Migration Behavior of Long-Term Bond Ratings of Canadian Corporate Issuers

CREDIT RISK MANAGEMENT HAS EVOLVED FROM INDIVIDUAL TO PORTFOLIO RISK MANAGEMENT, WHERE THE CO-MOVEMENTS IN THE RATING MIGRATIONS OF INDIVIDUAL BONDS ARE IMPORTANT

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In portfolio building, individual investors and asset managers make decisions about asset mix and the level of diversification both across and within asset classes (such as stocks and bonds). Inputs into these decisions include the expected returns, risks and return co-movements of each asset class and each individual asset being considered in the portfolio-building process. To effect such decisions, individual investors and asset managers often use bond ratings to measure the credit worthiness or quality of bond issues. Bond ratings provide a relative risk metric that facilitates portfolio building by allowing risk-adjusted return comparisons between various bonds and between bonds and other assets.

As individual investors and asset managers bear more risk in their bond portfolios, either to achieve higher expected returns or due to a decline in the supply of high-quality bond issues, they need a better understanding of how bond ratings migrate over time. Furthermore, regulatory pressures provide added impetus for asset managers at financial institutions such as the banks to develop accurate methods for the measurement, management and control of the credit risk of their asset portfolios.

Credit quality movements by issuers over time, as captured in measures such as transition rating matrices, represent an important element in quantitative approaches to manage credit risk in a portfolio context. Credit evaluation systems generally use the bond ratings of the underlying credit (issuer) even though these ratings may not be the most accurate indicator.

The literature on bond rating migration deals primarily with U.S. issuers. Thus, the primary purpose of this paper is to examine various aspects of the migration of bond ratings for Canadian corporate issuers. To this end, we examine a sample of bond rating migrations for senior, unsecured, long-term bonds rated by the Canadian Bond Rating Service (CBRS) for 395 corporate issuers over the 25-year period 1973-1998 and by Moody's for 195 corporate issuers over the 16-year period 1982-1998.

THE SAMPLE

Our sample consists of all such issues found in CBRS's proprietary database, Moody's Credit Opinions (January 1992 to July 1999), and Bloomberg. The beginning date for the Moody's sample coincides with its significant increase in coverage of Canadian-domiciled issuers in 1982.

Our sample issuers are categorized as being industrial, natural resource, utility or financial firms. Over the studied period, the relative shares of natural resource and utility issuers in number remained fairly stable around 20% and 10%, respectively. The largest category of

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TABLE 1. THE AVERAGE RATING TRANSITION MATRIX FOR A ONE-YEAR TRACKING HORIZON

This table presents the average rating transition probabilities (in percentages) for a one-year tracking horizon based on CBRS-rated issuers over the 1973-1998 time period. WR refers to a withdrawn rating.

Rating	Rating To:																			
From:	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	C	D	WR	Total
AAA	86.99	4.29	4.87	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.41	100.00
AA+	2.81	84.73	4.03	5.38	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.48	100.00
AA	1.57	4.02	83.36	4.14	0.43	2.96	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.21	100.00
AA-	0.00	0.83	5.23	74.01	4.21	11.45	1.28	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.63	100.00
A+	0.00	0.00	3.78	0.95	82.62	6.69	1.68	0.90	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.12	100.00
A	0.15	0.00	2.21	0.11	3.54	79.31	4.60	0.32	2.83	0.23	0.00	0.46	0.00	0.00	0.11	0.00	0.00	0.00	6.12	100.00
A-	0.00	0.00	1.60	0.00	1.28	9.36	71.99	4.54	3.12	2.04	0.00	0.42	0.00	0.00	0.33	0.00	0.00	0.00	5.31	100.00
BBB+	0.00	0.00	0.00	0.00	1.04	6.10	8.45	72.74	3.75	1.92	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	5.57	100.00
BBB	0.00	0.00	0.35	0.00	0.00	4.84	1.26	4.76	75.72	4.38	0.18	2.18	0.71	0.00	0.18	0.00	0.00	0.00	5.43	100.00
BBB-	0.00	0.00	0.00	0.00	1.56	0.00	2.03	1.56	11.55	59.29	2.47	6.17	1.59	0.00	0.48	0.00	0.00	0.00	13.29	100.00
BB+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31	9.17	5.39	54.78	11.13	1.18	0.00	0.00	0.00	0.00	0.00	16.04	100.00
BB	0.00	0.00	0.00	0.00	0.69	0.23	0.00	0.00	4.65	3.42	10.23	59.50	0.51	0.00	4.03	0.00	1.54	0.11	15.07	100.00
BB-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.67	50.00	0.00	8.33	0.00	0.00	0.00	25.00	100.00
B+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00	100.00
B	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	4.45	2.17	1.09	65.55	1.84	5.45	0.00	19.10	100.00
B-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.56	66.67	5.56	0.00	22.22	100.00
C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00	1.67	5.00	64.04	1.00	27.67	100.00
D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00	0.00	100.00

