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ABOUT

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Enhancing Returns, Mitigating Risk: Leveraging Moody's Alpha Factor and Deterioration Probability in Bond Portfolio Management

Insurance companies and pension fund asset managers face the challenge of balancing risk exposures and returns in their investments while adhering to regulatory constraints. Moody's Alpha Factor (AF), derived from our fair-value bond pricing framework, combined with the Deterioration Probability (DP) metric, offers a powerful solution to address this challenge. We construct sector-neutral, investment-grade bond portfolios by selecting securities with high AF ranking—a proxy for identifying undervalued bonds—while excluding issuers with a high DP ranking. Our research shows that this approach reduces credit risk while also achieving enhanced cumulative returns relative to benchmark indices over time. A case study on Carnival Corporation illustrates how a high DP ranking may serve as an early indicator of credit rating downgrades, enabling more effective, proactive risk mitigation strategies.

Enhancing Bond Portfolio Risk-Adjusted Returns

Navigating the balance between achieving target returns while adhering to risk mandates within a bond portfolio presents a significant challenge, particularly under stringent regulatory constraints. Insurance companies and pension fund managers face this challenge as they must preserve capital to cover their liabilities while complying with regulatory frameworks, such as the EU's Solvency II Directive and the U.S. National Association of Insurance Commissioners (NAIC) standards. These frameworks restrict the pursuit of high-risk, high-return strategies by adjusting capital requirements based on asset risk profiles and favoring investments that ensure security, quality, liquidity, and profitability of the overall portfolio.[1]

While these regulatory frameworks may limit portfolio selection to high-grade bonds, such instruments can vary significantly in return potential, and their ratings alone may not necessarily reveal near-term downgrade risk. This article explores how Moody's Alpha Factor (AF) and Deterioration Probability (DP) metrics can be leveraged to develop active corporate bond trading strategies that systematically identify potential downgrade risks and mitigate risk exposures without compromising returns.

Alpha Factor and Deterioration Probability: Actionable Investment Signals

Moody's provides near real-time, actionable investment signals and other pricing insights for over half a million corporate bonds worldwide. Our fair-value pricing framework aids portfolio managers and investors in identifying potentially undervalued corporate bonds by incorporating risk information from the more liquid equity market. When paired with an approach that flags potential credit rating downgrade risks, this framework allows for the construction of active investment strategies that proactively deliver superior risk-adjusted cumulative returns.

Moody's Deterioration Probability (DP) provides a daily-updated estimate of the one-year probability of a rating downgrade event for rated firms.[2] For unrated firms, it estimates the probability of a similar decline in creditworthiness, referred to as a "shadow-downgrade" event.[3] A low DP ranking relative to other issuers indicates a low downgrade risk. To enhance the relatively low returns often associated with risk-averse strategies, investors can leverage Moody's EDF-X fair-value pricing framework to identify potentially undervalued bonds that may deliver superior risk-adjusted cumulative returns. These undervalued bonds are identified by the gap between Moody's fair-value spread (FVS) and the market-observed option-adjusted spread (OAS).[4] Our analyses demonstrate that a dynamically rebalanced, sector-neutral, investment-grade portfolio—comprising bonds issued by entities rated A3 or higher, with low issuer DP rankings and high OAS-to-FVS ratios (termed the Alpha Factor, or AF)—can reduce risk while consistently outperforming value-weighted benchmark indices over time in both U.S. and European investment-grade markets.[5] This strategy underscores how the AF metric, when used to actively select assets, can help improve portfolio returns by capitalizing on potential pricing inefficiencies in the bond market.

In addition to portfolio-level analyses, we examine the case of Carnival Corporation, where a high DP ranking signaled elevated downgrade risk well before the company became a fallen angel and

[1] See, for instance, Solvency II's "prudent person principle" and Solvency Capital Requirement (SCR), and NAIC's risk-based capital (RBC) requirement.
[2] Moody's Deterioration Probability (DP) is part of Moody's EDF-X risk solution and is not part of the process by which Moody's Ratings assigns or changes its credit ratings. Moody's Ratings maintains its own separate processes for monitoring credit risk and managing rating actions.
[3] For unrated firms, the DP is calibrated using a sample of rated firms based on non-rating characteristics, providing an estimate of what the firm's downgrade probability would be if it were rated.
[4] Many bonds have embedded put and call options, which can distort the observed spread. The OAS reflects a market-observed spread after removing such option-related distortions. We use treasury yields as the reference curve in calculating bond spreads.
[5] Transactions costs are not considered in our analyses, but under reasonable assumptions, the results of the active investment strategy should more than compensate for these costs.

experienced poor cumulative returns. This case highlights how persistent deterioration signals can complement relative value indicators to offer valuable insights for risk-mitigating investment decisions.

