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RATINGS VERSUS SPREADS AS INDICATORS OF PRICE RISK

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Past comparisons of "market ratings," or yield spreads over Treasury rates, and letter grades published by credit rating agencies have focused on the two indicators' respective records in predicting defaults or promptness in reflecting company-specific changes in credit quality. Corporate bond managers who mark to market and are evaluated on the basis of their annual total return, however, care greatly about price sensitivity to market-wide changes in credit risk premiums. Empirical evidence presented in this study indicates that market ratings provide better information on that matter than agency ratings.

1 Introduction and literature review

Disparaging the credit rating agencies is a favorite pastime of corporate bond market participants. Investment managers in this asset class have a vested interest in denigrating ratings in order to persuade prospective clients of the value they add through credit-based security selection. They consequently take pains to point out purported misjudgments of the rating industry's Big Three—Moody's Investors Service, Standard & Poor's, and Fitch Ratings. The frequently asserted corollary is that the market is more adept than the agencies at assessing credit risk, as expressed through the spreads-versus-Treasuries it assigns to individual issues.

Formal comparisons of the letter grades published by the rating agencies and market-based risk measures go back at least as far as the research conducted by the financial scholar Harold Fraine, who drew upon his 1929–1934 participation in investment committee meetings of First Securities Corporation. That work ultimately culminated in the 1958 publication of *Corporate Bond Quality and Investor Experience*, sponsored by the National Bureau of Economic Research (NBER). It was authored by

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W. Braddock Hickman, who had worked under Fraine as assistant director of a 1939–1941 NBER study.

Hickman, who later served as President of the Federal Reserve Bank of Cleveland, compared default rates on issues selected on the basis of *agency ratings* with those of issues selected on the basis of *market ratings*. The study defined an issue's agency rating as the median of the ratings assigned by Moody's, Investors Service, Poor's, Standard Statistics (or Standard & Poor's following those two agencies' 1941 merger), and Fitch. An issue's market rating was defined as the difference between its yield-to-maturity and the yield of a Triple-A issue of the same maturity.

The analysis of default rates, covering the period 1912–1943, divided issues into high-grades and low-grades. High-grades were defined, by agency rating and market rating, respectively, as Triple-A to Triple-B and yield spreads of under 100 basis points (bps). Low-grades were defined as issues with ratings of Double-B or below or yield spreads of 100 bps or more.

Hickman first analyzed the comparative effectiveness of agency and market ratings at the time of issuance. He reported that "the default rates for the agency selections were generally lower for the high-grades and higher for the low-grades than were the market ratings, showing that the agencies had the superior system."[1] Hickman concluded that "the agencies were more effective than the market in predicting life-span default risk at offering."[2]

That finding, Hickman recognized, might have reflected simply the instability of market ratings over long periods. Accordingly, he analyzed separately the one-year default experience of new issues. In this analysis, he reported, "The results were fairly inconclusive; so far as they go, they were in favor of the market rating."[3] Hickman concluded, "There is thus some evidence that the market was a more efficient predictor than the agencies when applied to offerings or outstandings at a given moment of time."[4]

Findings such as Hickman's particularly interested buy-and-hold investors. That description generally fit life insurance companies, the investment concerns of which were the impetus behind the work that Hickman and Fraine before him undertook. The chief concern of such investors was whether a bond would make good on its contractual obligations for timely payment of interest and principal. Under statutory accounting rules, life insurers held bonds in their general accounts at amortized cost,[5] except in cases where a default occurred or was deemed highly probable. Because life insurers did not mark other bonds to market, they would not have been strongly interested in another potential research question: Which are the better guides to market-price risk: agency ratings or market ratings?