issuers in number was the industrials, which represented about 65% of the issuers in 1975, and more than 40% of the issuers in 1998. The relative share of financial issuers in number increased markedly with the deregulation of the Canadian financial sector in 1986, and returned to much lower levels during 1997 and 1998.

ANALYSIS OF RATING TRANSITION MATRICES

Rating transition matrices with 18 and 19 states (rating categories) for horizons of one through 10 years are computed for our sample issuers. Each cell in, for example, the one-year transition matrix reports the probability of an issuer migrating from one rating state to another over the course of a twelve-month horizon. For tracking horizons over a year, the estimate reported in each cell is the average of the corresponding cell's likelihood calculated annually for a one-year horizon over a given number of years.

Table 1 reports the transition matrix for a one-year tracking horizon for bonds rated by CBRS over the 1973-1998 period. Its on-diagonal elements are the probabilities of the various rating categories maintaining their initial ratings. All but one of the on-diagonal probabilities (i.e., for bonds rated B+) exceed 50%, and their off-diagonal probabilities tend to be considerably and progressively smaller as one moves away from their corresponding on-diagonal probabilities.[1] These results are consistent with the U.S. findings reported by Altman and Kao (1992), Carty (1997), Carty and Fons (1993) and Bahar and Brand (2000) for U.S. issuers. They imply that the credit qualities of issuers generally remain stable over a one-year horizon with few large credit quality movements.

In the interest of brevity, we do not include the tables of transition matrices for longer tracking horizons of two, three, five and 10 years. However, an examination of these undisplayed results indicates that the on-diagonal probabilities of retaining specific bond ratings tend to decrease substantially with a longer tracking horizon. To illustrate, the probability of retaining an AAA bond rating is 87%, 76%, 66%, 47% and 20% over a one-, two-, three-, five- and 10-year tracking horizon, respectively. Over a two-year tracking horizon, the probability of an issuer maintaining its original credit rating is below 50% for all rating categories of BBB- or lower, with the exception of the C rating where it is about 56%. Over a five-year tracking horizon, most investment-grade issuers have a somewhat greater chance of a bond rating upgrade or downgrade than maintaining their initial rating. In contrast, the likelihood of a change in the bond rating is over 70% for most speculative-grade issuers. Hence, as the tracking horizon gets longer, all issuers are more likely to undergo a credit quality rating movement.

Results for CBRS-rated bonds for the 1988-1998 period yield similar but greater probabilities of migration, which may be partially due to this period's smaller sample size. Furthermore, rating stability for this shorter time period deteriorates more quickly for sub-investment-grade compared to investment-grade issuers.

When we examine the directional change (upgrade/downgrade) that each category of ratings follows over various tracking horizons for CBRS–rated bonds for the 1973-1998 period, we find downgrading is more likely as the tracking horizon lengthens for issuers at the higher end of the rating spectrum (namely, AA+, AA

and AA-). This is consistent with U.S. studies which find that highly rated issuers exhibit a propensity to be downgraded rather than being upgraded. Conversely, the highest sub-groups of B-rated debtors, namely BBB+ to BB, exhibit an increasing tendency to be upgraded as the tracking horizon lengthens.

We find that speculative-grade issuers generally display a lower frequency of migration when rated by Moody's than by CBRS for all tracking horizons. To illustrate, for a BB-/Ba3-rated bond issuer, the likelihood of maintaining the current bond rating for tracking horizons of one, two, three and five years are 79%, 67%, 38% and 33% for issuers rated by Moody's, and 43%, 33%, 0% and 0% for issuers rated by CBRS.

BOND RATING MIGRATION ACTIVITY, DRIFT AND MOMENTUM

The bond rating activity ratio is calculated by dividing the number of issuers with rating changes during the year by the number of issuers rated during the year (Carty, 1997). Based on Table 2, the highest annual rating activity ratios of about 65% in 1982 and 76% in 1991 occur during the last two economic recessions. These results suggest, as expected, that the level of economic activity is an important determinant of bond rating activity at the rating agencies.

