moody's rating system management practices attempt to limit rating reversals and dampen rating change volatility and, as a consequence, different issuers carrying the same rating may have different risks of rating migration and default.
- As noted in Moody's prior research dating back to 1993, recently downgraded issuers have a greater likelihood of future rating downgrades and default than do recently upgraded issuers. For example, obligors downgraded in the past twelve months are eight times more likely to be downgraded than upgraded in the next year. Downgraded issuers are eleven times more likely to default over one year than upgraded issuers.
- Moody's rating outlooks and reviews are used to signal the likely direction and timing of future rating actions and the evolution of default risk. For example, at a one-year time horizon, issuers with negative outlooks are seven times more likely to be downgraded than upgraded; issuers with positive outlooks are nearly twice as likely to be upgraded as downgraded; and issuers with stable outlooks have the highest probability of no rating change. Default rates within a given rating category also vary systematically by outlook status. For example, obligors with positive outlooks are, on average, nine times less likely to default over one year than obligors with negative outlooks.
- Rating history and outlook status are each highly predictive of future rating changes, but rating history appears to have little additional impact on rating transitions once outlook status is controlled for. The likelihood of a rating transition over a given time horizon is nearly constant for a given rating and outlook, regardless of rating changes that occurred in the last year.
- Rating history and rating outlooks have independent effects on the conditional likelihood of default. At a one-year risk horizon, a credit rating downgrade signals a higher risk of default, holding outlook status constant. Over a longer holding period (three years), rating history has a weaker incremental impact on the probability of default.
- The historical performance of Moody's ratings as predictors of default is enhanced when measured on a conditional basis compared to an unconditional basis. Applying a one-notch adjustment to credit ratings for outlooks and a two-notch adjustment for rating reviews raised the historical 3-year-horizon accuracy ratio (AR) to 70.9%, compared to 64.9% on an unconditional basis. More aggressive adjustments would increased the AR only a small additional amount (0.3%) and may not be appropriate in other sample periods. Similarly, additional adjustments for rating history raised the historical accuracy ratio by only 0.2%.

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Introduction

Moody's credit ratings have been used as indicators of relative credit risk for nearly a century. For most of their history, credit ratings alone have been relied on to measure and rank the relative creditworthiness of debt issuers and obligations. Credit rating changes — upgrades and downgrades — have also long been the only means available to signal improving or deteriorating fundamental credit quality. Although Moody's has modified its rating scale from time-to-time to better serve issuers and investors,[1] a Moody's credit opinion has historically consisted solely of credit rating assignments and changes. Until recently, no formal mechanism existed to communicate perceived changes in credit quality that might ultimately be reflected in a rating change.

Rating outlooks and reviews (the Watchlist[2]) were developed to provide indications of the likely direction and timing of future credit rating changes. Since their introduction in the early 1990s, such rating signals have become important parts of the overall rating process. Rating outlooks and reviews help mitigate the mutual tension between the two objectives of the credit rating system, stability and accuracy. Moody's rating management practices seek to limit rating changes if there is a high likelihood that they might be reversed over a short period of time and to dampen rating change volatility by moving ratings in a gradual, even predictable, fashion in response to changes in fundamental credit quality.

One can interpret Moody's rating system as a natural consequence of a classic signal extraction problem: when an obligor's credit risk profile appears to have shifted, is the change permanent or transitory? In general, only fundamental credit quality changes that are believed to be permanent should result in a credit rating action. Rating outlooks can be viewed as an indication that a change in risk profile has been observed, but its permanence has not yet been established. When it is believed that a permanent change in risk has indeed occurred, the obligor may be placed on review for a rating change. When any remaining uncertainty is resolved, the rating is either changed or confirmed. Since, by design, rating outlooks anticipate credit rating actions, the distributions of credit rating changes and defaults at a future date conditional on rating outlooks is likely to differ significantly from the unconditional distributions for a given rating category. Hence, a complete Moody's credit opinion consists of both a credit rating and a rating outlook. The fact that credit rating changes are serially correlated (exhibit rating momentum) also raises the possibility that past rating actions may need to be included in the expanded definition of a complete Moody's credit opinion.

This report documents the historical rating transition and default rates of Moody's-rated debt issuers conditional on lagged rating actions, rating outlooks, and rating reviews. We primarily seek to answer three questions, each addressed in its own section of this special comment. First, we ask how different are rating transition and default rates conditional on rating history and outlook/Watchlist status, where each is considered in isolation? Second, does rating outlook/Watchlist status fully summarize transition and default risk within each rating category? Or does rating transition and default risk still depend in part on rating history once conditioned on outlooks and reviews? Finally, we investigate whether the information content of Moody's credit ratings is increased by recognizing the information contained in rating outlooks and reviews.[3]

Data & Methodology

Although Moody's ratings database contains credit histories as far back as 1919, rating reviews and outlooks have a much shorter history. Watchlist data is available beginning in 1991, when rating reviews became a formal part of the rating process. Rating outlooks came into extensive use in 1995. The data set we use in this study is the intersection of these three sets of data. As a result, the study spans the time period from January 1995 to September 2003. The object of study is the corporate bond issuer. Sovereign, sub-sovereign, and municipal issuers are excluded, as are structured finance transactions. Cohorts of issuers are formed at monthly intervals between January 1, 1995 and September 1, 2002. The year 1995 is the first year we use for conditioning (to derive lagged rating actions), resulting in seven available years with which to form and follow cohorts of issuers. In total, the data set includes 5,272 corporate obligors globally that had debt outstanding between 1995 and 2003 with rating outlook and/or Watchlist assignments, resulting in 231,666 overlapping firm-years.

1. *For example, Moody's introduced numerically modified ratings for ratings between Aa and B in 1982, and numerically modified Caa ratings in 1997.*
2. *The terms rating review and Watchlist are used interchangeably throughout this report.*
3. *In this study, we do not address the issue of whether factors external to Moody's credit ratings – such as the business cycle – might improve their accuracy. Nickell, Perraudin and Varotto (2000), Kim (1999), and Cantor and Mann (2003b) analyze the cyclical properties of rating transition rates.*

The credit ratings on which we base the result of this study are Moody's notional obligor-level ratings. These estimated senior unsecured ratings are typically based on either an issuer's outstanding senior unsecured obligations or its issuer rating. If an issuer does not have a senior unsecured debt rating or an issuer rating, an estimated senior unsecured rating is derived by inference from the issuer's other rated debt issues. The object of using estimated senior unsecured ratings is to facilitate a comparison of credit ratings across issuers that controls for differences attributable to seniority and security.[4]

Alphanumeric modifiers for the Caa rating category were introduced in June 1997. The 1995, 1996, and 1997 cohort years' rating change calculations are made using the Caa whole letter rating, while cohorts formed after June 1997 use the Caa1, Caa2, and Caa3 modified rating categories. For all cohort years, the Ca and C rating categories are grouped into one rating class labeled Ca-C. Rating downgrades associated with an event of default are placed into a separate, mutually exclusive default category.[5]

Rating Outlooks & Reviews

Moody's continually monitors the credit quality of the issuers it rates and when warranted, upgrades or downgrades an issuer's credit rating to reflect changes in its fundamental credit quality. Although ratings are the primary means by which Moody's expresses its opinion of an obligor's credit quality, rating outlooks and the Watchlist are supplemental tools to communicate potential changes in corporate credit quality. The assignment or changing of rating outlooks and placement on review are often precursors to actual credit rating changes.

A Moody's rating outlook is an opinion regarding the likely direction of an issuer's credit quality, and therefore its rating, over the medium term, usually with an average ex-ante horizon of 18 months. Rating outlooks take the values positive, negative, stable, and developing (contingent upon an event). So-called "developing outlooks" are an extreme minority of outlooks assigned (less than 0.4% of outlooks assigned between 1995 and 2003), and as they do not clearly signal a future rating direction, we did not use them as a basis for calculating conditional default and rating transition statistics. Prior to 2002, rating outlooks were assigned by the analyst monitoring the credit in consultation with her team managing director, or by a full rating committee. Rating outlooks are now assigned and changed only after a committee has convened. In this study, an issuer's current rating outlook terminates when a rating change takes place, when a rating is withdrawn, or when it is placed on the Watchlist.

Rating reviews are a subset of rating outlooks that are much stronger statements about the future direction a credit rating may take. When an obligor's credit quality has changed to the point that its rating may need to be revised upward or downward, it is placed on Moody's Watchlist as on review for possible upgrade, on review for possible downgrade, or review with direction uncertain. Unlike rating outlooks, rating reviews have always been decided by a full rating committee. As with developing outlooks, we omit the direction uncertain Watchlist category in this study since it does not provide a clear signal about a credit rating's future direction. Its exclusion does not impact the results contained herein, as uncertain rating reviews constitute less than 4% of all Watchlist assignments between 1995 and 2003. Rating reviews are concluded either by changing the issuer's credit rating or confirming its existing credit rating. Following the conclusion of a rating review, a new rating outlook may be assigned, or the issuer may again be placed on the Watchlist if another rating change is anticipated.[6]

Exhibit 1 presents the distribution of rating outlooks and reviews, as well as descriptive statistics for the duration of rating outlooks, measured in months.[7] Stable outlooks were the most commonly assigned category between 1995 and 2003, constituting over a third of all outlook assignments. Negative outlooks were nearly twice as prevalent as positive outlooks over this time period. Similarly, the deterioration in aggregate credit quality that occurred over the sample period also shows up in the Watchlist assignments, with reviews for downgrade outnumbering reviews for upgrade by over two to one.

The empirical duration statistics correspond closely to expectations: the mean duration of rating reviews (both positive and negative) is approximately three months, while rating outlooks are generally terminated between 12 and 18 months. Stable outlooks exhibit the longest expected duration, and positive outlooks appear to last somewhat longer on average than negative outlooks. The data also shows that there is considerable variation in outlook duration, as evidenced by relatively high standard deviations that, in some cases, exceed their means. Though not tabulated here, the authors found no significant differences in outlook and Watchlist duration by rating category.

