

Rating Transition and Default Rates Conditioned on Outlooks

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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. 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, its credit opinion has historically consisted solely of credit rating assignments and changes.¹ Until recently, there was no formal mechanism to convey recognized changes in credit quality that might ultimately be reflected in a rating change.

Rating outlooks and reviews (the Watchlist) were developed to provide an indication of the likely direction and timing of future credit rating changes. Since their introduction in the early 1990s, these rating signals have become important parts of the overall rating process. Rating outlooks and reviews help mitigate the 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 a change 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. A

consequence of these practices is positive serial correlation in Moody's credit rating changes.

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 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 is placed on review for a *rating change*. When the remaining uncertainty is resolved, the rating is either changed or confirmed.

As rating outlooks by design anticipate credit rating actions, the distributions of credit rating changes and defaults at a future date conditional on rating outlooks are likely to differ significantly from the unconditional distributions for a given rating category. Hence, a complete Moody's credit opinion consists of a credit rating and rating outlook/review. The fact that credit rating changes are serially correlated (exhibit rating momentum) also raises the possibility that past rating actions also need to be included in the expanded definition.

We document 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. First,

we ask how different rating transition and default rates conditional on rating history and outlook/Watchlist status are, when each is considered in isolation.²

Second, does rating outlook/Watchlist status fully summarize transition and default risk within each rating category? Or do rating transition and default risk still depend in part on rating history, each conditioned on outlooks and reviews?

Finally, we investigate how much more information there is in Moody's credit ratings when we recognize the information in rating outlooks and reviews.³

I. DATA AND METHODOLOGY

Although Moody's ratings database includes credit histories as far back as 1919, rating reviews and outlooks have a much shorter history. Watchlist data are available beginning in 1991, when rating reviews became a formal part of the rating process. Rating outlooks came into 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.

Our focus is corporate bond issuers. 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. We use year 1995 for conditioning (to derive lagged rating actions), resulting in seven available years of data for the cohorts. In total, the data set includes 5,272 corporate obligors globally with debt outstanding between 1995 and 2003 that had rating outlook or Watchlist assignments, resulting in 231,666 overlapping firm-years.

The credit ratings on which we base our results are Moody's notional obligor-level ratings. These estimated senior unsecured ratings are typically based on an issuer's outstanding senior unsecured obligations or its issuer rating.⁴

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. We use these notional obligor-level ratings to facilitate a comparison of credit ratings across issuers that controls for differences attributable to seniority and security.⁵ Although the analysis is conducted using Moody's alphanumeric rating scale (Aaa, Aa1, Aa2), for simplicity in many places we present statistical results that are aggregated to the whole-letter rating level.

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 that we call Ca-C. Rating downgrades associated with an event of default are placed into a separate and mutually exclusive default category, as are rating withdrawals.⁶

II. RATING OUTLOOKS AND REVIEWS

Moody's constantly 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 that are expected to be long-lasting. Although ratings are the primary way Moody's expresses its opinion of an obligor's credit quality, rating outlooks and the Watchlist are supplemental signals used to communicate observed changes in corporate credit quality. Assignment or changing of rating outlooks and reviews is often a precursor 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 of 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 do not use them as a basis for calculating conditional default and rating transition statistics.

Before 2002, rating outlooks were assigned by the analyst monitoring the credit in consultation with a team managing director or by a full rating committee. Rating outlooks are now assigned and changed only after a committee has convened. An issuer's current rating outlook terminates when a rating change takes place, when a rating is withdrawn, or when the issuer is placed on the Watchlist.

Rating reviews (the Watchlist) are a subset of rating outlooks that are much stronger statements about the future direction and timing of a credit rating change. When an obligor's credit quality has changed so 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 on review with direction uncertain. Unlike rating outlooks, rating reviews have always been decided by a full rating committee.

EXHIBIT 1

Outlook Period Length (Months)

Outlook	Mean	Median	Standard Deviation	% Sample
Watch Up	3.1	3.8	1.1	13.8%
Positive	11.7	15.2	12.9	8.9%
Stable	15.9	18.6	13.8	37.6%
Negative	8.7	12.1	11.4	14.3%
Watch Down	3.1	4.4	0.8	25.4%

As in the case of developing outlooks, we omit the direction uncertain Watchlist category in this study, because these reviews do not provide a clear signal about a credit rating's future direction. Their exclusion does not impact our results as uncertain rating reviews constitute less than 4% of all Watchlist assignments between 1995 and 2003.

Rating reviews are concluded by either changing the issuer's credit rating or confirming its current credit rating. Following this conclusion, a new rating outlook may be assigned, or the issuer may again be placed on the Watchlist if another rating change is anticipated.⁷

Exhibit 1 presents the distribution of rating outlooks and reviews, as well as descriptive statistics for the length of rating outlooks, measured in months.⁸ Stable outlooks were the most commonly assigned rating outlooks between 1995 and 2003, constituting over a third of all outlooks. Negative outlooks were nearly twice as prevalent as positive outlooks over the period. Similarly, the deterioration in aggregate credit quality that occurred over this time period also shows up in the Watchlist assignments, with reviews for downgrade outnumbering reviews for upgrade by nearly two-to-one.

The empirical duration statistics correspond closely to expectations. The average rating reviews (both positive and negative) last approximately three months, while rating outlooks are generally terminated between 12 and 18

months. Stable outlooks last the longest, and positive outlooks appear to last somewhat longer on average than negative outlooks.

The data also show considerable variation in outlook period length, as evidenced by relatively high standard deviations that in some cases exceed their means. Although it is not tabulated here, we find no significant differences in outlook and Watchlist duration by rating category.