The rating drift ratio measures whether bond rating movements have predominantly improved or deteriorated over time, and what the relative change has been. The rating drift ratio is found by first subtracting the total number of downgrades from the total number of upgrades, and then dividing this difference by the number of issuers rated during the year.

Based on the rating drift ratios reported in Table 2, the bond ratings of Canadian issuers improved during each of the years in the 1975-1980 period, and they deteriorated substantially during each of the years in the 1982-1983 and 1990-1993 periods. While the rating drift ratios differ appreciably for CBRS- and Moody's-rated bonds during each of the years in the 1985-1989 period, this may be due to coverage of fewer issuers by Moody's during this period of time.

An analysis of rating momentum involves a test of the notion that an upgrade (downgrade) in bond rating to a given rating (say triple-B) over a past period (say the year 2000) provides no information about the direction of subsequent rating changes over the next period (say the year 2001). To illustrate, assume that an upgrade to a triple-B rating indicates upgrade momentum. This means that an issuer that is upgraded to a triple-B rating over the current year (say 2000) is more likely to experience a bond rating upgrade rather than a bond rating downgrade over the next year (say 2001). Based on unreported results, we find that no upward or downward momentum appears to exist for all rating categories.

TABLE 2. RATING ACTIVITY AND DRIFT

This table reports the annual rating activity ratios and rating drift ratios (in percentages) for the bonds rated by CBRS and by Moody's for bonds rated over the period 1974-1998.

	Raiting Activity Ratio (%)		Rating Drift (%)	
Year	CBRS	Moody's	CBRS	Moody's
1974	14.29		-6.77	
1975	13.99		13.99	
1976	22.92		6.25	
1977	38.81		4.48	
1978	16.67		5.07	
1979	24.44		15.56	
1980	41.09		36.43	
1981	32.31		0.00	
1982	65.08		-28.57	
1983	39.10	30.77	-4.51	-15.38
1984	26.97	23.08	7.24	7.69
1985	33.10	12.50	6.90	0.00
1986	51.77	25.00	7.80	-15.00
1987	28.87	44.00	19.01	-4.00
1988	55.33	21.21	22.00	3.03
1989	36.69	20.51	8.28	0.00
1990	40.99	32.56	-34.78	-23.26
1991	76.11	63.46	-53.89	-48.08
1992	33.52	54.10	-25.70	-34.43
1993	41.71	28.57	-22.29	-8.57
1994	16.77	18.42	10.56	-5.26
1995	31.01	18.60	12.03	0.00
1996	9.88	10.38	-1.23	2.83
1997	12.65	10.17	3.01	6.78
1998	15.64	25.69	-8.94	-4.86
Mean, 1974-1998	32.79	27.44 -	0.32	-8.66
Sigma, 1974-1998	0.17	0.15	0.20	0.15
Mean, 1974-1979	21.85	N/A	6.43	N/A
Sigma, 1974-1979	0.09	N/A	0.08	N/A
Mean, 1980-1989	41.03	25.30	7.46	-3.38
Sigma, 1980-1989	0.12	0.10	0.17	0.09
Mean, 1983-1989	38.83	25.30	9.53	-3.38
Sigma, 1983-1989	0.11	0.10	0.09	0.09
Mean, 1990-1998	30.92	29.11	-13.47	-12.76
Sigma, 1990-1998	0.21	0.19	0.22	0.19
Mean, 1989-1998	31.50	28.25	-11.29	-11.48
Sigma, 1989-1998	0.20	0.18	0.22	0.18

CONTEMPORANEOUS CORRELATION OF BOND RATING MIGRATIONS ACROSS ISSUERS

Each issuer rated by CBRS has the possibility over the upcoming year to migrate to one of 17 different rating categories, to undergo no rating change or to have its rating withdrawn. Consequently, a pair of issuers with the same rating (assumed to be a triple-B) at the end of a year has 361 (19x19) migration possibilities over the course of the upcoming year. Assuming that rating migrations are not contemporaneously correlated, the likelihood that each individual issuer migrates to each of the 19 possible outcomes is equal to the transition rating likelihood reported for the triple-B rating category in Table 1, or by the numbers given in the first column of the joint rating matrix presented in Table 3. The required

TABLE 3. JOINT RATING TRANSITION MATRIX ASSUMING NO BOND RATING MIGRATION CORRELATIONS ACROSS ISSUERS WITH THE SAME INITIAL BOND RATING OF BBB