Developing Alpha-Generating Investment Strategies

We explore how combining Moody's fair-value bond pricing framework with credit risk indicators, including the DP metric, can support the construction of investment-grade portfolios that mitigate downgrade risk while producing healthy long-term cumulative returns. The DP metric is estimated based on several factors, including Moody's ratings and probability of default (PD)-related measures.[6] Intuitively, a higher DP is informed by both actual rating downgrade momentum and elevated forward-looking PD signals, recognizing that defaults are typically preceded by a series of agency rating downgrades.

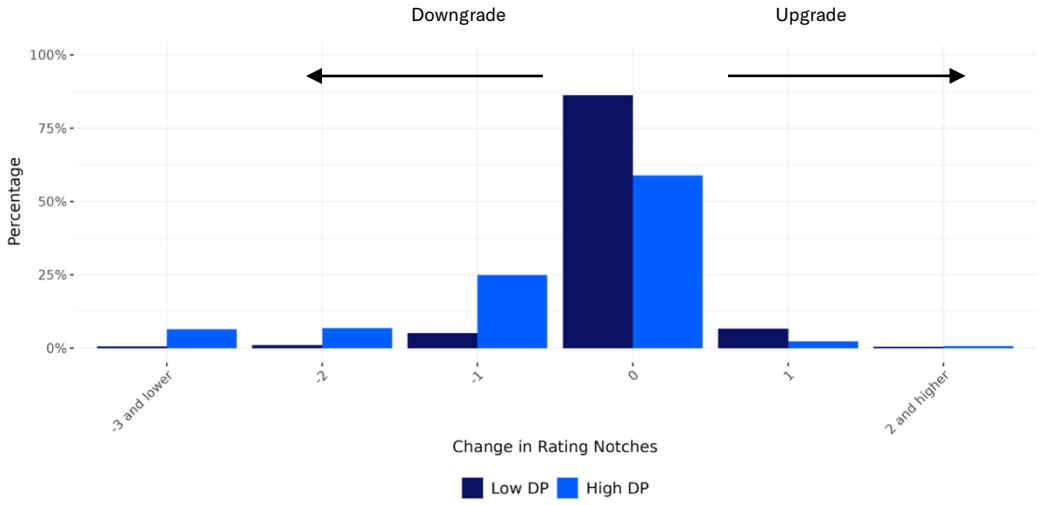
In our analyses, we consider bonds in U.S. investment-grade ("USIG") and European investment-grade ("EUIG") indices from January 2007 to October 2024.[7] Notably, our observation window includes recent periods of significant economic stress, such as the onset of the COVID-19 pandemic, the 2021-2023 inflationary period, and the wave of central bank interest rate hikes that began in early 2022. Figure 1 illustrates the distribution of 12-month credit rating changes for issuers in the USIG and EUIG indices. Each month, issuers are categorized into two groups based on their DP: "high DP" (top 10%) and "low DP" (bottom 90%). A clear pattern emerges: high DP issuers are noticeably more prone to experiencing credit rating downgrades of varying degrees than their low DP counterparts. This pattern highlights the DP metric's utility in identifying potential downgrade risk. A high DP is also associated with heightened fallen angel risk.[8] Figure 2 shows that the percentage of fallen angel downgrade events occurring within 12 months after the DP measurement date is conspicuously higher for high DP issuers across all investment-grade ratings, with Baa3-rated issuers being the most susceptible to such events.

[6] A firm's DP is estimated using its PD level, a PD trigger level, the slope of its PD term structure, an industry median PD growth rate, a relative PD level (defined by the firm's PD divided by the industry median PD), its history of Moody's ratings and rating outlooks, and Market Implied Ratings (MIR). For further details, see Malone, S., Baron, I. and White, R. (2018). The Deterioration Probability (DP) Model: Methodology and Validation. Moody's.