The distribution of rating outlooks and rating reviews by whole-letter rating category is shown in Exhibit 2. By rating category, we again find that stable outlooks were most often assigned, particularly for speculative-grade-rated issuers. One-third of investment-grade-rated issuers and 45% of speculative-grade-rated issuers had stable outlooks on the cohort formation date. Yet negative rating conditions represented a 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. Investment-grade constitutes 63% of the sample and speculative-grade 37%. Credit ratings in the middle of the ratings scale show the highest concentration of issuers (64%), while ratings at the end-points of the credit rating scale—Aaa and Caa—show the lowest concentrations of issuers.⁹

III. CONDITIONAL CREDIT RATING TRANSITION RATES

An investigation of the conditional behavior of credit ratings naturally begins with rating changes themselves. Exhibit 3 shows the one- and three-year unconditional rating transition rates for our data set. While these familiar statistics are accurate representations of actual rating changes, the historical data are of limited use as proxies

EXHIBIT 2

Distribution of Outlooks by Whole-Letter Rating

	Watch Up	Positive	Stable	Negative	Watch Down	Total
Aaa	NA	NA	68.4%	8.7%	22.9%	1.2%
Aa	18.3%	7.0%	28.7%	12.5%	33.6%	12.2%
A	18.2%	6.9%	30.6%	11.0%	33.3%	26.5%
Baa	15.0%	8.0%	37.1%	13.4%	26.5%	23.0%
Ba	12.1%	13.7%	38.7%	13.3%	22.2%	14.1%
B	7.5%	11.1%	52.2%	16.4%	12.8%	18.7%
Caa	3.1%	8.4%	33.7%	42.1%	12.7%	4.3%
Investment-Grade	16.7%	7.2%	33.3%	12.1%	30.7%	62.9%
Speculative-Grade	8.8%	11.8%	44.9%	18.2%	16.4%	37.1%

EXHIBIT 3

One- and Three-Year Unconditional Rating Transition Rates by Whole-Letter Rating

One-Year				Three-Year			
Rating	Upgraded	Unchanged	Downgraded	Rating	Upgraded	Unchanged	Downgraded
Aaa	NA	86.2	13.8	Aaa	NA	77.3	22.7
Aa	8.1	74.8	17.1	Aa	17.3	45.9	36.8
A	8.6	73.9	17.5	A	17.1	46.9	36.0
Baa	10.9	72.7	16.4	Baa	20.4	46.5	33.1
Ba	16.9	61.2	21.9	Ba	28.6	32.2	39.2
B	12.2	64.6	23.3	B	24.1	37.4	38.5
Caa	13.5	66.1	20.4	Caa	29.7	40.4	29.9
Investment-Grade	9.1	73.9	17.0	Investment-Grade	18.0	47.3	34.8
Speculative-Grade	14.2	63.4	22.4	Speculative-Grade	26.5	35.4	38.1
All Rated	11.0	70.1	18.9	All Rated	20.7	43.5	35.9

for transition probabilities. While most issuers' credit ratings are stable over short time horizons, obligors within a given rating cohort have migrated into that cohort from rating categories above and below. Furthermore, movement of a credit rating to a level that reflects its new and fundamental credit risk often occurs incrementally rather than with a single mult notch rating change. These rating changes are typically in the same direction, resulting in positively serially correlated rating changes (rating momentum).

The serial correlation of credit rating changes is well documented. Altman and Kao [1992], Carty and Fons [1993], Altman [1998], and Fons [2002] all report various empirical results that show credit ratings exhibit significant path-dependence.

Exhibit 4 shows weighted-average one- and three-year rating transition frequencies conditional on the last rating action for all rated issuers in our data set.¹⁰ 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.

In the sample period available for study, 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. Issuers upgraded within the last year are nearly twice as likely to be upgraded as to be downgraded in the next year.

The effects of rating history are not perfectly symmetric, however. 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. Downgraded issuers are nine times more likely to be downgraded than upgraded in the next year.

Exhibit 4 also shows that the effect of past down-

grades 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 over one year, compared to six times for speculative-grade-rated issuers.

The results shown in Exhibit 4 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 very close to the unconditional mean. At both the one- and three-year horizon, issuers that were upgraded show the highest level of rating stability; 80% of issuers retained 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 speculative-grade-rated issuers.

It is worth noting that, although the results in Exhibit 4 appear to suggest that the rating momentum effect is stronger for credit rating downgrades than for upgrades, the empirical pattern more likely reflects the fact that three of the seven years in the 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 5 demonstrates that outlooks are indeed systematically associated with future rating actions, at both one- and three-year investment horizons. Obligor with positive

