Update

Sufficient Diversification in Credit Portfolios

- **We revisit our earlier research on Sufficient Diversification in Credit Portfolios to update the analysis through June 30, 2017.**
- **The basis of the analysis is a study of the effect of ratings downgrades on corporate bond returns relative to their peer groups during the month in which a downgrade occurs and in the four quarters prior to this event.**

Based on models presented in our earlier work, this is interpreted to provide some guidance for setting position limits in the form of ratios of position limits for bonds with different credit ratings.

Jay Hyman
+972 3 623 8745
jay.hyman@barclays.com
Barclays, UK

Vadim Konstantinovsky, CFA
+1 212 526 8290
vkonstan@barclays.com
BCI, US

www.barclays.com

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Introduction

One of the main tools for controlling risk in a corporate bond portfolio is issuer diversification. As a result, many portfolio mandates are subject to an investment policy that includes limits on the permitted exposure to a given bond or issuer. How should such limits be set? In particular, should larger positions be allowed in less risky credits, such as those with higher credit ratings?

Several years ago, in *Sufficient Diversification in Credit Portfolios*, we proposed an approach in which the ratio of position sizes for bonds of different credit ratings was based on an empirical study of realized losses due to downgrades. In a follow-up article, *Sufficient Diversification in Credit Portfolios: Balancing Two Approaches*, we updated the data through the end of 2010, and presented a second possible mechanism for setting these ratios based on average DTS[1] levels. In this update, we extend this study through the end of June 2017. Please see the earlier publications for a more complete description of the analysis and the motivations behind it.

Results

Figure 1 provides updated results for the empirical study that forms the backbone of this model. This is an event study of bonds that experienced a downgrade, in which we measure the extent of their underperformance relative to their (pre-downgrade) peer group in the month of the downgrade and the 11 months preceding it.

The left side of Figure 1 shows the statistics of monthly returns relative to a relevant peer group, averaged over all bonds within the specified number of months prior to the downgrade event; the right-hand side shows the statistics of quarterly underperformance. At the bottom right, we present summary statistics for the full-year underperformance.

FIGURE 1

Average Underperformance Due to Downgrades, August 1988 – June 2017

			Monthly		Quarterly and Annual		
Months Prior to Downgrade	**Initial Quality**	**Observations**	**Mean**	**Std Dev**	**Mean**	**Std Dev**	**t-Stat**
Zero to two	Aaa-Aa	1,232	-0.33	3.18	-0.99	5.88	-5.9
	A	2,207	-1.11	6.90	-3.33	11.84	-13.2
	Baa	1,512	-2.70	10.51	-8.09	19.34	-16.3
Three to five	Aaa-Aa	1,232	-0.18	1.75	-0.54	2.68	-7.1
	A	2,207	-0.39	2.99	-1.17	5.22	-10.5
	Baa	1,512	-1.01	5.09	-3.04	7.65	-15.5
Six to eight	Aaa-Aa	1,232	-0.07	1.10	-0.22	1.73	-4.5
	A	2,207	-0.03	2.46	-0.10	4.14	-1.2
	Baa	1,512	-0.60	3.38	-1.79	5.92	-11.8
Nine to 11	Aaa-Aa	1,232	-0.06	0.95	-0.18	1.52	-4.1
	A	2,207	-0.05	2.10	-0.16	3.38	-2.2
	Baa	1,512	-0.10	2.71	-0.29	4.64	-2.4
Full year	Aaa-Aa	1,232			-1.93	7.28	-9.3
	A	2,207			-4.76	13.38	-16.7
	Baa	1,512			-13.22	20.50	-25.1

Source: Bloomberg, Barclays Research

[1] DTS is the product of duration and spread (**D**uration **T**imes **S**pread), which we use as a fundamental measure of credit exposure. See *A New Measure of Spread Exposure in Credit Portfolios*, Barclays Research, 2010.