[7] We use the following ICE BofA indices: ICE BofA US Corporate Index (C0A0) and ICE BofA Euro Corporate Index (ER00). We refine these benchmark indices to only include bonds from publicly listed issuers (or their listed parent companies) with available sector, duration, and spread data; a PD scored by Moody's CreditEdge™ model; an FVS scored by Moody's bond pricing model; and sufficient liquidity, with an adequate amount outstanding.

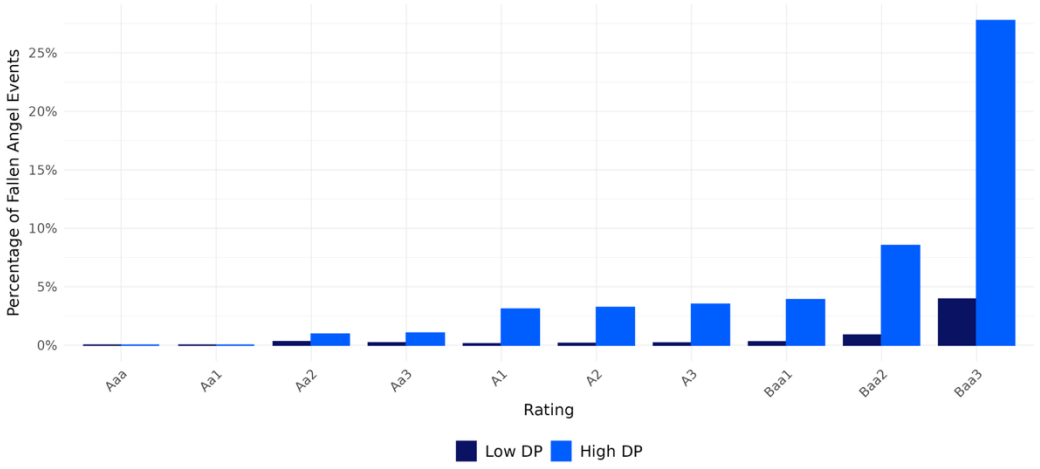
[8] See Malone, S. and Choi, Y. (2019). Dealing with Fallen Angel Risk. Moody's Analytics, which shows that a high DP ranking (in their case, using a top quintile DP cutoff) has early warning predictive power for fallen angel events over 12-month horizons. They also show low DP U.S. and European investment-grade portfolios outperform their high DP counterparts in cumulative total returns through the credit cycle.

FIGURE 1 Low DP issuers experience fewer downgrades relative to high DP issuers
12-month forward change in issuer ratings, high DP vs. low DP (January 2007-October 2023)



Note: We track monthly credit ratings and DP data for issuers in the USIG and EUIG indices, focusing on those rated as investment-grade by Moody's Ratings. If an issuer is removed from these indices, we stop tracking its current position. For each month (up to October 2023), we record the issuer's rating change over the next 12 months, regardless of its subsequent index status (so these changes include shifts to speculative-grade). Furthermore, we categorize issuers based on their DP into "high DP" (top 10%) and "low DP" (bottom 90%) groups relative to other issuers for that month. Finally, within each DP category, we tabulate the distribution of rating changes. Ratings are based on issuer SRA ratings from Moody's Ratings.[9]

FIGURE 2 Low DP issuers experience fewer fallen angel events relative to high DP issuers
Percentage of fallen angel events within 12 months by rating, high DP vs. low DP (January 2007-October 2023)



Note: We track monthly credit ratings and DP data for issuers in the USIG and EUIG indices, focusing on entities rated as investment-grade by Moody's Ratings. If an issuer is removed from these indices, we stop tracking its current position. We only include months where the issuer has ratings data over the next 12 months. For each month (up to October 2023), we record whether the issuer migrated to speculative-grade within the next 12 months, which we define as a fallen angel event. This approach allows a given downgrade to be counted as multiple events, accounting for the rating history preceding the downgrade. Furthermore, we categorize issuers based on their DP into "high DP" (top 10%) and "low DP" (bottom 90%) groups relative to other issuers for that month. Finally, within each DP/rating category, we calculate the percentage of fallen angel events. Ratings are based on issuer SRA ratings from Moody's Ratings.

[9] The SRA takes a Moody's-rated entity's actual senior unsecured rating (or senior rating) history when one exists and estimates it when the entity does not have any rated senior unsecured debt in all or part of its rating history. These estimated ratings allow Moody's to meaningfully compare credit quality across entities, regardless of their capital structures.