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4. Moody's ratings are opinions about expected credit loss, which is composed of a default probability component and a default severity component. Default severity is an issue-specific characteristic that is primarily a function of priority in the capital structure. See Fons (2002).

5. In this context, defaults and rating withdrawals are not rating transitions; they represent the two ways in which a debt issuer can leave the Moody's-rated pool, and cannot be considered a category ordered below Ca-C.

6. Keenan, Fons, and Carty (1998) contains a detailed discussion on Moody's Watchlist assignment policies as well as detailed statistical characteristics of rating reviews.

7. The outlook duration statistics reported in Exhibit 1 are only for the set of outlooks that have been concluded, and are therefore biased estimates of outlook duration.

Exhibit 1

Outlook Duration Statistics (in Months), 1995–2003

Outlook	Mean	Median	Standard Deviation	% Sample
Watch Up	3.1	3.8	1.1	2.0%
Positive	11.7	15.2	12.9	13.5%
Stable	15.9	18.6	13.8	57.2%
Negative	8.7	12.1	11.4	21.9%
Watch Down	3.1	4.4	0.8	5.5%

The distribution of rating outlooks and rating reviews by whole letter rating category is shown in Exhibit 2. For both investment-grade and speculative-grade-rated issuers, 57% had stable outlooks on the cohort formation date. However, negative rating conditions represented a rather high proportion of outlooks and reviews by whole letter rating category. Negative conditions outnumber positive conditions by nearly two to one. Overall, the data set is representative of the global distribution of Moody's ratings, with investment-grade constituting 56% of the sample and speculative-grade 44% of the sample. Credit ratings in the middle of the ratings scale show the highest concentration of issuers, while ratings at the end-points of the credit rating scale — Aaa and Caa — show the lowest concentrations of issuers.[8]

Exhibit 2

Distribution of Outlooks by Whole Letter Rating Category, 1995–2003

	Watch Up	Positive	Stable	Negative	Watch Down	Total
Aaa	NA	NA	83.2%	10.6%	6.2%	1.6%
Aa	3.5%	12.8%	52.6%	22.7%	8.4%	10.1%
A	2.5%	12.8%	56.8%	20.5%	7.4%	21.6%
Baa	2.3%	12.5%	58.2%	21.1%	5.9%	22.3%
Ba	2.4%	17.5%	54.6%	19.9%	5.7%	15.1%
B	1.0%	15.3%	62.5%	18.0%	3.2%	23.5%
Caa	0.5%	9.4%	38.1%	47.3%	4.7%	5.8%
Investment-Grade	2.6%	12.3%	57.3%	20.9%	6.9%	55.6%
Speculative-Grade	1.2%	14.8%	57.1%	23.1%	3.7%	44.4%
All Rated	2.0%	13.5%	57.2%	21.9%	5.5%	100%

Conditional Credit Rating Transition Rates

An investigation of the conditional behavior of credit ratings naturally begins with rating changes themselves. Exhibit 10 in the appendix shows the one- and three-year unconditional, or historical, rating transition rates for our data set. While these familiar statistics are accurate representations of actual rating changes, the utility of the historical data as proxies for rating transition probabilities is limited. The reason is that, while most issuers' credit ratings are stable over short time horizons, many obligors within a given cohort have entered by migrating from rating categories above and below. Furthermore, moving a credit rating to a level that reflects its new, fundamental credit risk is often done incrementally rather than with a single, multi-notch rating change. These incremental rating changes are typically in the same direction. Unconditional rating transition rates can, therefore, be misleading measures of individual issuer transition probabilities.

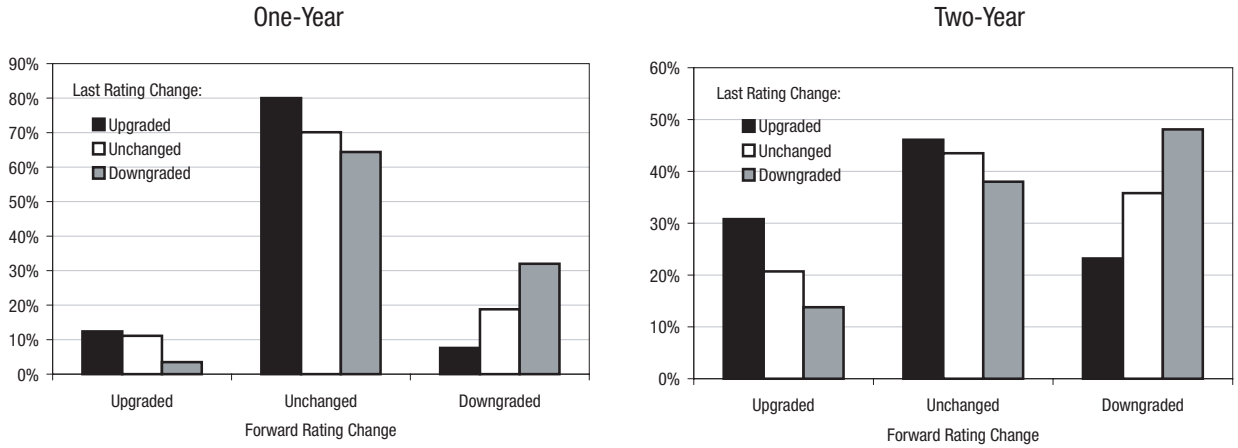
The serial dependence of credit ratings is well documented. Altman and Lao (1992), Carty and Fons (1993), Altman (1998), and Fons (2002), among others, report various empirical results that show that credit ratings exhibit significant path dependency. Exhibit 3 below shows weighted average one- and three-year rating transition frequencies conditional on the last rating action within the last twelve months for all rated issuers in our data set.[9] Both the one- and three-year transition rates corroborate previous findings: a rating change tends to be followed by another rating action in the same direction. The sample period we have available for study is one in which aggregate credit quality declined sharply, with an attendant increase in credit rating downgrades relative to upgrades. Despite this cyclical bias, the results show that past upgrades are more likely to result in future upgrades than downgrades.

8. *In considering the data presented in Exhibit 2, it is important to note that the distribution of outlooks and rating reviews during the sample period (1995-2003) may not be wholly indicative of the future distribution for two reasons. Firstly, Moody's has only recently standardized its procedures for assigning rating outlooks, ensuring that every issuer is now assigned a formal outlook. As a result, the aggregate ratio of outlooks to rating reviews is likely to be higher going forward. Secondly, the sample period includes the 2000-2002 time period, which witnessed perhaps the most adverse credit environment since the 1930s. As a result, the ratio of positive outlooks and reviews for upgrade to negative outlooks and reviews for downgrade is also likely to be higher in the future.*
9. *The chart does not include downgrades associated with an event of default. In this study, we treat rating downgrades and defaults as mutually exclusive states.*

However, the effects of rating history are not perfectly symmetric. At both a one-year and three-year time horizon, past rating downgrades are a stronger signal of another rating change in the same direction than are rating upgrades. Issuers upgraded within the last year are nearly twice as likely to be upgraded as to be downgraded in the next year. Downgraded issuers are nine times more likely to be downgraded than upgraded in the next year. Exhibit 11 in the appendix includes detailed rating transition statistics conditional on past rating actions within the last year, including results by rating category. Although the likelihood of a rating downgrade following a previous downgrade is nearly identical for investment-grade and speculative-grade rated issuers (32%), the tables show that the effect of past downgrades is relatively stronger for investment-grade-rated issuers than speculative-grade-rated issuers at both a one- and three-year transition horizon: investment-grade-rated issuers are 18 times more likely to be downgraded than upgraded within one year, compared to six times for speculative-grade-rated issuers.

Exhibit 3

One- & Three-Year Rating Transition Rates Conditional on Last Rating Change within 12 Months, 1996-2003



The results shown in Exhibits 3 and 11 also highlight the stability of conditional rating transitions. Most issuers retained the rating with which they began the year, regardless of the last rating action. In the aggregate, approximately 70% of obligors' ratings were unchanged over a year on average, which is identical to the unconditional mean. At both the one- and three-year horizon, issuers that were upgraded show the highest level of rating stability, with 80% of issuers retaining their beginning-of-period rating at the one-year horizon and 46% at the three-year horizon. This result, too, is relatively stronger for investment-grade-rated issuers than speculative-grade-rated issuers. The likelihood of no rating change following a credit rating upgrade for investment-grade-rated issuers is 13% higher over one year and 21% higher over three years than for speculative-grade-rated issuers. It is worth noting that, although Exhibit 3 might appear to suggest that the rating momentum effect is stronger for credit rating downgrades than for upgrades, the empirical pattern may reflect the fact that the three of the seven years in our sample time period experienced tremendous corporate credit distress and relatively few upgrades.

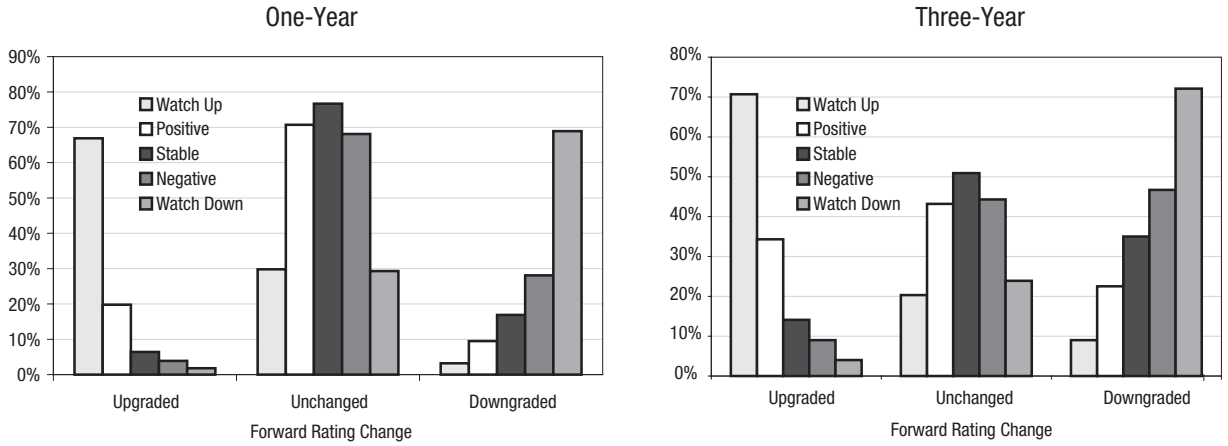
Rating outlooks and reviews are designed to anticipate and signal future rating changes. Exhibit 4, which shows rating transition rates conditional on outlooks for all rated issuers in our sample, demonstrates that outlooks are indeed systematically associated with future rating actions, at both one- and three-year investment horizons. Obligors with positive rating conditions (reviews for upgrade and positive outlooks) were much more likely to experience a future credit rating upgrade than downgrade. The converse also holds true: reviews for downgrade and negative outlooks were highly correlated with subsequent events of credit rating downgrade. A corollary result is that outlooks have a very low incidence of "false positives," signaling a rating change in the opposite direction.