EXHIBIT 4

One- and Three-Year Rating Transition Rates Conditional on Lagged Rating Action

One-Year Rating t	One-Year				Three-Year Rating t	Three-Year			
	Change t-1	Upgraded t-1	Unchanged t-1	Downgraded t-1		Change t	Upgraded t+1	Unchanged t+1	Downgraded t+1
Aaa	Upgraded	NA	86.7	13.3	Aaa	Upgraded	NA	82.8	17.2
	Unchanged	NA	86.2	13.8		Unchanged	NA	77.2	22.8
	Downgraded	NA	NA	NA		Downgraded	NA	NA	NA
Aa	Upgraded	5.4	91.5	3.1	Aa	Upgraded	25.1	55.9	19.0
	Unchanged	8.2	74.5	17.3		Unchanged	17.3	45.7	37.0
	Downgraded	0.4	80.5	19.1		Downgraded	5.0	49.4	45.6
A	Upgraded	9.2	85.0	5.8	A	Upgraded	25.2	55.8	19.0
	Unchanged	8.7	73.9	17.4		Unchanged	17.1	47.0	35.9
	Downgraded	1.9	66.5	31.6		Downgraded	8.7	38.7	52.7
Baa	Upgraded	13.1	80.1	6.8	Baa	Upgraded	31.2	47.2	21.6
	Unchanged	11.1	72.8	16.1		Unchanged	20.5	46.7	32.8
	Downgraded	2.1	63.1	34.9		Downgraded	10.2	38.5	51.3
Ba	Upgraded	17.4	70.1	12.5	Ba	Upgraded	37.6	31.0	31.4
	Unchanged	17.2	61.1	21.6		Unchanged	28.7	32.3	39.0
	Downgraded	4.4	56.3	39.3		Downgraded	18.0	29.8	52.2
B	Upgraded	15.7	75.9	8.3	B	Upgraded	38.7	33.6	27.7
	Unchanged	12.3	64.4	23.3		Unchanged	24.1	37.4	38.5
	Downgraded	5.6	66.6	27.8		Downgraded	19.6	39.4	41.0
Caa	Upgraded	29.4	58.8	11.8	Caa	Upgraded	51.7	31.0	17.2
	Unchanged	13.9	66.4	19.7		Unchanged	29.8	40.5	29.7
	Downgraded	5.5	62.2	32.3		Downgraded	25.1	39.8	35.1
Investment-Grade	Upgraded	9.5	84.8	5.6	Investment-Grade	Upgraded	26.8	53.3	19.9
	Unchanged	9.3	73.9	16.9		Unchanged	18.0	47.3	34.7
	Downgraded	1.8	66.5	31.7		Downgraded	9.0	39.9	51.2
Speculative-Grade	Upgraded	17.5	71.5	11.0	Speculative-Grade	Upgraded	38.5	31.9	29.6
	Unchanged	14.4	63.3	22.3		Unchanged	26.6	35.4	38.0
	Downgraded	5.2	62.5	32.4		Downgraded	19.8	35.8	44.4
All Issuers	Upgraded	12.4	80.0	7.6	All Issuers	Upgraded	30.8	46.1	23.2
	Unchanged	11.1	70.1	18.8		Unchanged	20.7	43.5	35.8
	Downgraded	3.5	64.4	32.0		Downgraded	13.8	38.0	48.1

EXHIBIT 5

One- and Three-Year Rating Transition Rates Conditional on Outlook

One-Year

Rating t	Outlook t	Upgraded t+1	Unchanged t+1	Downgraded t+1
Aaa	Watch Up	NA	NA	NA
	Positive	NA	NA	NA
	Stable	NA	98.6	1.4
	Negative	NA	56.2	43.8
	Watch Down	NA	16.7	83.3
Aa	Watch Up	61.8	37.7	0.5
	Positive	19.2	76.7	4.1
	Stable	4.7	84.8	10.6
	Negative	1.6	73.9	24.5
	Watch Down	0.4	26.0	73.5
A	Watch Up	62.7	35.3	2.0
	Positive	18.4	78.5	3.1
	Stable	3.8	82.3	13.9
	Negative	2.7	72.6	24.7
	Watch Down	1.1	33.9	65.0
Baa	Watch Up	69.6	27.4	3.1
	Positive	18.3	72.8	8.9
	Stable	5.6	83.8	10.6
	Negative	2.6	74.5	22.9
	Watch Down	1.5	31.8	66.6
Ba	Watch Up	75.0	19.5	5.5
	Positive	22.9	67.4	9.7
	Stable	11.4	67.2	21.4
	Negative	6.0	64.9	29.1
	Watch Down	4.9	25.7	69.4
B	Watch Up	67.6	25.6	6.8
	Positive	18.9	65.4	15.7
	Stable	7.7	68.0	24.3
	Negative	4.4	57.7	37.9
	Watch Down	2.1	27.1	70.9
Caa	Watch Up	74.5	10.6	14.9
	Positive	24.4	55.3	20.3
	Stable	6.6	65.5	27.9
	Negative	6.9	66.4	26.7
	Watch Down	4.7	19.2	76.1
Investment-Grade	Watch Up	65.0	33.0	2.0
	Positive	18.5	75.8	5.7
	Stable	4.5	83.9	11.5
	Negative	2.4	73.4	24.2
	Watch Down	1.1	31.0	68.0
Speculative-Grade	Watch Up	72.1	21.4	6.5
	Positive	21.1	65.5	13.5
	Stable	8.8	67.5	23.7
	Negative	5.5	62.0	32.5
	Watch Down	3.7	25.2	71.1
All Rated	Watch Up	66.9	29.8	3.2
	Positive	19.8	70.7	9.5
	Stable	6.4	76.7	16.9
	Negative	3.9	68.1	28.1
	Watch Down	1.8	29.3	68.9

Three-Year

Rating t	Outlook t	Upgraded t+1	Unchanged t+1	Downgraded t+1
Aaa	Watch Up	NA	NA	NA
	Positive	NA	NA	NA
	Stable	NA	95.21	4.79
	Negative	NA	36.95	63.05
	Watch Down	NA	14.19	85.81
Aa	Watch Up	67.62	22.86	9.52
	Positive	37.81	49.59	12.60
	Stable	11.86	58.21	29.93
	Negative	6.12	45.95	47.92
	Watch Down	1.52	21.17	77.31
A	Watch Up	68.25	24.37	7.38
	Positive	32.79	57.89	9.32
	Stable	10.32	54.44	35.24
	Negative	5.84	51.54	42.63
	Watch Down	2.86	27.71	69.43
Baa	Watch Up	71.03	21.38	7.59
	Positive	33.70	40.74	25.56
	Stable	13.39	60.17	26.44
	Negative	7.59	49.84	42.57
	Watch Down	3.81	25.81	70.39
Ba	Watch Up	77.08	12.24	10.68
	Positive	35.99	41.26	22.75
	Stable	21.20	36.32	42.48
	Negative	10.40	36.36	53.24
	Watch Down	8.95	16.56	74.49
B	Watch Up	70.94	14.10	14.96
	Positive	32.91	33.18	33.91
	Stable	16.31	40.60	43.09
	Negative	10.81	32.57	56.61
	Watch Down	5.52	25.10	69.38
Caa	Watch Up	93.94	0.00	6.06
	Positive	35.80	18.20	46.00
	Stable	16.46	39.05	44.49
	Negative	20.19	46.38	33.43
	Watch Down	8.47	18.22	73.31
Investment-Grade	Watch Up	69.07	22.91	8.02
	Positive	34.10	49.47	16.43
	Stable	11.39	59.06	29.55
	Negative	6.51	49.50	43.99
	Watch Down	2.79	25.22	71.99
Speculative-Grade	Watch Up	75.73	12.29	11.98
	Positive	34.52	36.08	29.40
	Stable	18.08	38.96	42.96
	Negative	12.67	36.79	50.54
	Watch Down	7.60	19.97	72.43
All Rated	Watch Up	70.7	20.3	9.0
	Positive	34.3	43.2	22.5
	Stable	14.1	50.9	35.0
	Negative	9.0	44.3	46.7
	Watch Down	4.0	23.9	72.1