This table is based on two, initially rated BBB issuers. The probabilities are calculated using bonds rated by CBRS since 1973. WR refers to a withdrawn rating.

table 3

		SECOND ISSUER'S END-OF-PERIOD RATING																			
		AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	C	D	WR	
		0.00	0.00	0.35	0.00	0.00	4.84	1.26	4.76	75.72	4.38	0.18	2.18	0.71	0.00	0.18	0.00	0.00	0.00	5.43	
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AA+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AA	0.35	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.27	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.35 AA-
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 A+
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A	4.84	0.00	0.00	0.02	0.00	0.00	0.23	0.06	0.23	3.67	0.21	0.01	0.11	0.03	0.00	0.01	0.00	0.00	0.00	0.26	4.84 A-
1.26	0.00	0.00	0.00	0.00	0.00	0.06	0.02	0.06	0.96	0.06	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.07	1.26	BBB+
4.76	0.00	0.00	0.02	0.00	0.00	0.23	0.06	0.23	3.61	0.21	0.01	0.10	0.03	0.00	0.01	0.00	0.00	0.00	0.26	4.76	BBB
75.72	0.00	0.00	0.27	0.00	0.00	3.67	0.96	3.61	57.34	3.32	0.14	1.65	0.54	0.00	0.14	0.00	0.00	0.00	4.11	75.72	BBB-
4.38	0.00	0.00	0.02	0.00	0.00	0.21	0.06	0.21	3.32	0.19	0.01	0.10	0.03	0.00	0.01	0.00	0.00	0.00	0.24	4.38	BB+
0.18	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.18	BB
2.18	0.00	0.00	0.01	0.00	0.00	0.11	0.03	0.10	1.65	0.10	0.00	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.12	2.18	BB-
0.71	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.03	0.54	0.03	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.04	0.71	B+
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	B
0.18	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.18	B-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	D
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	WR
5.43	0.00	0.00	0.02	0.00	0.00	0.26	0.07	0.26	4.11	0.24	0.01	0.12	0.04	0.00	0.01	0.00	0.00	0.00	0.29	5.43	
		0.00	0.00	0.35	0.00	0.00	4.84	1.26	4.76	75.72	0.33	0.01	0.17	0.05	0.00	0.01	0.00	0.00	0.00	5.43	100.00

TABLE 4. EMPIRICAL JOINT RATING TRANSITION MATRIX REFLECTING HISTORICAL BOND RATING MIGRATION CORRELATIONS ACROSS ISSUERS WITH THE SAME INITIAL BOND RATING OF BBB

This table is based on two, initially rated BBB issuers. The probabilities are calculated using bonds rated by CBRS since 1973. WR refers to a withdrawn rating.

table 4

		SECOND ISSUER'S END-OF-PERIOD RATING																			
		AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	C	D	WR	
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AA+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AA	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.01	0.04	0.23	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.35
AA-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 A+
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
A	0.00	0.00	0.00	0.01	0.00	0.00	0.62	0.08	0.27	3.40	0.13	0.00	0.11	0.01	0.00	0.00	0.00	0.00	0.00	0.21	4.84 A-
0.00	0.00	0.00	0.01	0.00	0.00	0.08	0.07	0.07	0.81	0.09	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.10	1.26	BBB+
0.00	0.00	0.00	0.04	0.00	0.00	0.27	0.07	0.55	3.20	0.26	0.01	0.10	0.03	0.00	0.00	0.00	0.00	0.00	0.24	4.76	BBB
0.00	0.00	0.00	0.23	0.00	0.00	3.40	0.81	3.20	59.25	2.71	0.10	1.53	0.46	0.00	0.15	0.00	0.00	0.00	3.88	75.72	BBB-
0.00	0.00	0.00	0.02	0.00	0.00	0.13	0.09	0.26	2.71	0.64	0.02	0.15	0.09	0.00	0.00	0.00	0.00	0.00	0.27	4.38	BB+
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.10	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.18	BB
0.00	0.00	0.00	0.01	0.00	0.00	0.11	0.01	0.10	1.53	0.15	0.01	0.16	0.01	0.00	0.00	0.00	0.00	0.00	0.10	2.18	BB-
0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.46	0.09	0.00	0.01	0.06	0.00	0.01	0.00	0.00	0.00	0.02	0.71	B+
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	B
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.18	B-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	D
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	WR
0.00	0.00	0.00	0.02	0.00	0.00	0.21	0.10	0.24	3.88	0.27	0.02	0.10	0.02	0.00	0.02	0.00	0.00	0.00	0.54	5.43	
		0.00	0.00	0.35	0.00	0.00	4.84	1.26	4.76	75.72	4.38	0.18	2.18	0.71	0.00	0.18	0.00	0.00	0.00	5.43	100.00