Issuers with positive rating outlooks were, on average, nearly twice as likely to be upgraded as to be downgraded at the one-year horizon. Although the effect weakens somewhat at the three-year transition horizon, issuers with positive outlooks continue to show a higher likelihood of upgrade than downgrade. Negative rating outlooks resulted in downgrades seven times more often than rating upgrades. At the three year horizon, negative outlooks continued to indicate a likelihood of downgrade five times that of an upgrade. Exhibit 12 in the appendix provides rating transition rates conditional on rating outlooks and reviews by whole letter rating. The table shows that, as signals of future rating changes, outlooks were relatively more powerful for investment-grade-rated issuers than speculative-grade-rated issuers. For example, investment-grade-rated issuers were ten times more likely to be downgraded than upgraded, compared to five times for speculative-grade-rated issuers at the one-year horizon.

The strongest association is, not surprisingly, between Watchlist assignments and rating changes. For all rated obligors, issuers on review for upgrade were nearly 22 times more likely, on average, to be upgraded as to be downgraded, while those on review for downgrade were 35 times more likely to be downgraded as to be upgraded. Over a three-year holding period, Watchlist assignments continue to exhibit a strong association with rating changes, particularly for reviews for downgrade.

Exhibit 4

One- & Three-Year Rating Transition Rates Conditional on Outlooks, 1996-2003



Exhibits 4 and 12 also show that issuers with stable outlooks exhibit the highest level of rating stability at both a one- and three-year risk horizon. On average 77% of all rated issuers with stable outlooks ended the one-year transition period with the same rating with which they began it; that percentage is 51% over three years. Although this result generally holds across all rating categories, as Exhibit 12 shows, it is especially strong for investment-grade-rated issuers. Over short transition periods (one year), rating upgrades within the last twelve months result in higher future rating stability; however, over a three-year risk horizon stable, outlooks show a higher association with future no rating change than do past rating upgrades.

Conditional Default Rates

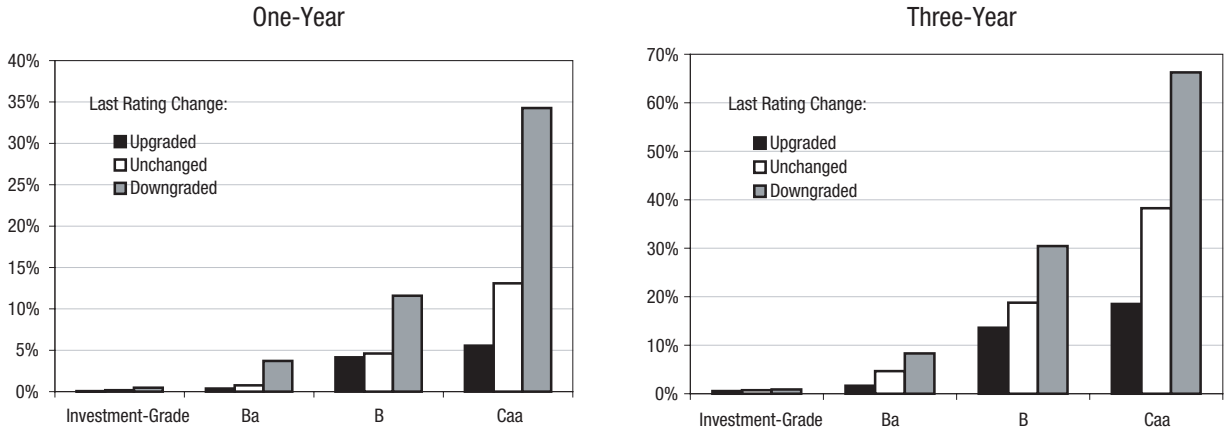
The conditional rating transition statistics presented above reveal that there is significant within-rating heterogeneity: conditioning on lagged rating actions and outlooks readily differentiates the likelihood of a rating change within a given rating category. Because there is a wide range of unconditional default rates consistent with a particular rating category, we should also expect lagged rating actions and outlooks to affect the probability of default within a rating category. As with rating transitions, unconditional default rates (which are presented in Exhibit 15 and 16 in the appendix) are incomplete estimates of default probabilities due to issuers entering a rating category cohort through upgrades and downgrades. By conditioning on rating history and outlooks, we can provide even more effective differentiation.

All else equal, debt issuers that have been downgraded show a notably higher risk of default; similarly, debt issuers that have experienced a credit rating upgrade in the last year default at significantly lower rates. Exhibit 5 demonstrates this finding. The graphs show weighted average default rates for one- and three-year risk horizons, conditional on lagged rating actions by whole letter rating category. The charts show that, holding past rating change constant, default rates increase monotonically by whole letter rating category. Overall, obligors that were downgraded were nearly 11 times more likely to default than those that were upgraded at a one-year horizon and almost seven times more likely at the three-year horizon.

In addition, for a given rating category, default rates increase monotonically from lagged upgrade to lagged downgrade. Detailed unconditional default rate data for whole letter rating categories in contained in Exhibit 16 in the appendix. Exhibit 18 in the appendix presents weighted average one- and three-year default rates by alphanumeric rating. Although not perfectly monotonic, default rates clearly increase across both dimensions (rating category and lagged rating change) at the alphanumeric rating level. Comparing Exhibit 15 with Exhibit 17, we find that average default rates for issuers whose ratings were unchanged in the prior twelve months are quite close to the unconditional default rates.

Exhibit 5

One- & Three-Year Default Rates by Whole Letter Rating Conditional on Last Rating Change within 12 Months, 1996-2003



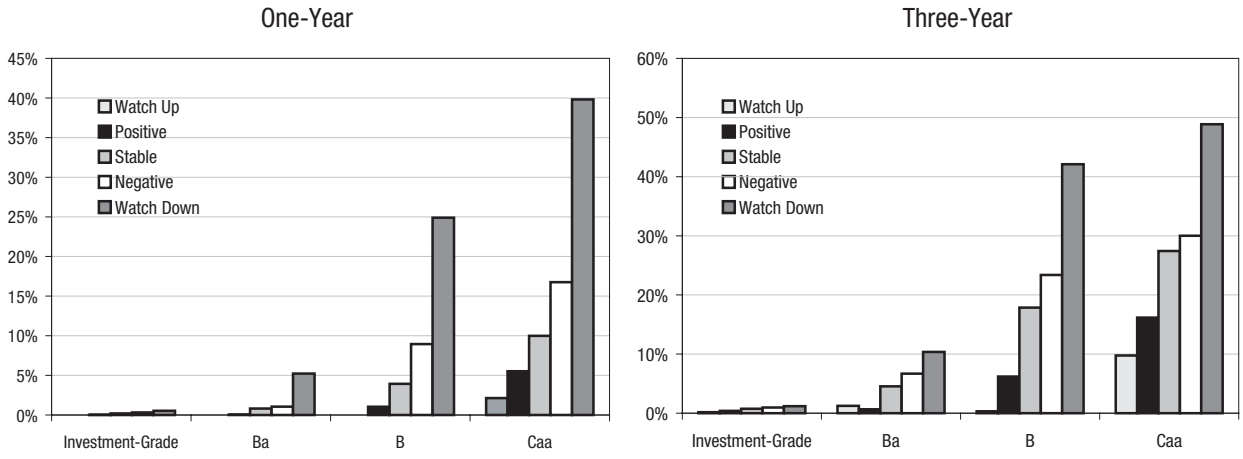
The previous section showed that rating outlooks are predictive of rating changes in both the short and long run. Consequently, outlooks should also be expected to differentiate default risk within a rating category. Exhibits 19 and 20 in the appendix present detailed weighted average one- and three-year default rates for whole letter and alphanumeric rating categories conditional on the outlook held on the cohort formation date. The tables show that default rates are strongly associated with outlooks and rating reviews, generally increasing from positive to negative conditions by rating category.

For all rated issuers, those that had a negative outlook were nearly nine times more likely to default within one year than issuers that had positive outlooks. At the three-year horizon all rated obligors with negative outlooks had default frequencies that were nearly four times those with positive outlooks. The likelihood of default is even larger when rating reviews are considered. The average historical conditional probability of default for obligors on review for downgrade is 6% at the one year horizon compared to 0.03% for issuers on review for upgrade. The relative magnitude diminishes at the three year horizon, but is no less dramatic: issuers on watch for downgrade are 18 times more likely to default than issuers on watch for upgrade at the three year risk horizon.

Exhibit 6 shows the average one- and three-year default rates by rating category conditional on aggregated outlooks. Visually, the differences in default rates are obvious: obligors with negative rating conditions (on Watch for downgrade and negative outlooks) exhibit substantially higher default rates than those that have stable or positive conditions (on Watch for upgrade and positive outlooks). The differences persist at the three-year risk horizon.