The results are little changed from our previously published results based on data from August 1988 through December 2010. We find that most of the effect from a downgrade is absorbed in the final few months before the event, with the largest underperformance in the month of the downgrade and the two months preceding it. As we look further back, we find a noticeable underperformance three to five months before a downgrade, and even as far as six to eight months back – for Baa bonds in particular. Nine or more months before a downgrade, bonds do not significantly underperform their peer groups.

Based on this, we built a model in which the empirically measured statistics of losses of downgraded bonds from Figure 1 are combined with observed downgrade frequencies from Moody's to obtain a model of downgrade risk for a particular bond of a given rating. The position size ratios that would equalize the resulting downgrade risks are then calculated as the inverse of the volatility ratio. As shown in Figure 2, this model suggests that positions in Aa bonds that are 2.6 times larger than equivalent positions in Baa bonds would have about the same level of downgrade risk.

There can be large variation from year to year in the number of downgraded bonds, as well as in the magnitudes of the losses they suffer. A summary of the annual experience through the end of 2016 is shown in Figure 3. For each year, we provide the number of downgrade events from each rating category, and the mean and standard deviation of the monthly performance relative to the peer group over the 12 months leading up to the downgrade.

Downgrade risk is not the only source of issuer-specific volatility in corporate bond markets. Even for issuers with stable ratings, there is always some amount of volatility in spreads relative to their peer groups. We have measured this spread volatility as well, and investigated the combination of downgrade risk with this "natural" spread volatility. Once again, we obtain a ratio of position sizes by using the inverse ratio of volatilities. The result of the analysis for a particular period is summarized by a position size ratio showing the relative sizes of equivalent-risk positions in bonds from different credit ratings. For example, a result of 3:2:1 would mean that roughly equal risk would be assigned to a $3mn position in a Aa-rated bond, a $2mn position in an A-rated bond, and a $1mn position in a Baa-rated bond. The results of the model for downgrade risk using data from different periods are shown in Figure 4. The results for the whole period from August 1988 to June 2017 are not very different from the previously published results from April 1990 to December 2010. We now have enough post-crisis data to re-estimate the model using data only since January 2010. These results allow for larger concentrations in Aa and A bonds than the full-period results, although still not as much as the pre-crisis results using data prior to 2008. For any data sample that includes 2008, the losses experienced by financials with ratings of A and even Aa in the crisis substantially increase the estimated risk associated with these ratings.

FIGURE 2

Downgrade-based Model for Diversification, August 1988 – June 2017

Initial rating	Downgrade probability	Statistical losses from downgrades		Expected loss on a single bond		Inverse vol
		Mean	Std Dev	Mean	Std Dev	
Aaa - Aa	8.27	-1.93	7.28	-0.16	2.16	2.6
A	6.40	-4.76	13.38	-0.30	3.59	1.5
Baa	5.21	-13.22	20.50	-0.69	5.57	1

Source: Moody's, Bloomberg, Barclays Research

FIGURE 3

Average Monthly Underperformance Due to Downgrades, over 12 months Prior to Downgrade, by Year of Downgrade Event, 1989-2016

