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FOUNDATIONS OF HIGH-YIELD ANALYSIS

Martin Fridson, CFA, Editor

CFA Institute Research Foundation

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Statement of Purpose

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DEDICATION

Dedicated to the memory of Michael Brown.

CONTENTS

PREFACE

On 21–22 June 2017, CFA Society New York hosted its High Yield Bond Master Class & 27th Annual High Yield Bond Conference. The presenters included leading authorities from asset managers, institutional investors, investment banks, credit-rating agencies, research organizations, and consulting firms. They instructed investors on numerous aspects of the high-yield investment process and analyzed current developments affecting the asset class. Write-ups on selected sessions constitute this brief. A Glossary defines all terms that appear in boldface italics in the text.

"UNDERSTANDING DEFAULT RATES, RECOVERIES, SPREADS, AND RETURNS"

Conference moderator Martin Fridson, CFA, chief investment officer of Lehmann Livian Fridson Advisors LLC, decomposes long-term returns on US high-yield bonds as follows:

(Treasury yield + Spread vs. Treasuries) – (Default rate + Recovery rate) = Return.

Over short periods, Fridson points out, total return can diverge widely from the output of this formula because of changes in the spread versus Treasuries and the underlying US Treasury yield. As an alternative to gauging the high-yield asset class's value at a point in time by comparing the spread versus Treasuries with its historical average, he offers an econometric model that compares the spread with a comprehensive measure of prevailing risk. Fridson cites research documenting the default rate's impact on the composition of the high-yield universe. He also emphasizes the variability of recovery rates over the course of the credit cycle. A striking feature of high-yield returns, Fridson observes, is their extraordinary dispersion in contrast to the investment-grade market.

"THE ART OF HIGH-YIELD CREDIT ANALYSIS"

Bill Hoffmann, senior analyst at Investcorp Credit Management US LLC, explains the process by which a high-yield analyst decides whether to recommend investment in a new issue. The analysis compares the new issue with issues of similar credits while taking into account macroeconomic factors, industry fundamentals, business-specific risks, and the issuer's financial strategy. Financial strategy comprises free cash flow, deleveraging potential, and the risk of additional leveraging transactions. Hoffmann emphasizes that this process is an art, not a science. To illustrate, he provides a case study from the United States involving Kraton Performance Polymers'

2015 announcement of the acquisition of Arizona Chemical. His analysis addresses the additional factors of the attractiveness of the business combination and synergies arising from it. Hoffmann finds that marketwide technical factors created an exceptional opportunity in the Kraton bond.

"FORECASTING THE HIGH-YIELD DEFAULT RATE"

Diane Vazza, head of Global Fixed Income Research at Standard & Poor's Global Ratings, outlines her firm's forecasting model for the US high-yield default rate. The main components of the model are economic variables, financial variables, bank lending practices, the interest burden of high-yield companies, the slope of the US Treasury yield curve, and credit-related variables. Vazza elaborates on how the default rate can be *suppressed* by easy access to credit for refinancing debt and extending maturities or, alternatively, be elevated by a rise in interest rates following heavy borrowing for leveraged buyouts, share repurchases, or increasing dividends rather than investment in conventional business activities. She further describes how the default rate can be affected by dynamics within particular industries that do not spill over into the rest of the high-yield universe. Because default probability is highest among the lowest-rated issuers, the universe's ratings mix also influences the default rate.

"CORPORATE BANKRUPTCY: PRIMER ON PROCESS AND PROSPECTS"

Anders Maxwell, managing director at PJ SOLOMON, presents a primer on the legal underpinnings and process of corporate bankruptcy. Emphasizing the centrality of valuing the estate, he explains that to address ambiguities in that task, the court may scrutinize accounting standards, financial projections, and key assumptions underlying competing valuations. Maxwell also describes the conditions under which an out-of-court restructuring is most feasible. He highlights factors that create opportunity in distressed securities, including volatile and uncertain values as a consequence of the opaque and complex dynamics of corporate restructuring and an inefficient market for the securities. Additionally, Maxwell presents two case studies to illustrate the pitfalls of relying on market prices as indications of intrinsic value. One bankrupt company's securities declined prior to the filing and rose afterwards; the other company's securities displayed the opposite pattern.

"AN INTRODUCTION TO HIGH-YIELD BOND COVENANTS"

Saish Setty, director of reorg covenants at Reorg Research, provides a theoretical framework for understanding the need for covenants and lays out the main risks to creditors. He describes some common covenants, including those dealing with debt levels,

liens, restricted payments or investments, and asset sales. He shows how covenants are necessitated by shareholder–creditor conflicts and inter-creditor conflicts. The risks arising from such conflicts include incurrence of risky investments by the borrower, subordination and dilution, and loss of value. Setty also explains the two general types of covenants—affirmative and negative—and discusses the significance of restricted and unrestricted subsidiaries. In addition, he highlights potential pitfalls. For example, he states that the so-called hookie dook provision, historically common in oil and gas issues, arguably gutted the liens covenant. Setty argues that close attention to defined terms, differences among an issuer's outstanding instruments, and interactions among different covenants can help identify hidden risks in an indenture.