Exhibit 6

One- and Three-Year Average Default Rates Conditional on Outlooks and Rating Reviews, 1996-2003



Joint Effects of Rating Actions & Outlooks

The two preceding sections presented rating transition and default rate statistics that showed the effects of prior rating history and outlook status in isolation from one another. That is, each section examined the impact of past rating actions and outlooks without considering the simultaneous, joint effect of these conditions. One might surmise that issuers for whom a rating action, say a rating downgrade, was followed by a negative outlook or review would exhibit higher downgrade and default probabilities than those who were downgraded but had a stable outlook following the rating change. We document these bivariate conditions in this section. In particular, we are interested in answering the following questions: when we consider the bivariate effects of lagged rating changes and outlooks on future rating actions and defaults, does one type of condition tend to dominate the other? Do rating changes continue to exhibit serial correlation once outlooks have been taken into consideration? Essentially, are rating outlooks sufficient statistics of rating transition probabilities?

Exhibits 13 and 14 in the appendix show the one- and three-year weighted average bivariate rating transition rates by whole letter rating category.[10] The table conditions on the simultaneous effect of credit rating, rating outlook, and lagged rating change. The tables reveal an important finding: when past rating actions and outlooks disagree in direction, rating outlooks dominate, indicating that the serial correlation of rating changes is substantially weakened or eliminated once outlook direction is controlled for.[11] For a given outlook condition, the forward rating transition rates given the last rating change are roughly constant.

As an example, consider the results for all rated corporate issuers at the three-year time horizon, reproduced from Exhibit 14 as Exhibit 7 below. Each column of the table shows that, for any given past rating change, credit rating upgrade rates increase with positive conditions, and that credit rating downgrade rates also increase with negative conditions, as the arrows in the table demonstrate. That the effect of serial correlation in rating changes is substantially weakened or eliminated is illustrated by the nearly constant intensity of rating transition conditional on rating outlook.

For example, obligors that had positive outlooks had a 41% likelihood of another upgrade over the next three years given a credit rating upgrade or no rating change in the last year, and a 48% likelihood of another upgrade given a credit rating in the last year. The shaded cells in Exhibit 7 highlight the near-irrelevance of rating history for positive outlooks. Similarly, given a rating upgrade or no rating change within the last twelve months, obligors with negative rating outlooks experienced a 55% likelihood of another rating downgrade over the next three years; the three-year likelihood of a downgrade conditional on a downgrade within the last year is 48%. The heavy boxed cells in Exhibit 7 highlight the near-irrelevance of rating history for negative outlooks. This result generalizes to rating reviews and to other points in the rating scale.

Exhibit 7

Three-Year Rating Transition Rates Conditional on Outlooks & Rating Change within Last 12 Months, All Rated Issuers, 1996-2003

	Upgraded Prior Year			Unchanged Prior Year			Downgraded Prior Year		
Outlook	Upgraded	Unchanged	Downgraded	Upgraded	Unchanged	Downgraded	Upgraded	Unchanged	Downgraded
Watch Up	58.1	35.2	6.7	58.2	34.2	7.6	85.2	6.6	8.2
Positive	40.5	44.8	14.7	40.6	44.7	14.7	48.2	29.2	22.6
Stable	23.4	50	26.7	23.8	48.9	27.3	13.4	48.3	38.3
Negative	15	30.5	54.5	14.8	29.7	55.4	10.6	41.9	47.5
Watch Down	4.4	30.8	64.8	4.8	27.6	67.6	5.7	26.5	67.8

Exhibit 21 in the appendix presents one- and three-year default rates by whole letter rating conditioned jointly on outlooks and last rating action within the last 12 months. At both time horizons, default rates for a given lagged rating change generally increase monotonically from negative outlooks to positive outlooks, highlighting the effectiveness of outlooks as signals of default risk even after rating history has been controlled for. However, the data in Exhibit 21 appears to indicate that rating history continues to have an effect on the probability of default even after outlooks are held constant. If the influence of rating history were effectively eliminated by rating outlooks and reviews, the likelihood of default would be nearly constant down any column for a given credit rating. At the one-year risk horizon, a credit rating downgrade signals a higher risk of default, even after holding outlook status constant. For example, the

10. *The rating transition rate estimates for the cases where outlook and lagged rating action disagree are, in many cases, based on small numbers of observations. For example, the one-year downgrade rate for A-rated issuers downgraded in the prior year and on Watch for upgrade (100%) is based on just one data point for one issuer.*
11. *The authors tested the statistical significance of these results with ordered probit regressions modeling the probability of a rating change. Although the standard errors of the estimated coefficients are biased downward, the regression results strongly rejected the significance of past rating upgrades and downgrades (with p-values near zero) across all rating levels.*

risk of default for issuers with negative outlooks that were downgraded within the last year is nearly four times higher than those whose ratings were unchanged over the last 12 months.

Over a longer holding period (three years), however, rating history appears to have a weaker incremental impact on the probability of default. Exhibit 8, reproduced from the three-year default rates table in Exhibit 21, highlights this finding. Exhibit 8 shows bivariate three-year default rates for B-rated issuers. Reading across the columns of the table, the data confirms the power of outlooks as signals of default risk, even after controlling for rating history. For a given past rating action, default rates exhibit a strong and monotonic increase moving from positive to negative outlook conditions. That rating history has a weaker influence on three-year default rates after controlling for outlook status is understood by reading down the rows of each column. For example, reading down the positive outlook column, we see that rating history does have an effect on the default rate after controlling for outlook status, but it is a weak one indeed. The empirical conditional default rate for obligors with positive outlooks is centered near 6%. The difference attributable to rating history for obligors with positive outlooks is only about 0.6%. Looking beyond the results for B-rated issuers, Exhibits 8 and 21 show that, with a few exceptions, this pattern is general. Hence, while we cannot completely dismiss rating history's impact on the historical probability of default, its influence is substantially controlled for by rating outlooks.[12]

Exhibit 8

Three-Year Default Rates for B-Rated Issuers Conditional on Outlooks & Rating Change within Last 12 Months, 1996-2003

Prior Year Change	Watch Up	Positive	Stable	Negative	Watch Down
Upgraded	0.0	5.6	12.7	24.7	44.0
Unchanged	1.0	6.2	17.5	20.0	45.2
Downgraded	0.0	6.8	21.3	26.2	48.0

Weakly increasing default rates

Strongly increasing default rates

On balance, the combined impact of rating history and outlook on the probability of default is not easily disentangled. The aggregate default rates presented in Exhibit 21 suggest that rating history might matter, while the default rates for speculative-grade shown in Exhibit 8 appear to demonstrate that the effect exists, but is weak. While we can conclude with some certainty that outlooks are a sufficient statistic for the probability of a credit rating change, a quantitative approach that can account for the marginal effect of rating history and outlook on the probability of default is required. The next section takes up this task, in the context of measuring the conditional accuracy of Moody's credit ratings.

Conditional Credit Rating Accuracy

Several methods for evaluating and comparing the accuracy of credit rating systems are in use today.[13] The method we use in this report is the accuracy ratio (AR). The accuracy ratio is a measure of a credit rating system's relative ability to discriminate between defaulters and non-defaulters over a specified investment horizon. Rating systems that assign their lowest credit ratings to defaulters and their highest credit ratings to non-defaulters will have relatively higher AR statistics. Like a correlation statistic, the values of an AR lie between negative one and positive one, where one represents a "perfect" relative ordering of credit risk; i.e., all defaulters in the population received the lowest credit rating, while all non-defaulters received the highest.[14]

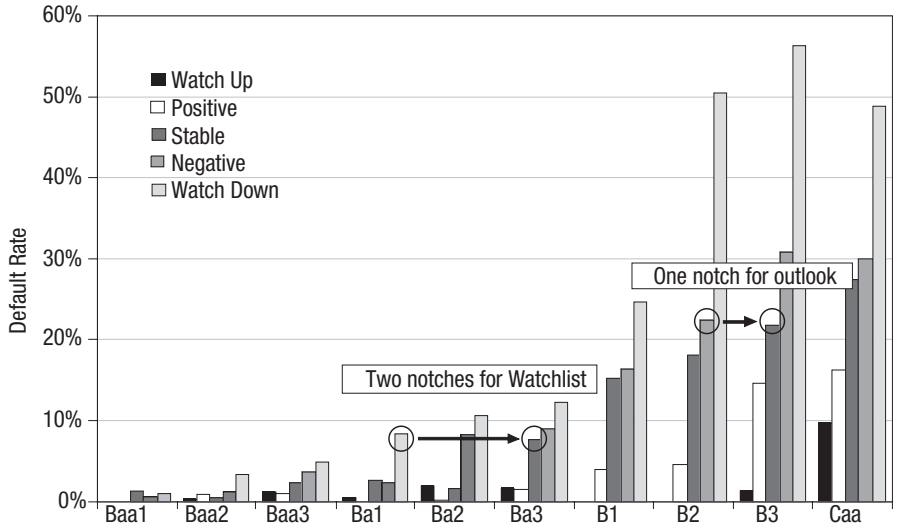
Unconditionally, Moody's credit ratings demonstrate a high degree of accuracy in terms of their ability to rank relative default risk. For the data set used in this study, the average accuracy ratio across all cohorts is 64.8% at the three-year time horizon.[15] In light of our findings in the previous sections that there are wide differences in expected default rates within a rating category when conditioned on rating histories and outlooks, we pose the following question. Is there another ordering of credit ratings — adjusting for outlook, rating review and, possibly, rating history — that results in a higher accuracy ratio? Equivalently, what adjustments to an obligor's unconditional credit rating are necessary in order to align its expected probability of default with its stable-outlook probability of default given its rating history and outlook?