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; that is, 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 continued to show a higher likelihood of upgrade than downgrade. Negative rating outlooks resulted in downgrades six 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 5 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.

The detail provided in Exhibit 5 indicates that rating reviews are also somewhat stronger signals of future rating change assignments for investment-grade-rated issuers than they are for speculative-grade-rated issuers, with the effect particularly strong for reviews for downgrade.

Exhibit 5 also shows that issuers with stable outlooks exhibit the highest level of rating stability at both a one- and three-year risk horizon. On average 78% of all rated issuers with stable outlooks ended the one-year transition period with the same rating with which they began; that percentage is 53% over three years. Although this result generally holds across all rating categories, it is especially strong for investment-grade-rated issuers.

As a signal of rating stability, stable outlooks generally

prove to be a more reliable indicator than an unchanged or upgraded rating in the prior year, as a comparison of Exhibits 4 and 5 shows. Over short transition periods (one year), rating upgrades suggest higher rating stability; over three years, however, stable outlooks show a higher association with no rating change than past rating upgrades and no past rating changes.

IV. CONDITIONAL DEFAULT RATES

All these conditional rating transition statistics reveal significant within-rating heterogeneity; conditioning on lagged rating actions and outlooks readily differentiates the likelihood of a rating change within a given rating category. Exhibits 6 and 7 show the weighted-average unconditional one- and three-year default rates. Because there is a wide variation in unconditional default rates consistent with a particular rating category, we should also expect lagged rating actions and outlooks to differentiate the probability of default within a rating category. As with rating transitions, unconditional default rates are biased estimates of default probabilities because issuers enter a rating category cohort through upgrades and downgrades.

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 8 demonstrates this finding. It shows weighted-average default rates for one- and three-year risk horizons, conditional on lagged rating actions by whole-letter rating category. 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 7 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. Exhibit 9 presents weighted-average one- and three-year default rates by alphanumeric rating. Although not perfectly monotonic, default rates clearly increase across both dimensions (rating level and rating history) at the alphanumeric rating level. A comparison of Exhibits 6 and 8 shows that average default rates for issuers whose ratings were unchanged are quite close to the unconditional default rates.

Exhibits 10 and 11 show weighted-average one- and three-year default rates for whole-letter and alphanu-

EXHIBIT 6

One- and Three-Year Unconditional (Historical) Default Rates by Whole-Letter Rating

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 7

One- and Three-Year Unconditional (Historical) Default Rates by Alphanumeric Rating

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

meric rating categories conditional on the outlook held on the cohort formation date. These numbers show that default rates are strongly associated with outlooks, generally increasing from positive to negative conditions by rating category.

For all rated issuers, those with a negative outlook were nearly nine times more likely to default within one year than issuers with 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 greater when rating reviews are considered. The average historical conditional probability of default for obligors on review for downgrade is 5.99% 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 horizon.

V. JOINT EFFECTS OF RATING ACTIONS AND OUTLOOKS

One would surmise that issuers for which a rating action, say, a rating downgrade, is followed by a negative outlook or review would exhibit higher downgrade and default probabilities than those that were downgraded but had a stable outlook following the rating change. 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 12 and 13 show one- and three-year weighted-average bivariate rating transition rates by whole-letter rating category. The results are conditioned on the simultaneous effect of credit rating, rating outlook, and lagged rating change.¹¹

We see an important finding. When past rating actions and outlooks are opposite in direction, rating outlooks dominate, indicating that the serial correlation of rating changes is substantially weakened or neutralized once outlook direction is controlled for. For a given outlook condition, the rating transition rates, given the last rating change, are roughly constant.

Consider the results for all rated corporate issuers at the three-year time horizon, excerpted from Exhibit 13 as Exhibit 14. Each column of the table shows that, for any given past rating change, credit rating upgrade rates increase with positive conditions, and 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 neutralized is illustrated by the nearly constant intensity of rating transition conditional on rating outlook.

EXHIBIT 8

One- and Three-Year Default Rates by Whole-Letter Rating Conditional on Lagged Rating Change

One-Year				Three-Year			
Rating t	Upgraded t-1	Unchanged t-1	Downgraded t-1	Rating	Upgraded t-1	Unchanged t-1	Downgraded t-1
Aaa	0.00	0.00	NA	Aaa	0.00	0.00	NA
Aa	0.00	0.00	0.00	Aa	0.00	0.00	0.00
A	0.00	0.06	0.00	A	0.00	0.36	0.11
Baa	0.17	0.39	0.98	Baa	1.57	1.58	1.69
Ba	0.37	0.76	3.71	Ba	1.65	4.66	8.31
B	4.14	4.61	11.59	B	13.61	18.78	30.45
Caa	5.56	13.09	34.27	Caa	18.52	38.26	66.26
Investment-Grade	0.06	0.17	0.48	Investment-Grade	0.56	0.73	0.87
Speculative-Grade	2.02	4.11	15.39	Speculative-Grade	6.92	15.63	33.76
All Rated	0.79	1.62	8.68	All Rated	2.92	6.20	18.97