That question became more pertinent in later years, as mark to market, total-return-oriented investors, including pension plans, mutual bond funds, and, eventually, hedge funds, became increasingly prominent players in the corporate bond market. Numerous studies have compared the performance of agency ratings and market ratings from the standpoint of promptness in reflecting changes in credit quality. A 2012 study by Dimensional Fund Advisors provides a typical finding of this body of research:

> The financial media treated the recent credit-ratings downgrade of fifteen major US and European banks by Moody's Investors Service as big news. But for the financial markets, it was old news.
>
> In fact, the stocks and bonds of the 15 institutions rallied after the announcement by Moody's on June 21. Not only had the news been widely anticipated as far back as four months ago when the agency indicated the banks would be

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subject to a ratings review, but for up to two years beforehand, markets had been pricing the banks' bonds as riskier than Moody's ratings would indicate.[6]

On the other hand, Grothe (2013) finds that:

. . .the effects of rating actions on market prices are significant and depend on the current state of the market. While during favourable market conditions rating actions are not crucial for market pricing, they become very significant in the periods of crisis.[7]

These studies and others like them focus on changes in individual issuers' credit quality and whether market ratings or agency rating actions[8] respond more quickly to reflect those changes. It is not only when an individual issuer undergoes an idiosyncratic credit quality change, however, that active managers care about which type of credit quality indicator is most reliable. They are also concerned with the price risk of bonds that experience no issuer-specific change in credit risk but are subjected to secondary market volatility arising from increases or decreases in credit risk in the corporate bond universe at large.

Periods of market-wide increases and decreases in corporate credit risk are identified by, respectively, increases and decreases in the risk premiums (nowadays usually defined as yield spreads over default-risk-free Treasuries) of corporate bond indexes. The usual cause of spread widening or tightening is a change in the economic outlook.[9] Accordingly, corporate bond investors who are bearish (bullish) on the economy seek to own issues that are relatively insensitive (sensitive) to changes in market-wide credit risk. Note that the credit-quality-based classification of low-beta and high-beta bonds is distinct from classification of bonds according to their interest rate sensitivity, i.e., short-duration versus long-duration.

A portfolio manager seeking to select issues on the basis of sensitivity to changes in market-wide credit risk can rely on either agency ratings or market ratings. By focusing on these functions, our study breaks new ground in comparing the two types of ratings. As detailed above, previous research compared agency ratings and market ratings on the basis of either their accuracy in gauging default risk or their promptness in responding to issuer-specific changes in credit risk. The following analysis, on the other hand, compares the two types of ratings according to their value as inputs to security selection premised on expected changes in market-wide credit risk. Our findings are also of interest to a risk manager seeking to measure the sensitivity of issues within a portfolio and, by extension, the price risk of the portfolio as a whole.

2 Analysis

Our research strategy was to compare market ratings and agency ratings on the basis of their ability to explain variance in price movements within a sample of speculative-grade, or high-yield bonds. These issues, rated Double-B or lower, display greater sensitivity to general fluctuations in credit risk than investment grade issues, rated Triple-B or higher. For example, in the period December 1996 to December 2016, the monthly standard deviation of the price of the ICE BofAML US High Yield Index was 9.58% versus 5.17% for the investment grade ICE BofAML US Corporate Index, even though the high-yield index was less sensitive to interest rate movements, with an average effective duration of 4.41 during the period versus 6.14 for its investment grade counterpart.

We conducted our analysis on two monthly observation periods, one in which the market-wide credit risk premium decreased substantially and one in which it increased substantially. To isolate as fully as possible the impact of market-wide changes in credit risk, we chose two months in which the market-wide credit risk premium (spread-versus-Treasuries) changed substantially

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but underlying Treasury yields moved very little. Under this plan, the price movement of a bond within our sample should have been mainly a function of its credit risk and only minimally a function of its duration. The two months we selected by these criteria were:

1. *March 2016*. The option-adjusted spread (OAS) on the ICE BofAML US High Yield Index tightened from 775 to 705 basis points, while the effective yield on the ICE BofAML US Treasury Index declined negligibly, from 1.36% to 1.34%. The high-yield index's price change in this month was +3.81%.
2. *December 2015*. The option-adjusted spread (OAS) on the ICE BofAML US High Yield Index widened from 640 to 695 basis points, while the effective yield on the ICE BofAML US Treasury Index rose modestly, from 1.68% to 1.77%. The high-yield index's price change in this month was −3.17%.