Portfolio managers can potentially mitigate downgrade risks while achieving long-term cumulative returns comparable to or exceeding those of benchmark indices by employing two key strategies: First, screen out issuers that are prone to becoming fallen angels using a combination of the DP metric and a ratings-based cutoff. Second, identify potentially undervalued bonds through Moody's bond pricing framework. In the Moody's pricing framework, a bond is considered potentially undervalued when its AF—the ratio of its OAS to FVS—is above one.[10] The FVS is driven by multiple factors, including the issuer's cumulative forward-looking PD, loss given default (LGD) associated with the bond's region of issuance and the issuer's sector, a market Sharpe ratio associated with the bond's region of issuance and rating class (i.e., investment-grade vs. high-yield), and firm size.[11] The cumulative PD integrates point-in-time market capitalization and financial statement information to improve risk assessment in the relatively illiquid corporate bond market. An increase in the LGD or cumulative PD signifies heightened credit risk, leading to a potential widening of the bond spread. Similarly, an increase in the market Sharpe ratio indicates a demand for greater risk-adjusted returns in the overall bond market, pushing up spreads. On the other hand, larger companies tend to have lower spreads, all else equal, as they typically have easier access to capital to cover debts.[12] Since the FVS is calibrated to align with the market-observed OAS on average, individual deviations between the two metrics signal potential opportunities for relative value trades. Exploiting these discrepancies may help investors enhance long-run cumulative returns.[13]

Alpha Factors and Deterioration Probability metrics provide investors with powerful tools to identify potentially undervalued bonds and downgrade risks.

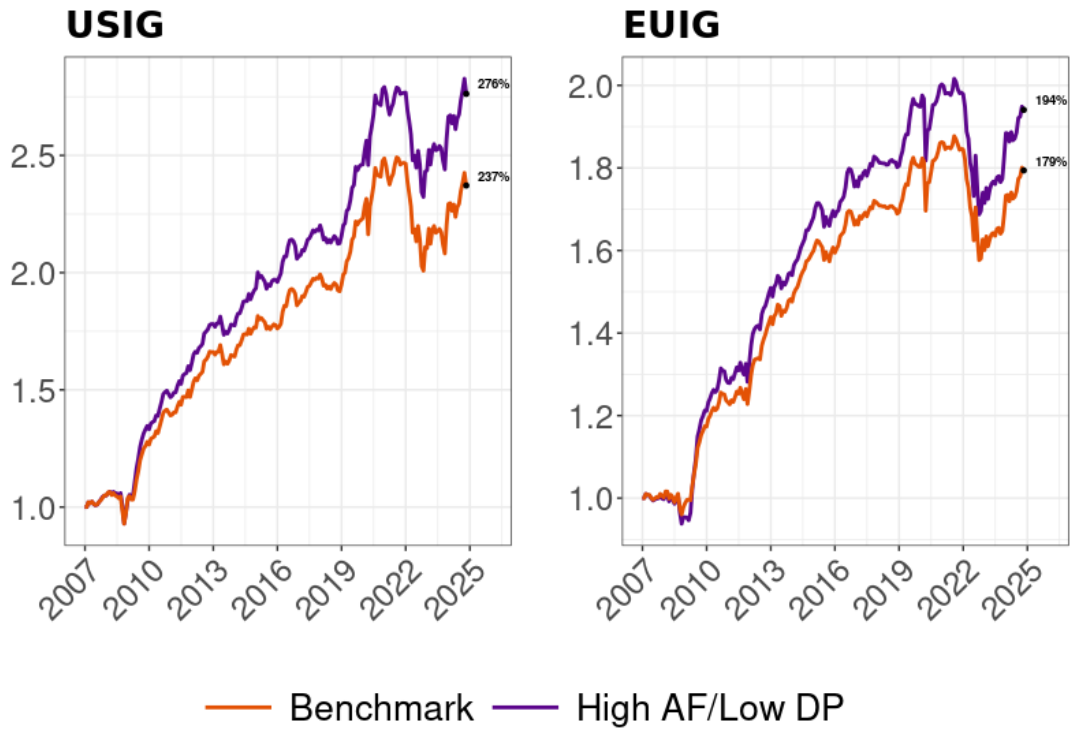
To illustrate these active portfolio management strategies, we consider the following trading approach. From each index (USIG or EUIG), we construct a value-weighted, sector-neutral portfolio at the beginning of each month by sequentially applying the following filters: 1) select bonds with an issuer SRA rating of A3 or higher (eliminating potential "borderline" fallen angels), 2) exclude bonds with an issuer DP in the top decile, and 3) select bonds with an AF in the top quintile relative to peers associated with comparable duration and sector.[14] Figure 3 displays the cumulative total returns of these high-AF, low-DP portfolios compared with their respective benchmark indices.