EXHIBIT 9

One- and Three-Year Default Rates by Alphanumeric Rating Conditional on Lagged Rating Change

One-Year				Three-Year			
Rating t	Upgraded t-1	Unchanged t-1	Downgraded t-1	Rating t	Upgraded t-1	Unchanged t-1	Downgraded t-1
Aaa	0.00	0.00	NA	Aaa	0.00	0.00	NA
Aa1	0.00	0.00	0.00	Aa1	0.00	0.00	0.00
Aa2	0.00	0.00	0.00	Aa2	0.00	0.00	0.00
Aa3	0.00	0.00	0.00	Aa3	0.00	0.00	0.00
A1	0.00	0.00	0.00	A1	0.00	0.00	0.00
A2	0.00	0.09	0.00	A2	0.00	0.38	0.00
A3	0.00	0.08	0.00	A3	0.00	0.66	0.26
Baa1	0.00	0.35	0.28	Baa1	1.12	1.13	0.56
Baa2	0.50	0.25	1.51	Baa2	1.49	1.35	2.27
Baa3	0.00	0.61	1.08	Baa3	2.07	2.36	2.17
Ba1	0.00	0.49	2.24	Ba1	1.14	2.80	6.34
Ba2	0.00	0.44	4.67	Ba2	0.51	2.85	9.35
Ba3	1.14	1.23	4.33	Ba3	3.41	7.62	9.33
B1	1.72	2.68	2.28	B1	7.47	13.88	15.67
B2	2.08	5.09	11.23	B2	11.46	19.60	31.43
B3	13.24	7.39	21.15	B3	32.35	26.48	43.13
Caa1	4.00	12.05	29.61	Caa1	20.00	38.31	61.45
Caa2	4.76	16.00	38.73	Caa2	9.52	41.10	76.47
Caa3	12.50	12.22	38.46	Caa3	37.50	33.91	64.29
Investment-Grade	0.06	0.17	0.48	Investment-Grade	0.56	0.73	0.87
Speculative-Grade	2.02	4.11	15.39	Speculative-Grade	6.92	15.63	33.76
All Rated	0.79	1.62	8.68	All Rated	2.92	6.20	18.97

For example, obligors with 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 upper shaded cells in Exhibit 14 highlight the near-irrelevance of rating history for positive outlooks.

Similarly, given a rating upgrade or no rating change within the last 12 months, obligors with negative rating outlooks experienced a 55% likelihood of another rating downgrade over the next three years; the three-year like-

lihood of a downgrade conditional on a downgrade within the last year is 48%. The lower shaded cells in Exhibit 14 highlight the near-irrelevance of rating history for negative outlooks.

These results generalize to rating reviews and to other points in the rating scale.

Exhibit 15 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

EXHIBIT 10

One- and Three-Year Default Rates by Whole-Letter Rating Conditional on Outlook

One-Year						Three-Year					
Rating	Watch Up	Positive	Stable	Negative	Watch Down	Rating	Watch Up	Positive	Stable	Negative	Watch Down
Aaa	NA	NA	0.00	0.00	0.00	Aaa	0.00	0.00	0.49	13.15	0.65
Aa	0.00	0.00	0.00	0.00	0.00	Aa	0.16	0.64	2.66	1.78	2.77
A	0.00	0.00	0.10	0.15	0.04	A	0.88	0.41	1.57	3.12	4.16
Baa	0.00	0.07	0.38	0.64	1.54	Baa	0.34	4.67	17.50	15.98	18.34
Ba	0.00	0.04	0.81	1.06	5.22	Ba	0.94	7.16	16.04	48.18	33.63
B	0.00	1.04	3.93	8.95	24.90	B	1.60	9.57	16.40	41.90	58.93
Caa	2.13	5.52	9.99	16.76	39.81	Caa	12.20	39.84	57.28	43.17	71.99
Investment-Grade	0.00	0.03	0.19	0.32	0.53	Investment-Grade	0.17	0.40	0.76	0.97	1.18
Speculative-Grade	0.12	0.97	3.44	8.84	18.80	Speculative-Grade	1.34	5.57	14.45	21.37	30.50
All Rated	0.03	0.49	1.63	4.32	5.99	All Rated	0.58	3.00	6.96	11.25	10.56

EXHIBIT 11

One- and Three-Year Default Rates by Alphanumeric Rating Conditional on Outlook

One-Year						Three-Year					
Rating	Watch Up	Positive	Stable	Negative	Watch Down	Rating	Watch Up	Positive	Stable	Negative	Watch Down
Aaa	NA	NA	0.00	0.00	0.00	Aaa	NA	NA	0.00	0.00	0.00
Aa1	0.00	0.00	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	Aa2	0.00	0.00	0.00	0.00	0.00
Aa3	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	A1	0.00	0.00	0.00	0.00	0.00
A2	0.00	0.00	0.10	0.33	0.11	A2	0.00	0.94	0.14	1.04	0.10
A3	0.00	0.00	0.18	0.00	0.00	A3	0.00	0.00	1.51	0.72	0.73
Baa1	0.00	0.00	0.36	0.20	1.21	Baa1	0.00	0.00	1.33	0.55	1.10
Baa2	0.00	0.00	0.21	0.54	1.15	Baa2	0.27	0.82	0.46	1.23	3.38
Baa3	0.00	0.20	0.60	1.25	2.26	Baa3	1.11	1.01	2.42	3.62	4.89
Ba1	0.00	0.00	0.48	0.14	3.22	Ba1	0.39	0.00	2.60	2.36	8.37
Ba2	0.00	0.00	0.42	1.99	3.29	Ba2	1.95	0.15	1.56	8.32	10.60
Ba3	0.00	0.11	1.27	1.16	8.68	Ba3	1.69	1.52	7.65	8.97	12.21
B1	0.00	0.98	2.53	5.07	12.03	B1	0.00	4.05	15.24	16.35	24.65
B2	0.00	1.12	4.23	8.83	31.03	B2	0.00	4.59	18.20	22.40	50.42
B3	0.00	1.03	5.94	13.12	37.21	B3	1.40	14.63	21.76	30.87	56.35
Caa1	3.70	3.82	8.43	14.93	43.21	Caa1	1.72	25.33	29.13	32.59	54.69
Caa2	0.00	4.55	14.72	19.98	40.88	Caa2	15.79	23.69	24.32	33.10	54.30
Caa3	0.00	15.32	9.31	16.30	38.57	Caa3	80.00	33.33	25.41	22.85	50.61
Investment-Grade	0.00	0.03	0.19	0.32	0.53	Investment-Grade	0.17	0.40	0.76	0.97	1.18
Speculative-Grade	0.12	0.97	3.44	8.84	18.80	Speculative-Grade	1.34	5.57	14.45	21.37	30.50
All Rated	0.03	0.49	1.63	4.32	5.99	All Rated	0.58	3.00	6.96	11.25	10.56