In each period we created a random sample of 100 issues from the ICE BofAML US High Yield Index. That universe consists of non-defaulted, nonconvertible, speculative-grade bonds. The index excludes issues of less than one year of remaining maturity. In the period we analyzed, $100 million was the minimum face amount outstanding that qualified for inclusion in the index.

The dependent variable in our analysis was price change during the observation period. The key independent variables we tested were market ratings and agency ratings. As detailed below, we conducted supplementary tests that incorporated additional information provided by the rating agencies and normalized for term risk and for capital structure priority.

For the purposes of this study we defined an issue's market rating as its option-adjusted spread (OAS) over Treasuries, as provided by the ICE BofAML Index System. For agency ratings, we relied on the Composite Ratings assigned to issues in that rating system. These ratings combine the notation systems used by Moody's Investors Service (Ba1, Ba2, Ba3, B1, etc.) and Standard & Poor's and Fitch Ratings (BB+, BB, BB−, B+, B1, etc.) and average those agencies' ratings. For simplicity of exposition, we hereafter refer to market ratings as "spreads" and to agency ratings simply as "ratings."

Table 1 Numerical rating scores linear basis.

Composite rating	Score
BB1	1
BB2	2
BB3	3
B1	4
B2	5
B3	6
CCC1	7
CCC2	8
CCC3	9
CC	10
C	11

Source: ICE BofAML Index System, used with permission.

To make the alphanumeric ratings usable as explanatory variables, we assigned them numerical scores. We employed two alternative specifications. The first was simply a linear numerical score, as shown in Table 1.

Our second specification, detailed in Table 2, took into account the acceleration of default incidence with migration down the rating scale. In this specification we assigned each alphanumeric rating a value equivalent to its mean annual default rate (percentage-of-issuers basis) over the period 1983–2016, as reported by Moody's.

Considering only the alphanumeric ratings might not be fair to the rating agencies. They provide

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Table 2 Numerical scores based on mean annual default rate by percentage of issuers 1983–2016.

Composite rating	Default rate (%)
BB1	5.000
BB2	5.837
BB3	7.263
B1	8.659
B2	16.716
B3	30.141
CCC1	36.893*
CCC2	45.157
CCC3	53.331
CC-C	64.807

*Interpolated to equate percentage-of-percentage increases from B3 to CCC1 and from CCC1 to CCC2 at +22.4%. This need arises from a lack of history on CCC1 and CCC3 prior to 1998, putting CCC1 out of sequence with the monotonic increases exhibited by the other ratings.
Source: ICE BofAML Index System, used with permission.

additional information that could be significant in explaining variance in price movements. Specifically, for each speculative-grade issue that the agencies rate, they also assign either an outlook or a watchlisting, which we refer to collectively as *rating prospects*.

An outlook is an indication that the probable future direction of the rating is positive, stable, or negative. A watchlisting indicates that the rating agency is contemplating a rating revision, pending the resolution of some matter bearing on the issuer's credit risk. For instance, an upgrade may be under consideration on grounds of an issuer's proposed acquisition by a higher-rated company. The agencies will not change the rating unless and until the deal is consummated. (If the agencies were to upgrade on the mere possibility of an acquisition, they would then have to downgrade the company a short while later if the deal fell through for some reason such as an antitrust action. Bondholders strongly object to short-run ratings volatility.)

A watchlisting can be positive, negative, or developing. The last designation addresses situations in which the rating may either rise or fall, depending on the resolution. In our testing we categorized an issue's rating prospect as neutral if it had either a stable outlook or a developing watchlisting.