12. *The authors also tested the statistical significance of rating history and outlook status in probit regressions modeling the probability of default. The regression results generally failed to decisively reject the influence of past rating actions.*
13. *See, for example, Sobehart, Keenan, and Stein (2000) and Cantor and Mann (2003a) for a description of several methods.*
14. *The brief description above closely follows Cantor and Mann (2003a). For a detailed description of the AR metric, please refer to their paper.*
15. *The accuracy of Moody's ratings during the 1996-2003 sample period was lower on average than its long-term average accuracy and its more recent performance. For detailed comparisons, see Cantor and Mann (2003c).*

The procedure entails a grid search of various rating notch adjustments for outlook, Watchlist status, and rating action in the past twelve months. The three-year accuracy ratio associated with each of these notching schemes is recorded and compared. Intuitively, the results of the previous sections suggest that, in order to equalize default risk, issuers who experienced past downgrades and negative rating conditions should have their ratings adjusted downward, while issuers that were upgraded or have positive outlooks should be notched up. Exhibit 9 illustrates this procedure heuristically. For example, the credit ratings of Ba1-rated issuers that were on review for downgrade should be adjusted down by two notches to Ba3. Similarly, the credit ratings of B2-rated issuers with negative outlooks need to be adjusted down by one notch in order to equate their conditional probability of default with their steady-state probability of default. In our grid search we allowed for rating notch adjustments based on rating history as well as outlooks and reviews. We confined our attention to adjustments that were independent of rating levels (i.e., Aaa, Aa, Baa, Ba, B, and Caa issuers were all adjusted equally) because the sample size is not large enough to meaningfully measure the effects of different adjustments at different rating levels.

Exhibit 9

Three-Year Default Rate Mapping Procedure, Adjusting for Rating Outlook



The grid search generated several plausible mapping schemes that increased the accuracy ratio of the rating system. Different sets of ex-ante restrictions on the grid search naturally result in different optimal notching rules. However, the most powerful mappings (i.e., those that maximize the AR) generally shared the following features:

- Adjustments should be symmetric for positive and negative conditions.
- Adjustments should be greater for rating reviews than for outlooks:
  - Ratings of issuers on review for downgrade (upgrade) should be adjusted downward (upward) by two or three notches
  - Ratings of issuers with a negative (positive) outlook should be adjusted downward (upward) by one or two notches.
- Adjustments for prior rating history may not be necessary, although the accuracy ratio was increased slightly by lowering (raising) the ratings of issuers that experienced a downgrade (upgrade) in the past year by one notch.

As mentioned above, the average unconditional accuracy ratio across all cohorts is 64.8% at the three-year time horizon. Adjusting credit ratings on review for upgrade or downgrade by two notches and adjusting ratings for outlook status by plus (for positive outlook) or minus (for negative outlook) one rating notch raised the average accuracy ratio to 70.9%. Adjusting more aggressively — three notches for reviews and two notches for outlooks — increased the accuracy ratio to 71.2%; adding a one-notch adjustment for rating history increased the accuracy ratio to 71.4%.

These statistics suggest that most of the improvement in accuracy is achieved by adjusting ratings on review by two notches and ratings without stable outlooks by one notch, with no adjustment for rating history. While it is tempting to emphasize the more aggressive rating adjustments based on their higher accuracy ratio, it is uncertain whether this specific set of adjustments would continue to optimize the AR over a longer time period that includes credit cycle expansions as well as contractions. As we noted earlier in this report, the sample period we have available to study was one of acute credit stress, one that coincided almost precisely with the peak and trough of historically severe credit

cycle. The same caveat applies to including the one-notch adjustments for rating history. The marginal gain in accuracy by adjusting for rating actions within the last year — 0.2% — may not be justified over other sample periods. Ultimately, it is an empirical question that only more data will allow us to answer.

These adjustments have powerful impacts on the measured accuracy of Moody's ratings. The difference between the unconditional AR and the AR-based on these proposed rating adjustments (two notches for Watchlist and one notch for outlook) is economically significant, more than enough to close the accuracy gap in many cases between credit ratings and market-based credit risk measures. For example, as reported in Cantor and Mann (2003a), on a matched sample, ratings implied from bond spreads were more accurate than Moody's unconditional bond ratings by 1.6 percentage points. The mappings described above increased Moody's measured accuracy from between 6.1 to 6.8 percentage points.

Conclusion

The statistical results reported in this study demonstrate that past credit rating actions and current rating outlooks are systematically related to the future probability of a rating change or default. Corroborating the findings of previous Moody's and academic research, we found that credit ratings exhibit positive serial correlation. However, serial correlation in credit rating changes largely disappears when rating changes are conditioned on outlooks and rating reviews, suggesting that the rating outlook is a sufficient statistic of rating transition probability. Rating reviews and outlooks are strong signals of rating change in the same direction. The results are somewhat less definitive for the probability of default. Rating outlooks are positively related to the risk of default over short and long time horizons, but rating history may also matter. Past downgrades do, in some rating categories, increase the likelihood of default although these effects appear to be insufficiently strong to raise the conditional accuracy of the rating system. When the risk of default is measured using longer-horizon benchmark (the three-year accuracy ratio), however, outlook/review status appears to be a sufficient measure of conditional credit risk, and there appears to be no imperative need to also track an obligor's past rating history.

The interpretation of these empirical findings is that a large degree of the within-rating heterogeneity – which biases unconditional estimates of the probability of a rating change and default – can be controlled for by conditioning on rating outlooks and reviews. Consequently, a credit rating alone does not completely summarize an obligor's credit quality. A complete Moody's credit opinion consists of both an issuer's current credit rating and its current rating outlook or review status. The results are somewhat ambiguous as to whether it is necessary to also consider an issuer's rating history. As we demonstrated above, the ability of Moody's credit ratings to differentiate between defaulters and non-defaulters increases by conditioning on these signals. Although the time period available for study is relatively brief, and coincides nearly perfectly with the peak and trough of a particularly severe credit cycle, the results of this study convincingly demonstrate that conditioning on outlook and Watchlist designations significantly increases the information content of Moody's credit rating system.

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Related Research

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Moody's Rating Migration and Credit Quality Correlation, 1920-1996, July 1999 (# 25097)

Understanding Moody's Corporate Bond Ratings And Rating Process, May 2002 (# 74982)

Default & Recovery Rates of Corporate Bond Issuers, February 2003 (# 77471)

An Historical Analysis of Moody's Watchlist, October 1998 (# 38755)

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Appendix: Statistical Tables of Rating Transition & Default

Rating Transition Rates

Exhibit 10

One- & Three-Year Unconditional (Historical) Rating Transition Rates by Whole Letter Rating, 1996–2003

	One-Year Change		
Rating	Upgraded	Unchanged	Downgraded
Aaa	NA	86.2	13.8
Aa	8.1	74.8	17.1
A	8.6	73.9	17.5
Baa	10.9	72.7	16.4
Ba	16.9	61.2	21.9
B	12.2	64.6	23.3
Caa	13.5	66.1	20.4
Investment-Grade	9.1	73.9	17.0
Speculative-Grade	14.2	63.4	22.4
All Rated	11.0	70.1	18.9

	Three-Year Change		
Rating	Upgraded	Unchanged	Downgraded
Aaa	NA	77.3	22.7
Aa	17.3	45.9	36.8
A	17.1	46.9	36.0
Baa	20.4	46.5	33.1
Ba	28.6	32.2	39.2
B	24.1	37.4	38.5
Caa	29.7	40.4	29.9
Investment-Grade	18.0	47.3	34.8
Speculative-Grade	26.5	35.4	38.1
All Rated	20.7	43.5	35.9

Exhibit 11

One- & Three-Year Rating Transition Rates Conditional on Last Rating Change within 12 Months, 1996–2003

		One-Year Change		
Rating	Prior Year Change	Upgraded	Unchanged	Down-graded
Aaa	Upgraded	NA	86.7	13.3
	Unchanged	NA	86.2	13.8
	Downgraded	NA	NA	NA
Aa	Upgraded	5.4	91.5	3.1
	Unchanged	8.2	74.5	17.3
	Downgraded	0.4	80.5	19.1
A	Upgraded	9.2	85.0	5.8
	Unchanged	8.7	73.9	17.4
	Downgraded	1.9	66.5	31.6
Baa	Upgraded	13.1	80.1	6.8
	Unchanged	11.1	72.8	16.1
	Downgraded	2.1	63.1	34.9
Ba	Upgraded	17.4	70.1	12.5
	Unchanged	17.2	61.1	21.6
	Downgraded	4.4	56.3	39.3
B	Upgraded	15.7	75.9	8.3
	Unchanged	12.3	64.4	23.3
	Downgraded	5.6	66.6	27.8
Caa	Upgraded	29.4	58.8	11.8
	Unchanged	13.9	66.4	19.7
	Downgraded	5.5	62.2	32.3
Investment-Grade	Upgraded	9.5	84.8	5.6
	Unchanged	9.3	73.9	16.9
	Downgraded	1.8	66.5	31.7
Speculative-Grade	Upgraded	17.5	71.5	11.0
	Unchanged	14.4	63.3	22.3
	Downgraded	5.2	62.5	32.4
All Rated	Upgraded	12.4	80.0	7.6
	Unchanged	11.1	70.1	18.8
	Downgraded	3.5	64.4	32.0

		Three-Year Change		
Rating	Prior Year Change	Upgraded	Unchanged	Down-graded
Aaa	Upgraded	NA	82.8	17.2
	Unchanged	NA	77.2	22.8
	Downgraded	NA	NA	NA
Aa	Upgraded	25.1	55.9	19.0
	Unchanged	17.3	45.7	37.0
	Downgraded	5.0	49.4	45.6
A	Upgraded	25.2	55.8	19.0
	Unchanged	17.1	47.0	35.9
	Downgraded	8.7	38.7	52.7
Baa	Upgraded	31.2	47.2	21.6
	Unchanged	20.5	46.7	32.8
	Downgraded	10.2	38.5	51.3
Ba	Upgraded	37.6	31.0	31.4
	Unchanged	28.7	32.3	39.0
	Downgraded	18.0	29.8	52.2
B	Upgraded	38.7	33.6	27.7
	Unchanged	24.1	37.4	38.5
	Downgraded	19.6	39.4	41.0
Caa	Upgraded	51.7	31.0	17.2
	Unchanged	29.8	40.5	29.7
	Downgraded	25.1	39.8	35.1
Investment-Grade	Upgraded	26.8	53.3	19.9
	Unchanged	18.0	47.3	34.7
	Downgraded	9.0	39.9	51.2
Speculative-Grade	Upgraded	38.5	31.9	29.6
	Unchanged	26.6	35.4	38.0
	Downgraded	19.8	35.8	44.4
All Rated	Upgraded	30.8	46.1	23.2
	Unchanged	20.7	43.5	35.8
	Downgraded	13.8	38.0	48.1