EXHIBIT 12

One-Year Rating Transition Rates Conditional on Outlook and Lagged Rating Action

Rating t	Outlook t	Upgraded t-1			Unchanged t-1			Downgraded t-1		
		Upgraded t+1	Unchanged t+1	Downgraded t+1	Upgraded t+1	Unchanged t+1	Downgraded t+1	Upgraded t+1	Unchanged t+1	Downgraded t+1
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 Grade	Watch Up	14.8	80.0	5.2	67.7	30.5	1.8	0.0	100.0	0.0
	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 Grade	Watch Up	38.5	57.7	3.8	73.2	20.1	6.7	46.2	46.2	7.7
	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 13

Three-Year Rating Transition Rates Conditional on Outlook and Lagged Rating Action

Rating t	Outlook t	Upgraded t-1			Unchanged t-1			Downgraded t-1		
		Upgraded t+1	Unchanged t+1	Downgraded t+1	Upgraded t+1	Unchanged t+1	Downgraded t+1	Upgraded t+1	Unchanged t+1	Downgraded t+1
Aaa	Watch Up	NA	NA	NA	0.0	76.9	23.1	NA	NA	NA
	Positive	NA	NA	NA	0.0	100.0	0.0	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 Grade	Watch Up	54.8	39.6	5.7	54.6	38.8	6.6	84.8	8.7	6.5
	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 Grade	Watch Up	74.4	13.4	12.2	76.6	10.4	13.0	85.7	4.4	9.9
	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 14

Three-Year Rating Transition Rates Conditional on Outlook and Rating History—All Rated Issuers

Outlook	Upgraded t-1			Unchanged t-1			Downgraded t-1		
	Upgraded t+1	Unchanged t+1	Downgraded t+1	Upgraded t+1	Unchanged t+1	Downgraded t+1	Upgraded t+1	Unchanged t+1	Downgraded t+1
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

outlooks to positive outlooks, highlighting the effectiveness of outlooks as signals of default risk even after rating history has been controlled for.

Note, however, 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 risk of default for issuers with negative outlooks that were downgraded within the last year is nearly 4 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 16, excerpted from the three-year default rates in Exhibit 15, highlights this finding. Exhibit 16 shows bivariate three-year default rates for B-rated issuers. Reading across the columns of the table, we see the data confirm 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 may be 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. 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,

Exhibit 15 shows 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.

On balance, the combined impact of rating history and outlook on the probability of default is not easily disentangled. While we can conclude with some certainty that outlooks are a sufficient statistic for the probability of a credit rating change, default rates continue to exhibit a weak but positive relationship with past rating changes.

VI. CONDITIONAL DEFAULT PREDICTION ACCURACY

An important question is whether and how much the effects of outlook status and rating history matter to the ability of credit ratings to rank-order the likelihood of default. There are several ways to evaluate the accuracy of credit rating systems.¹² The method we use 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 scores.

Like a correlation statistic, the values of an AR score lie between negative one and positive one, where one represents a perfect relative ordering of credit risk—that is, all defaulters in the population received the lowest credit rating, while all non-defaulters received the highest.

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 0.648 at the three-year time horizon.¹³

EXHIBIT 15

One- and Three-Year Default Rates Conditional on Outlook and Lagged Rating Action