It may be the case that investors consider rating prospects in deciding how to reprice an issue when general risk premiums rise or fall. For example, when risk premiums decline, investors may be less aggressive in bidding up issues that have negative outlooks than they are in repricing comparably rated issues with stable or positive outlooks. To address this issue, we conducted multiple regression analyses that combined ratings with rating prospects.

We also considered the possibility that term risk introduced noise into our analysis. Bond maturities within our bull market sample ranged from 1.3 years to 30.6 years. The range for the bear market sample was 1.6 years to 24.4 years.

Term risk is ordinarily associated with changes in interest rates, rather than changes in credit risk premiums. It is true, however, that a change in OAS of a given number of basis points will ordinarily produce a bigger price change in a long-dated bond than short-dated one of the same issuer and capital structure priority. Figure 1 shows that within the BB sector, price returns generally rose by maturity range during our bull market observation period. (Discontinuities such as the one observed in the 7–10 year range in this example are generally attributable to idiosyncratic changes in credit quality at issuers that are over- or underrepresented within a particular maturity basket.)

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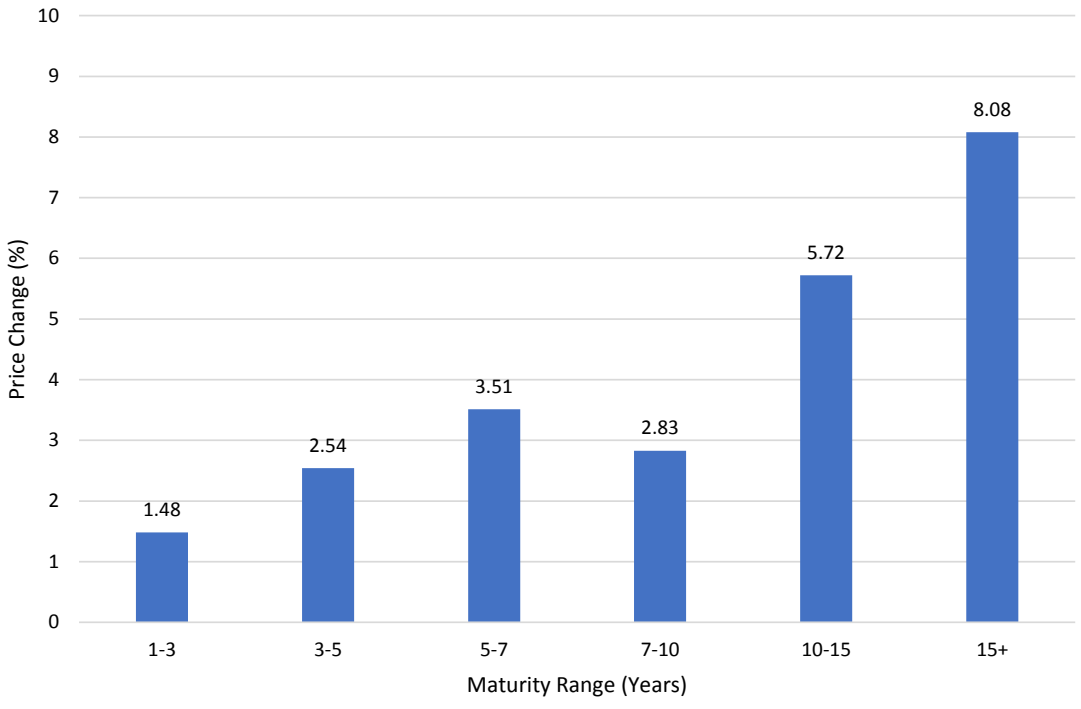

Figure 1 Price change by maturity—BB issues, March 2016.

To normalize for variance in term risk within our samples, we introduced an additional independent variable, effective duration, as provided by the ICE BofAML Index System. We tested multiple regressions using as independent variables OAS plus effective duration, as well as rating (both specifications) plus effective duration. Additionally, we tested multiple regressions involving rating (both specifications) plus rating prospect plus effective duration. (Note that rating prospect was not applicable to regressions in which OAS was an independent variable.)