Exhibit 12

One- & Three-Year Rating Transition Rates Conditional on Outlooks, 1996–2003

		One-Year Change					Three-Year Change		
Rating	**Outlook**	**Upgraded**	**Unchanged**	**Down-graded**	**Rating**	**Outlook**	**Upgraded**	**Unchanged**	**Down-graded**
Aaa	Watch Up	NA	NA	NA	Aaa	Watch Up	NA	NA	NA
	Positive	NA	NA	NA		Positive	NA	NA	NA
	Stable	NA	98.6	1.4		Stable	NA	95.2	4.8
	Negative	NA	56.2	43.8		Negative	NA	37.0	63.1
	Watch Down	NA	16.7	83.3		Watch Down	NA	14.2	85.8
Aa	Watch Up	61.8	37.7	0.5	Aa	Watch Up	67.6	22.9	9.5
	Positive	19.2	76.7	4.1		Positive	37.8	49.6	12.6
	Stable	4.7	84.8	10.6		Stable	11.9	58.2	29.9
	Negative	1.6	73.9	24.5		Negative	6.1	46.0	47.9
	Watch Down	0.4	26.0	73.5		Watch Down	1.5	21.2	77.3
A	Watch Up	62.7	35.3	2.0	A	Watch Up	68.3	24.4	7.4
	Positive	18.4	78.5	3.1		Positive	32.8	57.9	9.3
	Stable	3.8	82.3	13.9		Stable	10.3	54.4	35.2
	Negative	2.7	72.6	24.7		Negative	5.8	51.5	42.6
	Watch Down	1.1	33.9	65.0		Watch Down	2.9	27.7	69.4
Baa	Watch Up	69.6	27.4	3.1	Baa	Watch Up	71.0	21.4	7.6
	Positive	18.3	72.8	8.9		Positive	33.7	40.7	25.6
	Stable	5.6	83.8	10.6		Stable	13.4	60.2	26.4
	Negative	2.6	74.5	22.9		Negative	7.6	49.8	42.6
	Watch Down	1.5	31.8	66.6		Watch Down	3.8	25.8	70.4
Ba	Watch Up	75.0	19.5	5.5	Ba	Watch Up	77.1	12.2	10.7
	Positive	22.9	67.4	9.7		Positive	36.0	41.3	22.8
	Stable	11.4	67.2	21.4		Stable	21.2	36.3	42.5
	Negative	6.0	64.9	29.1		Negative	10.4	36.4	53.2
	Watch Down	4.9	25.7	69.4		Watch Down	9.0	16.6	74.5
B	Watch Up	67.6	25.6	6.8	B	Watch Up	70.9	14.1	15.0
	Positive	18.9	65.4	15.7		Positive	32.9	33.2	33.9
	Stable	7.7	68.0	24.3		Stable	16.3	40.6	43.1
	Negative	4.4	57.7	37.9		Negative	10.8	32.6	56.6
	Watch Down	2.1	27.1	70.9		Watch Down	5.5	25.1	69.4
Caa	Watch Up	74.5	10.6	14.9	Caa	Watch Up	93.9	0.0	6.1
	Positive	24.4	55.3	20.3		Positive	35.8	18.2	46.0
	Stable	6.6	65.5	27.9		Stable	16.5	39.1	44.5
	Negative	6.9	66.4	26.7		Negative	20.2	46.4	33.4
	Watch Down	4.7	19.2	76.1		Watch Down	8.5	18.2	73.3
Investment-	Watch Up	65.0	33.0	2.0	Investment-	Watch Up	69.1	22.9	8.0
Grade	Positive	18.5	75.8	5.7	Grade	Positive	34.1	49.5	16.4
	Stable	4.5	83.9	11.5		Stable	11.4	59.1	29.6
	Negative	2.4	73.4	24.2		Negative	6.5	49.5	44.0
	Watch Down	1.1	31.0	68.0		Watch Down	2.8	25.2	72.0
Speculative-	Watch Up	72.1	21.4	6.5	Speculative-	Watch Up	75.7	12.3	12.0
Grade	Positive	21.1	65.5	13.5	Grade	Positive	34.5	36.1	29.4
	Stable	8.8	67.5	23.7		Stable	18.1	39.0	43.0
	Negative	5.5	62.0	32.5		Negative	12.7	36.8	50.5
	Watch Down	3.7	25.2	71.1		Watch Down	7.6	20.0	72.4
All Rated	Watch Up	66.9	29.8	3.2	All Rated	Watch Up	70.7	20.3	9.0
	Positive	19.8	70.7	9.5		Positive	34.3	43.2	22.5
	Stable	6.4	76.7	16.9		Stable	14.1	50.9	35.0
	Negative	3.9	68.1	28.1		Negative	9.0	44.3	46.7
	Watch Down	1.8	29.3	68.9		Watch Down	4.0	23.9	72.1

Exhibit 13

One-Year Rating Transition Rates Conditional on Outlooks & Last Rating Change within 12 Months, 1996-2003

		Upgraded Prior Year			Unchanged Prior Year			Downgraded Prior Year		
Rating	**Outlook**	**Upgraded**	**Unchanged**	**Downgraded**	**Upgraded**	**Unchanged**	**Downgraded**	**Upgraded**	**Unchanged**	**Downgraded**
Aaa	Watch Up	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Positive	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Stable	0.0	92.9	7.1	0.0	98.6	1.4	NA	NA	NA
	Negative	NA	0.0	0.0	0.0	56.2	43.8	NA	NA	NA
	Watch Down	NA	0.0	0.0	0.0	16.7	83.3	NA	NA	NA
Aa	Watch Up	9.1	90.9	0.0	65.0	34.5	0.5	-	-	-
	Positive	17.8	82.2	0.0	19.3	76.5	4.2	0.0	100.0	0.0
	Stable	0.0	97.0	3.0	4.8	84.6	10.6	0.0	80.5	19.5
	Negative	5.9	76.5	17.6	1.6	74.1	24.3	0.0	51.5	48.5
	Watch Down	0.0	66.7	33.3	0.5	24.5	75.1	0.0	76.9	23.1
A	Watch Up	11.4	84.1	4.5	65.5	32.6	1.9	-	-	-
	Positive	22.2	77.8	0.0	18.4	78.5	3.1	6.7	80.0	13.3
	Stable	5.2	92.4	2.3	3.8	82.4	13.9	3.6	70.6	25.7
	Negative	5.0	75.0	20.0	2.7	72.7	24.6	0.9	68.1	31.0
	Watch Down	0.0	50.0	50.0	1.1	33.0	65.9	0.0	49.3	50.7
Baa	Watch Up	23.7	65.8	10.5	71.9	25.4	2.7	0.0	100.0	0.0
	Positive	12.7	83.1	4.2	18.5	72.6	8.9	4.2	70.8	25.0
	Stable	9.0	86.1	5.0	5.6	83.9	10.5	2.0	73.9	24.1
	Negative	4.5	59.1	36.4	2.6	74.9	22.4	1.0	61.0	38.0
	Watch Down	0.0	0.0	100.0	1.3	31.6	67.1	3.6	34.1	62.3
Ba	Watch Up	38.9	55.6	5.6	76.6	17.9	5.5	60.0	40.0	0.0
	Positive	27.3	69.7	3.0	22.7	67.3	9.9	21.4	71.4	7.1
	Stable	7.7	77.3	15.0	11.6	66.9	21.5	3.6	74.6	21.9
	Negative	6.5	74.2	19.4	6.2	65.0	28.8	0.7	59.5	39.9
	Watch Down	0.0	0.0	100.0	5.3	25.2	69.4	2.6	28.4	69.1
B	Watch Up	28.6	71.4	0.0	68.4	24.5	7.1	66.7	33.3	0.0
	Positive	17.0	81.1	1.9	18.9	65.1	16.0	15.5	74.1	10.3
	Stable	11.7	75.9	12.3	7.7	67.7	24.5	4.8	76.4	18.9
	Negative	20.0	40.0	40.0	4.5	58.0	37.5	2.7	53.5	43.9
	Watch Down	0.0	25.0	75.0	2.0	28.3	69.7	2.2	21.2	76.5
Caa	Watch Up	100.0	0.0	0.0	73.3	11.1	15.6	20.0	60.0	20.0
	Positive	64.3	14.3	21.4	24.0	55.8	20.3	7.5	64.2	28.3
	Stable	12.0	80.0	8.0	6.7	66.1	27.2	1.6	55.6	42.9
	Negative	27.3	63.6	9.1	7.3	67.1	25.5	1.7	53.2	45.1
	Watch Down	-	-	-	5.5	16.6	77.9	3.9	20.6	75.5
Investment	Watch Up	14.8	80.0	5.2	67.7	30.5	1.8	0.0	100.0	0.0
Grade	Positive	17.3	81.0	1.7	18.6	75.7	5.7	4.9	75.6	19.5
	Stable	5.2	91.2	3.7	4.5	84.0	11.4	2.5	73.3	24.2
	Negative	5.1	69.5	25.4	2.4	73.6	24.0	0.9	62.4	36.7
	Watch Down	0.0	50.0	50.0	1.0	30.1	69.0	2.0	43.5	54.4
Speculative	Watch Up	38.5	57.7	3.8	73.2	20.1	6.7	46.2	46.2	7.7
Grade	Positive	27.1	68.8	4.0	21.0	65.3	13.7	12.8	69.6	17.6
	Stable	9.6	76.9	13.5	8.9	67.3	23.8	3.8	71.2	25.0
	Negative	14.5	61.3	24.2	5.7	62.4	32.0	2.0	54.5	43.6
	Watch Down	0.0	20.0	80.0	4.0	25.3	70.7	2.7	24.0	73.3
All Rated	Watch Up	19.1	75.9	5.0	69.2	27.6	3.2	42.9	50.0	7.1
	Positive	22.5	74.6	2.9	19.8	70.6	9.6	10.8	71.1	18.1
	Stable	7.1	84.9	8.0	6.5	76.7	16.9	3.2	72.2	24.7
	Negative	9.9	65.3	24.8	3.9	68.4	27.6	1.6	56.8	41.5
	Watch Down	0.0	40.0	60.0	1.8	28.8	69.4	2.4	32.9	64.7