One-Year					Three-Year				
Rating t	Change t-1	Watch Up/Positive	Stable	Watch Down/Negative	Rating t	Change t-1	Watch Up/Positive	Stable	Watch Down/Negative
Aaa	Upgraded	NA	0.00	0.00	Aaa	Upgraded	NA	0.00	0.00
	Unchanged	NA	0.00	0.00		Unchanged	NA	0.00	0.00
	Downgraded	NA	NA	NA		Downgraded	NA	NA	NA
Aa	Upgraded	0.00	0.00	0.00	Aa	Upgraded	0.00	0.00	0.00
	Unchanged	0.00	0.00	0.00		Unchanged	0.00	0.00	0.00
	Downgraded	0.00	0.00	0.00		Downgraded	0.00	0.00	0.00
A	Upgraded	0.00	0.00	0.00	A	Upgraded	0.61	1.22	0.00
	Unchanged	0.00	0.11	0.13		Unchanged	0.22	0.62	0.62
	Downgraded	0.00	0.00	0.00		Downgraded	0.00	0.00	0.82
Baa	Upgraded	0.00	0.00	4.55	Baa	Upgraded	1.32	1.38	4.83
	Unchanged	0.06	0.39	0.78		Unchanged	0.53	1.57	1.99
	Downgraded	0.00	0.33	1.74		Downgraded	0.00	0.23	1.81
Ba	Upgraded	0.00	0.47	3.23	Ba	Upgraded	0.14	2.09	7.58
	Unchanged	0.04	0.83	1.64		Unchanged	0.87	5.35	7.03
	Downgraded	0.00	1.21	6.04		Downgraded	2.49	3.84	8.92
B	Upgraded	0.00	1.26	34.78	B	Upgraded	5.19	12.96	50.21
	Unchanged	0.99	3.94	10.32		Unchanged	5.58	17.74	23.04
	Downgraded	1.67	6.37	19.21		Downgraded	6.29	21.59	28.61
Caa	Upgraded	7.14	0.00	9.09	Caa	Upgraded	9.18	13.39	3.85
	Unchanged	9.86	9.35	16.54		Unchanged	30.62	23.24	24.14
	Downgraded	21.05	29.51	38.76		Downgraded	15.12	42.51	37.02
Investment-Grade	Upgraded	0.00	0.00	1.49	Investment-Grade	Upgraded	0.70	0.97	1.94
	Unchanged	0.02	0.21	0.34		Unchanged	0.30	0.92	0.96
	Downgraded	0.00	0.15	0.99		Downgraded	0.00	0.10	1.26
Speculative-Grade	Upgraded	0.47	0.75	15.38	Speculative-Grade	Upgraded	1.96	6.70	20.02
	Unchanged	1.28	3.39	9.22		Unchanged	5.77	14.33	17.95
	Downgraded	5.10	9.03	23.01		Downgraded	7.04	20.96	28.94
All Rated	Upgraded	0.20	0.33	8.33	All Rated	Upgraded	1.29	3.40	10.62
	Unchanged	0.60	1.65	4.05		Unchanged	2.84	7.07	7.14
	Downgraded	3.65	4.80	15.46		Downgraded	4.80	11.03	20.46

In light of our findings that there are wide differences in mean default rates within a rating category when rates are conditioned on rating histories and outlooks, we ask whether there is another ordering of credit ratings, adjusting for rating history and outlook, that would result in a higher accuracy ratio. Or, what adjustments to an obligor's unconditional credit rating for rating history and outlook are necessary in order to form credit rating categories with homogeneous default risk?

Our procedure entails a grid search of various rating notch adjustments for outlook status, Watchlist status, and past rating action, ranging from +3 (notched up by three alphanumeric categories) to -3 (notched down by three alphanumeric categories) for positive and negative conditions, respectively. The three-year accuracy ratio associated with each of these notching rules is recorded and compared.

Intuitively, our results so far suggest issuers that experienced a rating downgrade in the last year or had a negative outlook or review should have their unconditional credit ratings adjusted downward, while issuers upgraded in the past year or that had a positive outlook/review should have their unconditional ratings notched upward.

The grid search is confined to reasonable sets of notching rules; any mapping that, for example, suggested a downward rating adjustment for a past upgrade or positive condition was ruled out. In addition, we confine our attention to uniform rating notch adjustments (i.e., adjustments that are not a function of rating level, except for possible differences between the investment-grade and speculative-grade rate subsamples), and symmetric adjustments to ratings for positive and negative conditions.

EXHIBIT 16

Three-Year Default Rates Conditional on Outlook and Rating History—B-Rated Issuers

Change t-1	Rating Outlook t				
	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



Strongly increasing default rates

 Weakly increasing default rates

EXHIBIT 17

Impact of Rating Notch Adjustments on Accuracy Ratio

Watchlist	Outlook	Rating History	AR
3	2	1	0.71359
3	2	0	0.71174
2	2	1	0.71081
2	2	0	0.70794
2	1	1	0.71272
2	1	0	0.70942
1	1	1	0.70608
1	1	0	0.70047
1	0	1	0.68395
1	0	0	0.66898
0	0	1	0.65748
0	0	0	0.64845

The grid search generates several plausible notching rules that improve the accuracy ratio. Exhibit 17 summarizes these results. The average unconditional accuracy ratio across all cohorts is 0.648. Adjusting credit ratings on the Watchlist by two notches and outlooks by one notch, with no adjustment for rating history, raises the accuracy ratio to 0.709. Adjusting more aggressively—three notches for rating reviews and two notches for outlooks—increases the accuracy ratio to 0.712. Adding a one-notch adjustment for rating history increases the accuracy ratio by just 0.002, to 0.714.

These results suggest that most of the improvement in accuracy is achieved by adjusting ratings on review by two notches and ratings with outlooks other than stable by one notch, with no adjustment for rating history. While it is tempting to favor the more aggressive rating adjustment scheme because of its higher accuracy ratio, it is

uncertain whether this specific set of adjustments would continue to maximize the AR score over a longer period that would include credit cycle expansions as well as contractions. As we noted earlier, our sample period is one of acute credit stress, coinciding almost perfectly with the peak and trough of a historically severe credit cycle.

Similarly, the marginal gain in accuracy by adjusting for rating actions in the last year—a mere 0.002—may not be justified over other sample periods. Ultimately, this is an empirical question that only more data will allow us to answer.

The rating adjustments shown in Exhibit 17 have a powerful impact on the measured accuracy of Moody's ratings. The difference between the unconditional AR and the AR based on the proposed rating adjustments (two notches for Watchlist and one notch for outlook, and no notching for rating history) is economically significant, more than enough to close the accuracy gap between Moody's credit ratings and bond yield implied credit risk measures, which are historically more accurate than credit ratings (and more volatile) over short time horizons.¹⁴