Another potential source of noise was variation in capital structure priority within our samples. (The ICE BofAML High Yield Index includes senior secured, senior unsecured, subordinated, and junior subordinated issues, as well as some bank issues for which priority is designated by regulatorily defined capital structure tiers.) To address the possible cofounding effect of variations in priority, we reran all of the above-described tests, in each observation period, on subsamples consisting only of issues with the most common priority, senior unsecured. Sample sizes remained satisfactory after this adjustment. The senior-unsecured-only bull market and bear market samples contained 80 and 75 issues, respectively.

3 Results

Table 3 shows that in the full 100-bond bull market sample, spreads exhibited greater explanatory power than ratings. Assigning default-rate-based scores improved the explanatory power of ratings (adjusted R^2 of 17.1% vs. 5.2% for the linear scores). That still left ratings far behind the adjusted R^2 of 38.7% for OAS, however.

Both spreads and ratings displayed greater explanatory power in the bull market test than in the bear market test. Adjusted R^2 dropped to 18.7% from 38.7% for OAS. Even so, OAS continued to explain more of the variance in price

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Table 3 Regression output, all priority levels.

Market condition:	Bull market	Bear market
Month:	2016: March	2015: December
Sample size:	$n = 100$	$n = 100$
Explanatory Variable(s)	Adjusted R^2 (%)	
Option-Adjusted Spread	38.7	18.7
Numerical Rating–Linear	5.2	2.9
Numerical Rating–Default Rate	17.1	3.4
Num. Rtg. Linear + Prospect	4.3	3.2
Num. Rtg. Default + Prospect	16.4	3.3
OAS + Effective Duration	39.4	18.8
Num. Rtg. Linear + Effective Duration	4.3	1.9
Num. Rtg. Default + Effective Duration	16.4	2.4
Num. Rtg. Linear + Prospect + Effective Duration	3.4	2.3
Num. Rtg. Default + Prospect + Effective Duration	15.6	2.3

Sources: Bloomberg; ICE BofAML Index System, used with permission; Moody's Investors Service

changes than ratings. Based on linear scores, ratings explained just 2.9% of the variance in price changes. The default-rate-based scores did only slightly better, at 3.4%. Note that the differences in adjusted R^2 between the bull and bear markets may be partly explained by the larger movement in underlying Treasury yields in the latter period.

Ratings did not catch up to spreads in adjusted R^2 when supplemented by prospects, duration, or both prospects and duration. As detailed in

Table 4 Regresssion output, senior unsecured issues only.

Market condition:	Bull market	Bear market
Month:	2016: March	2015: December
Sample size:	$n = 80$	$n = 75$
Explanatory Variable(s)	Adjusted R^2 (%)	
Option-Adjusted Spread	41.8	8.9
Numerical Rating − Linear	5.7	−0.6
Numerical Rating − Default Rate	24	1.4
Num. Rtg. Linear + Prospect	4.5	−1.5
Num. Rtg. Default + Prospect	23.1	−1
OAS + Effective Duration	42.5	9.7
Num. Rtg. Linear + Effective Duration	4.5	−1.4
Num. Rtg. Default + Effective Duration	23.6	−0.7
Num. Rtg. Linear + Prospect + Effective Duration	3.4	−1.8
Num. Rtg. Default + Prospect + Effective Duration	22.7	−1.4

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Table 4, adjusted R^2 rose minimally or even fell when we added those independent variables to the regressions. Supplementing OAS with duration produced minor increases in adjusted R^2, to 39.4% from 38.7% in the bull market test and to 18.8% from 18.7% in the bear market test.