Exhibit 14

Three-Year Rating Transition Rates Conditional on Outlooks & Last Rating Change within 12 Months, 1996–2003

		Upgraded Prior Year			Unchanged Prior Year			Downgraded Prior Year		
Rating	**Outlook**	**Upgraded**	**Unchanged**	**Downgraded**	**Upgraded**	**Unchanged**	**Downgraded**	**Upgraded**	**Unchanged**	**Downgraded**
Aaa	Watch Up	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Positive	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Stable	0.0	99.1	0.9	0.0	99.1	0.9	NA	NA	NA
	Negative	NA	NA	NA	0.0	100.0	0.0	NA	NA	NA
	Watch Down	NA	NA	NA	0.0	0.0	100.0	NA	NA	NA
Aa	Watch Up	54.8	43.0	2.2	57.8	39.8	2.3	-	-	-
	Positive	31.6	64.6	3.8	31.8	64.3	3.8	50.0	50.0	0.0
	Stable	19.5	58.8	21.7	20.1	57.4	22.4	5.3	50.3	44.4
	Negative	4.3	19.4	76.3	4.3	19.6	76.1	0.7	52.1	47.2
	Watch Down	0.0	32.5	67.5	0.0	25.0	75.0	3.5	51.7	44.8
A	Watch Up	42.3	49.6	8.0	42.9	48.4	8.7	80.6	12.9	6.5
	Positive	30.6	61.4	8.0	31.0	61.1	8.0	64.2	33.6	2.2
	Stable	19.5	58.6	21.9	19.9	57.8	22.3	3.7	53.0	43.3
	Negative	18.6	51.7	29.7	19.0	50.6	30.4	8.6	46.0	45.4
	Watch Down	5.5	32.9	61.6	5.6	32.4	62.0	2.4	28.7	68.9
Baa	Watch Up	67.4	25.9	6.7	68.5	24.4	7.1	86.9	6.6	6.6
	Positive	45.8	38.2	16.0	46.3	37.5	16.3	46.0	32.2	21.8
	Stable	19.8	60.9	19.3	20.1	59.8	20.1	12.3	52.2	35.5
	Negative	6.3	42.2	51.5	6.4	41.7	51.9	5.0	49.4	45.7
	Watch Down	8.7	34.8	56.5	10.5	21.1	68.4	5.5	28.2	66.2
Ba	Watch Up	74.6	13.4	11.9	77.8	9.5	12.7	92.5	7.5	0.0
	Positive	47.4	32.9	19.7	48.0	32.0	20.0	53.3	26.0	20.7
	Stable	28.4	35.1	36.5	28.8	34.2	37.0	23.0	41.6	35.4
	Negative	18.1	19.9	62.0	17.0	19.2	63.8	3.0	37.8	59.2
	Watch Down	7.3	20.0	72.7	7.3	20.0	72.7	10.3	17.7	72.0
B	Watch Up	73.3	13.3	13.3	71.4	14.3	14.3	77.1	2.9	20.0
	Positive	35.8	42.6	21.6	36.2	41.6	22.1	43.7	28.1	28.1
	Stable	29.0	31.0	40.0	29.6	29.4	41.0	20.3	44.8	34.9
	Negative	27.6	9.0	63.4	27.8	8.3	63.9	15.0	32.4	52.6
	Watch Down	0.0	51.9	48.1	0.0	50.0	50.0	4.1	26.5	69.3
Caa	Watch Up	100.0	0.0-	0.0	76.1	15.0	8.9	87.5	0.0	12.5
	Positive	66.2	8.5	25.4	69.7	9.1	21.2	47.8	17.4	34.8
	Stable	63.6	22.5	14.0	64.3	22.2	13.5	11.8	39.9	48.3
	Negative	23.5	51.0	25.5	24.5	49.0	26.5	17.9	46.8	35.3
	Watch Down	-	-	-	4.0	17.0-	79.0	10.9	12.1	77.0
Investment	Watch Up	54.8	39.6	5.7	54.6	38.8	6.6	84.8	8.7	6.5
Grade	Positive	36.4	53.8	9.7	36.3	54.0	9.7	52.5	33.8	13.8
	Stable	19.1	60.6	20.3	19.6	59.5	20.9	7.6	52.3	40.1
	Negative	9.4	39.8	50.8	9.6	39.2	51.2	5.7	48.6	45.7
	Watch Down	4.1	31.0	64.8	4.6	26.7	68.7	4.1	30.8	65.1
Speculative	Watch Up	74.4	13.4	12.2	76.6	10.4	13.0	85.7	4.4	9.9
Grade	Positive	45.1	34.4	20.5	45.8	33.6	20.6	46.0	26.7	27.3
	Stable	30.2	33.1	36.8	30.6	32.0	37.4	20.3	43.5	36.2
	Negative	21.3	19.9	58.8	20.8	19.0	60.2	13.4	38.2	48.4
	Watch Down	4.9	30.5	64.6	5.1	29.1	65.8	8.1	20.0	71.9
All Rated	Watch Up	58.1	35.2	6.7	58.2	34.2	7.6	85.2	6.6	8.2
	Positive	40.5	44.8	14.7	40.6	44.7	14.7	48.2	29.2	22.6
	Stable	23.4	50.0	26.7	23.8	48.9	27.3	13.4	48.3	38.3
	Negative	15.0	30.5	54.5	14.8	29.7	55.4	10.6	41.9	47.5
	Watch Down	4.4	30.8	64.8	4.8	27.6	67.6	5.7	26.5	67.8

Exhibit 15

One- & Three-Year Unconditional (Historical) Default Rates by Whole Letter Rating, 1996–2003

One-Year		Three-Year	
Rating	**Default Rate**	**Rating**	**Default Rate**
Aaa	0.00	Aaa	0.00
Aa	0.00	Aa	0.00
A	0.06	A	0.35
Baa	0.40	Baa	1.53
Ba	0.82	Ba	4.40
B	4.81	B	17.74
Caa	14.59	Caa	30.95
Investment-Grade	0.17	Investment-Grade	0.71
Speculative-Grade	4.46	Speculative-Grade	14.66
All Rated	1.76	All Rated	6.10

Exhibit 16

One- & Three-Year Unconditional (Historical) Default Rates by Alphanumeric Rating, 1996–2003

One-Year		Three-Year	
Rating	**Default Rate**	**Rating**	**Default Rate**
Aaa	0.00	Aaa	0.00
Aa1	0.00	Aa1	0.00
Aa2	0.00	Aa2	0.00
Aa3	0.00	Aa3	0.00
A1	0.00	A1	0.00
A2	0.09	A2	0.37
A3	0.07	A3	0.63
Baa1	0.35	Baa1	1.08
Baa2	0.28	Baa2	1.32
Baa3	0.61	Baa3	2.28
Ba1	0.53	Ba1	2.71
Ba2	0.53	Ba2	2.72
Ba3	1.30	Ba3	7.14
B1	2.66	B1	13.15
B2	5.30	B2	18.46
B3	7.93	B3	24.53
Caa1	13.11	Caa1	33.42
Caa2	17.68	Caa2	31.27
Caa3	14.85	Caa3	24.37
Investment-Grade	0.17	Investment-Grade	0.71
Speculative-Grade	4.46	Speculative-Grade	14.66
All Rated	1.76	All Rated	6.10

Exhibit 17

One- & Three-Year Default Rates by Whole Letter Rating Conditional on Last Rating Change within 12 Months, 1996–2003

One-Year

Rating	Change Prior Year: Upgraded	Unchanged	Downgraded
Aaa	0.00	0.00	NA
Aa	0.00	0.00	0.00
A	0.00	0.06	0.00
Baa	0.17	0.39	0.98
Ba	0.37	0.76	3.71
B	4.14	4.61	11.59
Caa	5.56	13.09	34.27
Investment-Grade	0.06	0.17	0.48
Speculative-Grade	2.02	4.11	15.39
All Rated	0.79	1.62	8.68

Three-Year

Rating	Change Prior Year: Upgraded	Unchanged	Downgraded
Aaa	0.00	0.00	NA
Aa	0.00	0.00	0.00
A	0.00	0.36	0.11
Baa	1.57	1.58	1.69
Ba	1.65	4.66	8.31
B	13.61	18.78	30.45
Caa	18.52	38.26	66.26
Investment-Grade	0.56	0.73	0.87
Speculative-Grade	6.92	15.63	33.76
All Rated	2.92	6.20	18.97

Exhibit 18

One- & Three-Year Default Rates by Alphanumeric Rating Conditional on Last Rating Change within 12 Months, 1996–2003

One-Year

Rating	Change Prior Year: Upgraded	Unchanged	Downgraded
Aaa	0.00	0.00	NA
Aa1	0.00	0.00	0.00
Aa2	0.00	0.00	0.00
Aa3	0.00	0.00	0.00
A1	0.00	0.00	0.00
A2	0.00	0.09	0.00
A3	0.00	0.08	0.00
Baa1	0.00	0.35	0.28
Baa2	0.50	0.25	1.51
Baa3	0.00	0.61	1.08
Ba1	0.00	0.49	2.24
Ba2	0.00	0.44	4.67
Ba3	1.14	1.23	4.33
B1	1.72	2.68	2.28
B2	2.08	5.09	11.23
B3	7.39	13.24	21.15
Caa1	4.00	12.05	29.61
Caa2	4.76	16.00	38.73
Caa3	12.50	12.22	38.46
Investment-Grade	0.06	0.17	0.48
Speculative-Grade	2.02	4.11	15.39
All Rated	0.79	1.62	8.68