joint probability is the product of the probability that an individual triple-B issuer migrates to the BBB- state times the probability that an individual triple-B issuer migrates to the BBB+ category; that is, 4.38% times 4.76%, or 0.21%. This likelihood corresponds to the entry of the (BBB-, BBB+) cell of Table 3.

Consistent with the findings of Carty (1997) for U.S. issuers, the largest cell value of 57.34% corresponds to the likelihood that both triple-B issuers will maintain rating category over the year t+1. The likelihood for any other given rating combination is substantially lower. The cells in the joint rating transition matrix assuming no rating migration cross-correlations are now compared against the corresponding actual likelihoods derived from the rating histories conferred to CBRS-related issuers. The cells in the empirical joint rating matrix reported in Table 4 for CBRS-rated issuers display the joint probability of pairs of triple-B issuers migrating to the left-hand side row and the top column rating states over year t+1.

Comparing groups of corresponding cells from Tables 3 and 4, we note that the sum of the estimated probabilities for the observed co-movements of the rating migrations of issuers is greater than the sum of the correspond-

ing cells of the matrix assuming no rating migration co-movement. To illustrate, the sum of the entries corresponding to an improvement in credit quality for both issuers totals 1.26%, assuming zero rating migration cross-correlations, and 2.20% when they are derived from the observed co-movements of the rating migrations of triple-B issuers. The 1.26% and 2.20% values are obtained by adding up all the entries in the shaded block in the upper left-hand corner of Tables 3 and 4, respectively. Similarly, the aggregate likelihood of pairs of triple-B issuers undergoing a rating deterioration is 0.58% when rating migration cross-correlations are assumed to equal zero, and to be 1.46% when derived from the empirical data. The 0.58% and 1.46% values are obtained by adding up all the entries in the shaded block in the lower right-hand corner of Tables 3 and 4, respectively. Both tables demonstrate the existence of a positive relationship (correlation) between the rating migrations of two Canadian issuers who are initially rated triple-B. A positive correlation means one issuer is more likely to migrate to a higher (or lower) rating if the other identically rated issuer is upgraded (or downgraded) over the year.

CONCLUSION

Consistent with the literature, we find that issuers with high ratings are less likely to undergo a change in bond rating than their lower-rated counterparts. While lenders can assume that bond rating migrations are unlikely over the forthcoming year, they should not expect debtors to maintain their bond ratings over long-term time horizons. In fact, most issuers are expected to have different bond ratings at the end of a 10-year horizon, and high-quality debtors are more likely to migrate to lower than to higher bond ratings.

The evidence indicates that investors will not be able to predict the direction of an issuer's subsequent revision in bond rating by using its most recent change in bond rating since little evidence exists for bond rating momentum. The evidence indicates that the credit ratings of issuers in the same initial rating category (e.g., triple-B) are contemporaneously correlated. This suggests that to achieve the benefits of diversification requires a larger portfolio size (i.e., more bonds in the portfolio).

Our findings have implications for individual and institutional bond investors. Transition rating ratios are useful for an investor restricted to holding top-grade bonds with the expectation that these issues will maintain their credit quality rating. They are equally useful for an investor investing in the mid-market with the expectation of gaining from an expected rating upgrade (Bahar and Brand, 2000). The migration probabilities allow both types of investors to form more realistic expectations. Our findings also should be of interest to sophisticated banks who have become more active in the management of their credit portfolios using risk transfer instruments such as credit derivatives and securitization (Glassman, 2000). The Basel Committee on Banking Supervision (1999) concerned with the adequacy of the capital cushion in the banking sector has moved towards linking the allocation of regulatory capital with credit ratings. Credit risk management has evolved from individual to portfolio risk management, where the co-movements in the rating migrations of individual bonds are important. Our findings can be used to refine internal stressed default rates, to validate maturity exposure limits, or to map internal grades for Canadian corporate bond issuers to credit rating agencies. ✦

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ENDNOTES

1. The transition probabilities for the bonds rated B+ are based on a very small sample size.

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