In both markets, the high-AF, low-DP portfolio consistently outperforms the benchmark index over time, demonstrating the potential of AF as a trading signal for generating superior cumulative returns. Importantly, these higher returns were not gained on the back of higher risk. Table 1 further illustrates how the portfolio reduces risk exposure across several dimensions of credit risk compared to the benchmark index—specifically, LGD, duration, credit rating, and duration-matched cumulative PDs.[15] These results highlight that the high-AF, low-DP portfolios effectively mitigated risk in our data, while

[10] The AF is not defined if the FVS is nonpositive.
[11] The cumulative PD of a firm represents its probability of default at any time over a specified time horizon and is assessed using Moody's CreditEdge™ model. In cases where the bond is issued by a private subsidiary of a public company, we utilize the PD of the public parent. The LGD is estimated on a sample of senior unsecured bonds, with separate adjustment factors for subordinated bonds and secured bonds. Size is measured based on the issuer's sales and book value of assets.
[12] Firm size can act as a proxy for the liquidity premium.
[13] For further details on the AF as a relative value signal and the application of top quintile AF portfolios in portfolio management, see Luo, V., Parimoo, S., and Zhuang, Z. (2024). Bond Alpha Factor: Relative Value Trading for Superior Returns. Moody's.
[14] We categorize bonds into 65 distinct buckets, based on thirteen sectors and five duration ranges. Within each bucket, we select bonds in the top 20% by AF in each month's portfolio. The portfolio is sector-neutral and value-weighted: each sector is weighted each month by the total market value of issues in that sector as represented in the benchmark index that month, and this sector weight is distributed among the selected bonds in a way that is proportional to their relative market value weights within the index.
[15] Duration-matched cumulative PD refers to the issuer's cumulative PD over a time horizon equivalent to the bond's duration. While agency ratings are understood to be through-the-cycle risk metrics, the duration-matched cumulative PD is a point-in-time metric that reflects issuer- and bond-specific characteristics.

achieving strong returns relative to benchmark indices. Table 2 shows that this portfolio also closely tracks benchmark index returns, both in aggregate and within each sector.

FIGURE 3 High-AF, low-DP portfolios outperform benchmark indices
Cumulative total returns (January 2007-October 2024)



Note: Portfolios are dynamically rebalanced at the beginning of each month, with returns recorded at the end of the month. Cumulative total return curves are normalized to equal 1.0 at the start of January 2007. For example, a cumulative total return of 2.76 (276%) indicates that for every $1 invested at the beginning of January 2007, the final value of that investment is $2.76.

TABLE 1 High-AF, low-DP portfolios improve risk exposure of benchmark indices
Mean characteristics (January 2007-October 2024)

	HIGH-AF, LOW-DP				BENCHMARK INDEX			
INDEX	LGD	DURATION (YEARS)	DURATION-MATCHED CUMULATIVE PD	RATING	LGD	DURATION (YEARS)	DURATION-MATCHED CUMULATIVE PD	RATING
USIG	43%	6.85	3.02%	A2	46%	7.32	4.19%	A3
EUIG	46%	6.47	3.57%	A2	47%	6.08	4.30%	A3

Note: Sample mean statistics are computed using equal weighting across bonds and across time in the high-AF, low-DP portfolios and the benchmark indices. Ratings are based on issuer SRA ratings from Moody's Ratings. After excluding bonds without issuer SRA ratings, the mean rating is obtained by computing the mean of the equivalent numerical rating values (1=Aaa, 2=Aa1, 3=Aa2, etc.) and rounding to the nearest integer.