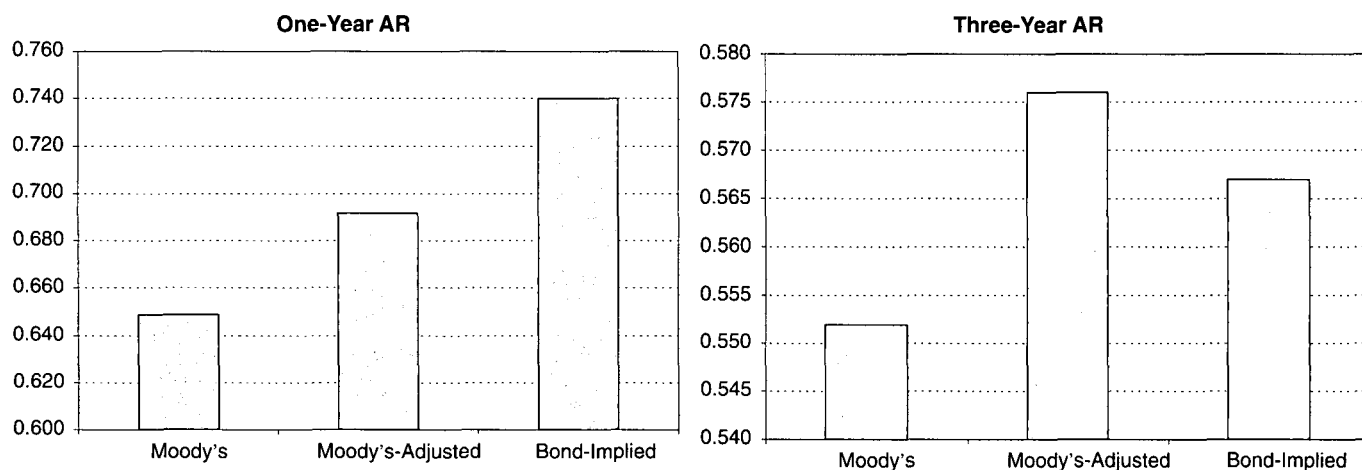
Exhibit 18 shows the comparative AR scores for Moody's credit ratings and bond yield implied ratings at a one- and three-year horizon for the 1999-2003 time period.¹⁵ At the one-year horizon, the AR score of Moody's credit ratings improves (to 0.692 from 0.649), but falls short of the AR score for the bond yield implied ratings (0.74). At a three-year horizon, however, the Moody's-adjusted rating scale AR score surpasses that of the bond yield implied ratings by nearly a full percentage point.

VII. CONCLUSION

The statistical results we report 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

EXHIBIT 18

Moody's Adjusted Ratings versus Bond Implied Ratings AR (1999-2003)



research, we find that credit ratings exhibit positive serial correlation, except that serial correlation in credit rating changes largely disappears when rating changes are conditioned on outlooks and rating reviews. Rating reviews and outlooks are strong signals of rating change in the same direction, while stable outlooks are the best indicator of no future credit rating change.

The results are somewhat different 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 not strong enough to materially improve the conditional accuracy of the rating system. When measured against a broader benchmark, however, (the three-year accuracy ratio), outlook/review status does appear to be a sufficient measure of conditional credit risk, and there appears to be no need to also track an obligor's past rating history.

The interpretation of these empirical findings is that a considerable amount of the within-rating heterogeneity—which biases unconditional estimates of the probability of a rating change and default—can be controlled by conditioning on rating outlooks and reviews. 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.

Although our sample period is relatively brief, and coincides nearly perfectly with the peak and trough of a particularly severe credit cycle, our results demonstrate that conditioning on outlook and Watchlist designations

significantly enhances the information content of Moody's credit rating system.

ENDNOTES

¹Moody's introduced numerically modified ratings for ratings between Aa and B in 1982, and numerically modified Caa ratings in 1997.

²We use the terms *rating review* and *Watchlist* interchangeably.

³We do not address whether factors external to Moody's credit ratings—such as the business cycle—might improve their accuracy. Kim [1999], Nickell, Perraudin, and Varotto [2000], and Cantor and Mann [2003a] analyze the cyclical properties of rating transition rates.

⁴Issuer ratings are opinions of the ability of firms to honor senior unsecured financial obligations and contracts.

⁵Moody's ratings are opinions about expected credit loss, which includes 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].

⁶In this context, defaults and rating withdrawals are not rating transitions; they represent the two ways a debt issuer can leave the Moody's-rated pool.

⁷Keenan, Fons, and Carty [1998] discuss Moody's Watchlist assignment policies as well as detailed statistical characteristics of rating reviews.

⁸The outlook length statistics reported in Exhibit 1 are only for the set of outlooks that have been terminated.

⁹In 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. First, 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. Second, the sample period includes the 2000–2002 time period, which delivered perhaps the most adverse credit environment since the 1930s. As a result, the ratio of positive outlooks and rating reviews to negative outlooks and reviews is also likely to be higher in the future.

¹⁰Exhibit 4 does not include downgrades associated with an event of default. In this article, we treat rating downgrades and defaults as mutually exclusive states.

¹¹The transition rate estimates for the cases where outlook and lagged rating action disagree are in many cases based on few 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.

¹²See Sobehart, Keenan, and Stein [2000] and Cantor and Mann [2003b] for a description of several methods.

¹³Moody's ratings during the 1996–2003 sample period were less accurate on average than its long-term average accuracy and its more recent performance.

¹⁴For example, as reported in Cantor and Mann [2003b], on a matched sample, ratings implied from bond spreads were more accurate than Moody's unconditional bond ratings by 1.6 percentage points.

¹⁵The bond yield implied ratings were derived by estimating the historical term structure of the median spread over U.S. Treasuries for each rating category. Cutoffs between the rating categories are created according to these curves so that the logarithms of the cutoffs between any two median curves are equally spaced. Ratings on the Watchlist were excluded in fitting the curves.

The time period available for comparison is limited by the availability of corporate bond yield data. We limited the data set to include bonds with terms greater than or equal to one year; outstandings greater than or equal to USD100 million; no external support; USD-denominated; and straight coupon bonds. Callable/puttable, private placements, sinkable, and zero-coupon bonds are retained only if the issuer has no other bonds in the data set without such features.

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