Three-Year

Rating	Change Prior Year: Upgraded	Unchanged	Downgraded
Aaa	0.00	0.00	NA
Aa1	0.00	0.00	0.00
Aa2	0.00	0.00	0.00
Aa3	0.00	0.00	0.00
A1	0.00	0.00	0.00
A2	0.00	0.38	0.00
A3	0.00	0.66	0.26
Baa1	1.12	1.13	0.56
Baa2	1.49	1.35	2.27
Baa3	2.07	2.36	2.17
Ba1	1.14	2.80	6.34
Ba2	0.51	2.85	9.35
Ba3	3.41	7.62	9.33
B1	7.47	13.88	15.67
B2	11.46	19.60	31.43
B3	26.48	32.35	43.13
Caa1	20.00	38.31	61.45
Caa2	9.52	41.10	76.47
Caa3	37.50	33.91	64.29
Investment-Grade	0.56	0.73	0.87
Speculative-Grade	6.92	15.63	33.76
All Rated	2.92	6.20	18.97

Exhibit 19

One- & Three-Year Default Rates by Whole Letter Rating Conditional on Outlook, 1996–2003

One-Year

	Outlook				
Rating	**Watch Up**	**Positive**	**Stable**	**Negative**	**Watch Down**
Aaa	NA	NA	0.00	0.00	0.00
Aa	0.00	0.00	0.00	0.00	0.00
A	0.00	0.00	0.10	0.15	0.04
Baa	0.00	0.07	0.38	0.64	1.54
Ba	0.00	0.04	0.81	1.06	5.22
B	0.00	1.04	3.93	8.95	24.90
Caa	2.13	5.52	9.99	16.76	39.81
Investment-Grade	0.00	0.03	0.19	0.32	0.53
Speculative-Grade	0.12	0.97	3.44	8.84	18.80
All Rated	0.03	0.49	1.63	4.32	5.99

Three-Year

	Outlook				
Rating	**Watch Up**	**Positive**	**Stable**	**Negative**	**Watch Down**
Aaa	NA	NA	0.00	0.00	0.00
Aa	0.00	0.00	0.00	0.00	0.00
A	0.00	0.32	0.57	0.72	0.31
Baa	0.45	0.65	1.33	1.70	3.09
Ba	1.25	0.65	4.54	6.69	10.37
B	0.32	6.20	17.85	23.37	42.11
Caa	9.76	16.16	27.42	30.00	48.86
Investment-Grade	0.17	0.40	0.76	0.97	1.18
Speculative-Grade	1.34	5.57	14.45	21.37	30.50
All Rated	0.58	3.00	6.96	11.25	10.56

Exhibit 20

One- & Three-Year Default Rates by Alphanumeric Rating Conditional on Outlooks, 1996–2003

One-Year

	Outlook				
Rating	**Watch Up**	**Positive**	**Stable**	**Negative**	**Watch Down**
Aaa	NA	NA	0.00	0.00	0.00
Aa1	0.00	0.00	0.00	0.00	0.00
Aa2	0.00	0.00	0.00	0.00	0.00
Aa3	0.00	0.00	0.00	0.00	0.00
A1	0.00	0.00	0.00	0.00	0.00
A2	0.00	0.00	0.10	0.33	0.11
A3	0.00	0.00	0.18	0.00	0.00
Baa1	0.00	0.00	0.36	0.20	1.21
Baa2	0.00	0.00	0.21	0.54	1.15
Baa3	0.00	0.20	0.60	1.25	2.26
Ba1	0.00	0.00	0.48	0.14	3.22
Ba2	0.00	0.00	0.42	1.99	3.29
Ba3	0.00	0.11	1.27	1.16	8.68
B1	0.00	0.98	2.53	5.07	12.03
B2	0.00	1.12	4.23	8.83	31.03
B3	0.00	1.03	5.94	13.12	37.21
Caa1	3.70	3.82	8.43	14.93	43.21
Caa2	0.00	4.55	14.72	19.98	40.88
Caa3	0.00	15.32	9.31	16.30	38.57
Investment-Grade	0.00	0.03	0.19	0.32	0.53
Speculative-Grade	0.12	0.97	3.44	8.84	18.80
All Rated	0.03	0.49	1.63	4.32	5.99

Three-Year

	Outlook				
Rating	**Watch Up**	**Positive**	**Stable**	**Negative**	**Watch Down**
Aaa	NA	NA	0.00	0.00	0.00
Aa1	0.00	0.00	0.00	0.00	0.00
Aa2	0.00	0.00	0.00	0.00	0.00
Aa3	0.00	0.00	0.00	0.00	0.00
A1	0.00	0.00	0.00	0.00	0.00
A2	0.00	0.94	0.14	1.04	0.10
A3	0.00	0.00	1.51	0.72	0.73
Baa1	0.00	0.00	1.33	0.55	1.10
Baa2	0.27	0.82	0.46	1.23	3.38
Baa3	1.11	1.01	2.42	3.62	4.89
Ba1	0.39	0.00	2.60	2.36	8.37
Ba2	1.95	0.15	1.56	8.32	10.60
Ba3	1.69	1.52	7.65	8.97	12.21
B1	0.00	4.05	15.24	16.35	24.65
B2	0.00	4.59	18.20	22.40	50.42
B3	1.40	14.63	21.76	30.87	56.35
Caa1	1.72	25.33	29.13	32.59	54.69
Caa2	15.79	23.69	24.32	33.10	54.30
Caa3	8.00	23.33	25.41	22.85	50.61
Investment-Grade	0.50	2.33	8.17	8.22	8.58
Speculative-Grade	0.74	4.44	9.52	17.57	22.72
All Rated	0.58	3.00	6.96	11.25	10.56

Exhibit 21

One- & Three-Year Default Rates Conditional Outlooks & Last Rating Action within 12 Months, 1996–2003

One-Year

Rating	Prior Year Change	Outlook: Watch Up	Positive	Stable	Negative	Watch Down
Aaa	Upgraded	NA	NA	0.00	0.00	0.00
	Unchanged	NA	NA	0.00	0.00	0.00
	Downgraded	NA	NA	NA	NA	NA
Aa	Upgraded	0.00	0.00	0.00	0.00	0.00
	Unchanged	0.00	0.00	0.00	0.00	0.00
	Downgraded	0.00	0.00	0.00	0.00	0.00
A	Upgraded	0.00	0.00	0.00	0.00	0.00
	Unchanged	0.00	0.00	0.10	0.15	0.04
	Downgraded	0.00	0.00	0.00	0.00	0.00
Baa	Upgraded	0.00	0.00	0.00	0.50	0.00
	Unchanged	0.00	0.07	0.38	0.60	1.50
	Downgraded	0.00	0.00	0.33	1.50	1.82
Ba	Upgraded	0.00	0.00	0.45	3.23	0.00
	Unchanged	0.00	0.05	0.82	0.98	4.48
	Downgraded	0.00	0.00	1.18	2.70	8.76
B	Upgraded	0.00	0.00	1.23	8.75	11.11
	Unchanged	0.00	1.05	3.90	8.45	24.61
	Downgraded	0.00	1.72	6.29	16.58	26.26
Caa	Upgraded	0.00	7.14	4.00	9.09	-
	Unchanged	1.22	9.13	9.33	14.89	37.37
	Downgraded	0.00	21.05	29.51	36.12	45.11
Investment-Grade	Upgraded	0.00	0.00	0.00	0.42	0.00
	Unchanged	0.00	0.03	0.20	0.31	0.51
	Downgraded	0.00	0.00	0.14	0.87	1.01
Speculative-Grade	Upgraded	0.00	0.50	0.74	7.38	16.67
	Unchanged	0.12	1.26	3.36	7.99	17.38
	Downgraded	0.00	5.49	8.91	22.40	24.51
All Rated	Upgraded	0.00	0.26	0.33	2.79	4.76
	Unchanged	0.03	0.64	1.63	3.87	5.12
	Downgraded	0.00	3.79	4.71	16.38	14.21

Three-Year

Rating	Prior Year Change	Outlook: Watch Up	Positive	Stable	Negative	Watch Down
Aaa	Upgraded	NA	NA	0.00	0.00	0.00
	Unchanged	NA	NA	0.00	0.00	0.00
	Downgraded	NA	NA	NA	NA	NA
Aa	Upgraded	0.00	0.00	0.00	0.00	0.00
	Unchanged	0.00	0.00	0.00	0.00	0.00
	Downgraded	0.00	0.00	0.00	0.00	0.00
A	Upgraded	0.00	0.74	1.19	0.00	0.00
	Unchanged	0.00	0.25	0.61	0.65	0.43
	Downgraded	0.00	0.00	0.00	1.34	0.00
Baa	Upgraded	1.70	1.18	1.33	1.40	3.75
	Unchanged	0.16	0.58	1.53	1.54	3.81
	Downgraded	0.00	0.00	0.22	1.73	1.79
Ba	Upgraded	0.00	0.15	2.04	5.82	7.58
	Unchanged	0.86	0.83	5.25	6.10	10.33
	Downgraded	8.16	1.01	3.77	7.97	10.75
B	Upgraded	0.00	5.62	12.68	24.67	44.00
	Unchanged	1.02	6.18	17.45	20.01	45.24
	Downgraded	0.00	6.80	21.27	26.17	47.96
Caa	Upgraded	0.00	8.74	13.23	3.75	-
	Unchanged	1.89	31.54	23.04	22.48	55.24
	Downgraded	13.79	14.75	42.19	35.01	56.28
Investment-Grade	Upgraded	0.58	0.70	0.92	1.00	1.38
	Unchanged	0.06	0.34	0.85	0.84	1.26
	Downgraded	0.00	0.00	0.10	1.40	0.90
Speculative-Grade	Upgraded	0.00	2.10	6.56	13.52	17.39
	Unchanged	0.99	6.22	14.11	16.21	28.63
	Downgraded	5.16	7.08	20.60	27.67	36.68
All Rated	Upgraded	0.43	1.39	3.28	6.44	6.13
	Unchanged	0.39	3.19	6.74	6.93	7.07
	Downgraded	3.45	4.97	10.76	21.07	17.83

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