TABLE 2 High-AF, low-DP portfolios have low tracking errors relative to benchmark indices
Annualized tracking errors relative to benchmark index (January 2007-October 2024)

SECTOR	USIG	EUIG
OVERALL PORTFOLIO	1.33%	1.26%
BANKS AND S&LS	3.75%	3.08%
UTILITIES - LOW RISK (ELECTRIC, GAS)	3.38%	3.17%
FINANCE COMPANIES & BROKERS/DEALERS	3.49%	3.37%
CONSUMER GOODS & DURABLES	1.49%	1.57%
MATERIALS/EXTRACTION	2.62%	1.90%
TRANSPORTATION	2.42%	2.35%
EQUIPMENT	1.41%	2.15%
CABLE TV & PRINTING/PUBLISHING	2.72%	1.26%
REIT/FINANCE - HIGH RISK	2.92%	2.54%
GENERAL SECTOR	2.59%	3.09%
AEROSPACE & MEASURING EQUIPMENT	2.09%	2.54%
HIGH TECH	1.92%	1.72%
MEDICAL	1.15%	1.57%

Notes:

a) The annualized tracking error for the overall portfolio is computed as

$$\sqrt{12} \times \text{Standard Deviation [monthly portfolio return} - \text{monthly benchmark index return]}.$$

Sector-wise tracking errors are computed similarly, with bonds weighted proportionally to their market value weights in the index for each sector.

b) "General Sector" encompasses Agriculture, Business Products (wholesale), Business Services, Consumer Services, Construction, Entertainment & Leisure, Hotels & Restaurants, Utilities, and unassigned sectors.

Case Study: Carnival Corporation

To further demonstrate the effectiveness of the DP rank filter in mitigating fallen angel risk, we examine the case of Carnival Corporation. From May 2019 to May 2020, Carnival had bond holdings in USIG and EUIG indices. By the end of this period, these holdings comprised a single bond in the USIG index, which migrated to a U.S. high-yield ("USHY") index in June 2020.[16] Figure 4 illustrates Carnival's senior unsecured rating and average DP percentile rank during this period. Up until February 2020, the company held an A3 senior unsecured rating, meeting our portfolio's rating filter. However, with the onset of the COVID-19 pandemic and subsequent suspension of cruise operations, Carnival experienced a sharp decline in market capitalization and was downgraded to Ba2 by June 2020. Notably, by February 2020—more than three months before becoming a fallen angel and a month before breaching the A3 rating cutoff—Carnival had already exhibited a high DP, with an average DP percentile exceeding the top-decile threshold, and ranking within the top two percent thereafter, even relative to the USHY index in June 2020.[17] This case highlights the DP metric's effectiveness as an early indicator of rating downgrade risk.

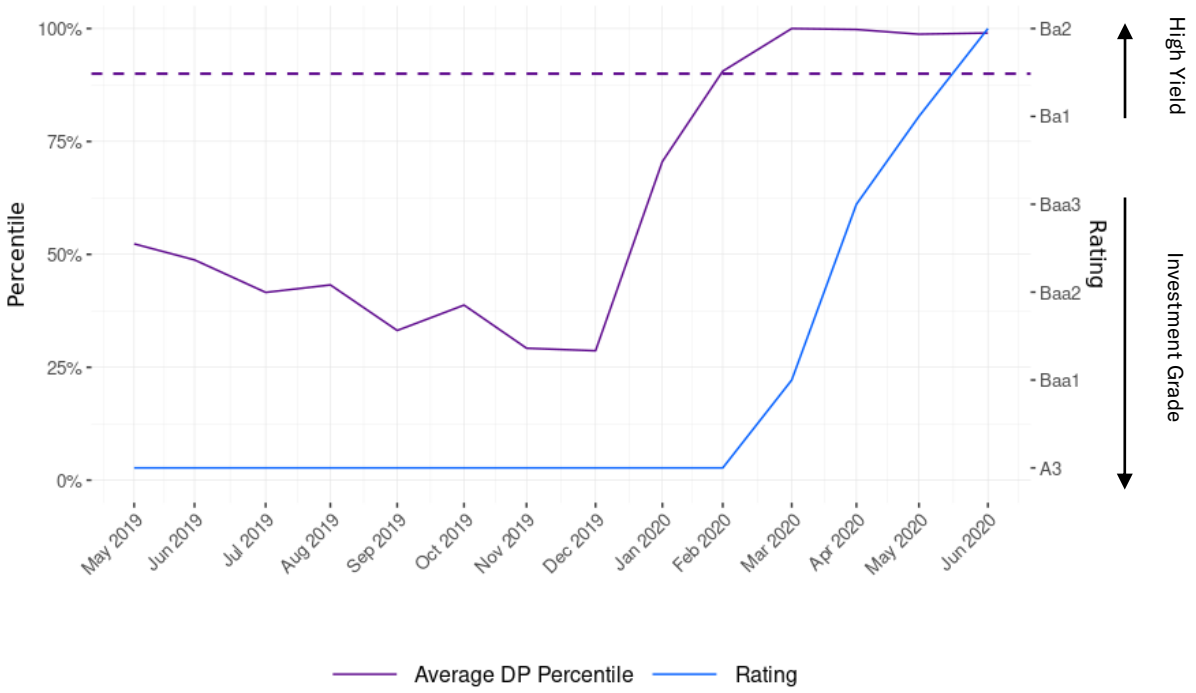
Carnival exhibited a relatively high DP signal more than three months before becoming a fallen angel and a month before breaching the A3 rating cutoff.