	Observations			Mean (%/month)			Standard Deviation		
	Aaa-Aa	A	Baa	Aaa-Aa	A	Baa	Aaa-Aa	A	Baa
1989	15	30	18	-0.34	-0.20	-0.35	1.42	1.22	1.97
1990	100	85	24	0.02	-0.26	-1.62	0.69	1.56	6.52
1991	134	86	52	-0.05	-0.09	-0.85	0.70	1.38	3.74
1992	85	129	29	0.02	-0.09	-0.30	1.13	1.08	2.35
1993	33	14	35	0.06	0.02	-0.28	1.00	0.72	1.57
1994	8	38	15	-0.08	-0.08	-0.37	0.41	0.96	1.84
1995	51	59	25	0.05	-0.08	-0.45	0.67	1.23	2.52
1996	32	56	35	0.01	-0.05	-0.50	0.51	0.76	4.01
1997	5	77	9	-0.05	-0.16	-0.12	0.43	0.64	0.76
1998	44	59	46	-0.10	-0.27	-0.53	0.86	1.19	2.83
1999	37	58	45	0.00	-0.12	-0.96	1.00	1.23	3.40
2000	46	89	49	-0.05	-0.46	-3.13	0.56	1.80	8.70
2001	30	135	111	-0.26	-0.44	-1.92	1.98	2.78	10.20
2002	68	178	222	-0.14	-0.63	-2.08	2.04	4.50	8.74
2003	59	78	72	-0.03	-0.40	-0.80	1.42	3.03	5.07
2004	8	39	59	0.07	-0.08	-0.13	0.71	1.19	2.28
2005	8	31	99	-0.03	-0.21	-0.95	0.30	1.08	2.86
2006	4	18	45	-0.01	-0.09	-0.37	0.21	0.72	2.65
2007	24	69	68	-0.11	-0.40	-0.66	0.51	1.46	2.48
2008	192	158	61	-0.66	-1.95	-1.47	3.81	9.93	5.10
2009	46	134	71	-0.32	-0.66	-0.79	3.34	9.53	10.57
2010	7	15	27	-1.21	1.11	0.13	3.81	3.61	6.12
2011	75	97	36	-0.16	-0.19	-0.44	1.37	2.74	2.49
2012	70	102	28	-0.07	-0.33	-0.07	1.49	2.28	2.94
2013	27	83	47	-0.04	-0.18	-0.14	0.54	1.54	2.30
2014	7	30	53	0.05	0.02	-0.29	0.43	0.86	2.18
2015	10	201	62	-0.01	-0.09	-1.54	0.74	1.11	4.87
2016	8	79	94	0.03	-0.45	-1.89	0.69	2.23	9.17

Source: Bloomberg, Barclays Research

FIGURE 4

Downgrade Risk and Other Non-systematic Risk; Position Size Ratios for Different Periods

	Downgrade Risk	Other Non-systematic Risk	Total Non-systematic Risk
August 1988 – June 2017			
Aaa - Aa	2.16	2.01	2.95
A	3.59	2.74	4.52
Baa	5.57	4.13	6.93
Position Size Ratio	2.6 : 1.5 : 1.0	2.1 : 1.5 : 1.0	2.3 : 1.5 : 1.0
January 2010 – June 2017			
Aaa - Aa	1.23	1.61	2.03
A	1.90	2.29	2.98
Baa	4.33	3.46	5.54
Position Size Ratio	3.5 : 2.3 : 1.0	2.1 : 1.5 : 1.0	2.7 : 1.9 : 1.0
April 1990 – December 2007			
Aaa - Aa	0.70	1.60	1.75
A	2.08	1.90	2.81
Baa	6.42	2.94	7.06
Position Size Ratio	9.2 : 3.1 :1.0	1.8 : 1.5 : 1.0	4.0 : 2.5 : 1.0
April 1990 – December 2010			
Aaa - Aa	2.37	1.76	2.95
A	4.02	2.42	4.69
Baa	6.19	3.63	7.17
Position Size Ratio	2.6 : 1.5 : 1.0	2.1 : 1.5 : 1.0	2.4 : 1.5 : 1.0

Source: Bloomberg, Barclays Research

We have also suggested a much simpler approach to setting position size limits based on average index DTS levels by credit rating. This allows a much quicker adjustment to market estimates of risk. A time series of the DTS-based position limit ratios for Aaa-Aa bonds and A-rated bonds (both relative to Baa position limits) are shown in Figure 5. This model is suggesting a ratio of approximately 2 : 1.5 : 1, in fairly good agreement with the full-period results of 2.3 : 1.5 : 1 from Figure 4.

FIGURE 5

Ratios of Position Limits of Aaa-Aa and A Issuers Relative to the Limits for Baa Issuers, as per DTS Model, December 1998 – June 2017

Source: Bloomberg, Barclays Research

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