Refining the analysis to include only senior secured issues produced mixed results. Positively, in the test of all priority levels, the bull market's adjusted R^2 increased for OAS (to 41.8% from 38.7%), for linear-scored ratings (to 5.7% from 5.2%), and for default-rate-based ratings (to 24.0% from 17.1%). Eliminating non-senior-unsecured issues had the opposite effect, however, on the bear market results. There, adjusted R^2 declined to 8.9% from 18.7% for OAS, to −0.6% from 2.9% for linear-scored ratings, and to 1.4% from 3.4% for ratings scored according to default rates. As in the tests of all priority levels, adding duration slightly increased adjusted R^2 for OAS in both bull and bear markets. Adding duration and prospects to the regressions for ratings did not materially cause ratings to gain ground on spreads as explainers of variance in the prices of individual high-yield bonds.

4 Conclusion

Duration, supplemented by convexity, is a well-established tool for gauging the sensitivity of bond prices to interest rate fluctuations. Important as well for risk managers and active managers of corporate bond portfolios is the ability to gauge sensitivity of individual issues to market-wide increases or decreases in credit risk premiums. This study finds that for the most price-sensitive corporate sector, consisting of speculative-grade issues, market ratings, i.e., yield spreads-versus-Treasuries, are better indicators of sensitivity than agency ratings.

This finding should not be interpreted as finding fault with agency ratings. The agencies specifically state that their ratings are not intended to be investment recommendations, i.e., predictors of returns.[11] Rather, agency ratings primarily address default risk, comprising both default probability and expected recovery in default. Their performance on that objective is better than rating agency critics generally acknowledge.[12] Taking the rating agencies to task for not doing something they have never claimed to do surely represents unfair criticism. They should be judged, rather, on the task they have set out to accomplish.

Permanent capital losses arising from defaults, however, are not the sole, or even the primary, day-to-day concern of corporate bond investors who mark to market and are evaluated on the basis of annual total return. They are more focused on limiting drawdowns, which have at least four causes: (1) general increases in interest rates, (2) general increases in credit risk premiums, (3) issuer-specific increases in credit risk, and (4) unanticipated, premature redemptions of individual issues. The empirical evidence presented in this study indicates that for the second and third items in that list, market ratings provide more useful information to risk managers and portfolio managers than agency ratings.

Notes

1 Hickman (1958), p. 357.
2 Hickman (1958), p. 357.
3 Hickman (1958), p. 361.
4 Hickman (1958), p. 262.
5 When a bond is purchased at a discount to face value, the amount of that discount must be amortized over the bond's life. Its amortized cost is the value, somewhere between the purchase price and par, on the measurement date.
6 Dimensional Fund Advisors (2012), p. 1.
7 Grothe (2013), p. 3.
8 Rating actions include revisions to ratings, as well as revisions to watchlistings and rating outlooks, as described below.

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[9] Corporate bond spreads can also widen in response to financial market shocks not directly linked to macroeconomic variables such as Gross Domestic Product. Examples include the October 19, 1987 stock market crash and the 1998 Long-Term Capital Management crisis.

[10] This is a stylized depiction of the corporate bond manager's decision-making process. In practice, security selection involves a tradeoff between expected return and expected variance. Additionally, portfolio managers, particularly those focused on speculative-grade bonds, do not rely exclusively on either agency or market ratings to gauge idiosyncratic credit risk. Rather, their judgments are informed by the work of in-house credit analysts, possibly supplemented by opinions of investment banks' analysts and independent research providers. It is nevertheless appropriate to pit agency ratings against market ratings as we do in this study, given that bond managers frequently cite that dichotomy to dispute the usefulness of agency ratings.

[11] As an example, Moody's.com (visited on October 14, 2018) states, "As ratings are designed exclusively for the purpose of grading obligations according to their credit quality, they should not be used alone as a basis for investment operations. For example, they have no value in forecasting the direction of future trends of market price. Market price movements in bonds are influenced not only by the credit quality of individual issues but also by changes in money rates and general economic trends, as well as by the length of maturity, etc. During its life even the highest rated bond may have wide price movements, while its high rating status remains unchanged."

[12] See Fridson (2010). Rating agency personnel state that they also consider bond covenants in assigning ratings.

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