[16] We consider the following index for USHY: ICE BofA US High Yield Index (H0A0). We refine this index as per footnote 7.
[17] We also examined Carnival's average AF percentile rank by comparing the AF of each of its bonds to those of bonds with similar duration and sector characteristics in the respective index that met both the A3 rating and DP rank filters on the same date. We then averaged these percentile ranks across Carnival's outstanding bonds. In February 2020, Carnival's average AF percentile rank fell within the top quintile, while its average DP percentile rank was in the top decile. This highlights the added value of the DP rank filter in identifying downgrade risk during portfolio construction—providing insights beyond those captured by the AF rank and rating filters alone.

Additionally, Carnival's downgrade was accompanied by diminished returns. An equal-weighted portfolio comprising Carnival's USIG and EUIG holdings, had it been initiated at the end of May 2019, would have seen its cumulative value peak by the end of January 2020 with a modest gain of 0.78%, only to suffer a cumulative loss of over 30% by the end of June 2020. Consequently, active management informed by Carnival's DP could have enabled timely divestment, helping investors avoid significant losses.

FIGURE 4 Carnival became a fallen angel over three months after a spike in its DP measure

Carnival Corporation's senior unsecured rating and average DP percentile rank (May 2019 -June 2020)



Note: The plotted values represent end-of-month data points (e.g., May 2019 corresponds with May 31, 2019). To be consistent with the portfolio strategy's calculation of the DP rank after applying the rating filter, we assign each of Carnival's bonds in the USIG/EUIG/USHY indices an issuer-level DP percentile rank. This rank is based on Carnival's DP relative to the sample of issuers in the respective index that meet the A3 rating threshold on the same date.[18] In the case of the USHY index, no rating filter is applied. We then average these DP percentile ranks across all of Carnival's bond issues (spanning the different indices) to obtain an overall average. Over the 13-month period, Carnival had two bonds in the USIG index—one of which migrated to USHY in June 2020—and two bonds in the EUIG index.

Moody's fair-value bond pricing framework offers portfolio managers a powerful tool for identifying potentially undervalued bonds through leading AF signals. When combined with the DP metric, which can be used to identify and mitigate prospective downgrade risks, this framework enables the construction of asset selection strategies that improve the risk-return tradeoff, positioning portfolios to outperform benchmark indices.

[18] To align with the convention that index returns are recognized one month after the portfolio construction date, the respective index is determined based on the month following the DP measurement date. Accordingly, Carnival's DP ranking as of the end of May 2020 is computed relative to the USHY index, since returns for its holdings as of the end of June 2020 are recognized in USHY.

Key Takeaways

- The combination of Alpha Factors from Moody's fair-value bond pricing framework and the Deterioration Probability metric provides institutional investors with a powerful toolkit to systematically identify potential undervalued bonds and downgrade risks, enabling the construction of portfolios that balance regulatory compliance with enhanced returns.
- Moody's Deterioration Probability metric serves as a key early warning indicator of downgrade risk, including fallen angel events, empowering investors to proactively manage and mitigate their risk exposures.
- Portfolios with a high Alpha Factor and low Deterioration Probability consistently demonstrate a superior risk-return profile across diverse market conditions, underscoring the value of active management in optimizing risk mitigation strategies.

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