"DYNAMICS OF THE HIGH-YIELD BOND MARKET"

Michael F. Brown, global head of research at Advantage Data Inc., analyzes high-yield price histories as a function of macroeconomic forces, microeconomic forces, impulse forces (influences that abruptly rise to a peak, then gradually fade), risk, and technical features of the time series themselves. He notes that in the short term, high-yield prices are subject to fluctuations and a high level of noise (random fluctuation). Over longer time intervals, price moves occur at lower frequencies and are subject to lower levels of noise and less fluctuation. Brown finds that high-yield prices move in recurring patterns involving trends and cycles. He explains how to filter out the noise and outliers that obscure these patterns. Also, he identifies the most important macro factors in driving fair value. Brown stresses the importance of using as a starting point a price source based on actual trades, such as TRACE (Trade Reporting and Compliance Engine) data for North American bond trades. This information can be supplemented by additional trade-related data—for example, volumes traded and amounts outstanding.

Martin Fridson, CFA

1. UNDERSTANDING DEFAULT RATES, RECOVERIES, SPREADS, AND RETURNS

Martin Fridson, CFA
Chief Investment Officer
Lehmann Livian Fridson Advisors LLC
New York City

The objective of this article is to identify and provide insights into the components of the returns on **high-yield bonds**.[1] In the course of doing so, I point out flaws in established modes of high-yield analysis and offer alternatives. I also highlight analytical contrasts between the high-yield asset class and **investment-grade** bonds.

COMPOSITION OF HIGH-YIELD RETURNS

Over extended periods, the return on an index of high-yield US bonds is approximately the amount calculated by a simple formula, with the appropriate proxies used for all terms:

Initial yield – **Default loss rate** = Return.

This formula can be expanded as follows:

(US Treasury yield + **Spread vs. Treasuries**) – (**Default rate** + **Recovery rate**) = Return.

Over short periods, largely because of capital gains and losses, returns can deviate widely from the result calculated in this way. To cite an extreme example, in 2016, the **yield to worst** (YTW) on the ICE BAML US High Yield Index minus the default loss rate reported by the blog of Edward Altman and Brenda Kuehne of the New York University Salomon Center equaled 5.78%. The index's actual return was 17.49%, reflecting a sharp reduction in perceived default risk.

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[1]Certain terms have been highlighted by boldface and italics upon first mention in each piece. For definitions of these terms, see the Glossary at the end.

Among the factors accounting for such deviations between the expected and actual return are changes in the Treasury yield and changes in the spread versus Treasuries. Above-market tender offers also contribute. To forecast the return on the asset class over a span of several years, however, an investor is well advised to focus on the previously mentioned components.

The accuracy of the simple calculation incorporating those components is illustrated by the experience of 1997–2016. The initial yield of the ICE BAML US High Yield Index was 9.39%. Based on data provided by Altman and Kuehne, the mean default loss rate for the period was 2.54%. The difference, 6.85 percentage points, was not far from the actual annualized return of 6.97%.

To enrich such forecasting exercises, the following discussion offers selected research insights into the inner workings of the key determinants of high-yield returns. (Detailed analysis of the first term in the expanded formula, the Treasury yield, is beyond the scope of this article.)

SPREAD VS. TREASURIES

Speculative-grade rating categories display extensive overlap in *option-adjusted spreads* (OASs). For example, on 31 March 2017, bonds in the OAS range of 421–543 bps were found in every alphanumeric rating category from BB1 to B3. (These credit quality categories are based on *composite ratings* used in the BAML indexes.)

Analysts commonly opine that the high-yield market is cheap because its spread is wider than—or expensive because its spread is narrower than—the historical average. The spread is a risk premium, however, so if the prevailing risk is greater than average, a wider-than-average spread is appropriate. In reality, high yield is cheap only if its spread is excessive in light of the risk.

A multiple regression model of risk that I have developed explains 80% of the historical variance in the high-yield OAS market on the basis of proxies for the following five explanatory variables:

- credit availability

- industrial production

- capacity utilization

- default rate

- five-year Treasury yield

The model also includes a dummy variable designating the period of *quantitative easing* by the US Federal Reserve.

By this analysis, the spread is frequently found to be far out of line with fair value for the risk. **Figure 1.1** plots the difference, in each month from December 1996 to March 2018, between the ICE BAML US High Yield Index's actual spread and the model's fair value estimate. A plot on the zero line indicates that the market is exactly at fair value, which almost never happens. The other two horizontal lines in the graph indicate extremes of one standard error (126 bps) from fair value. Plots above the upper line indicate extreme undervaluation, and plots below the lower line indicate extreme overvaluation.

FIGURE 1.1.   MONTHLY DIFFERENCE BETWEEN THE ICE BAML US HIGH YIELD INDEX'S ACTUAL SPREAD AND MODEL'S FAIR VALUE ESTIMATE, DECEMBER 1996–MARCH 2018
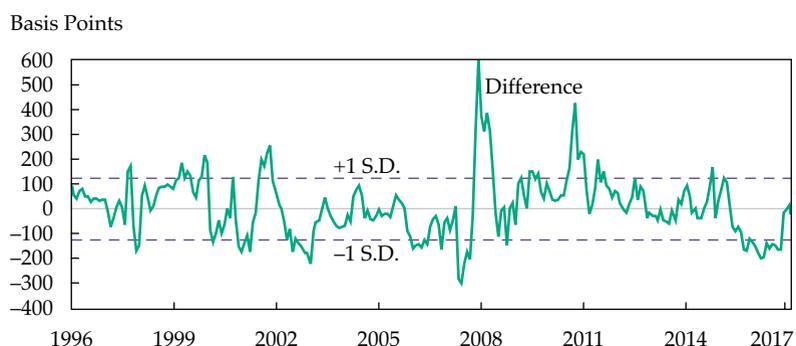
Note: S.D. is standard deviation.

Sources: Federal Reserve Board of Governors, ICE BAML Index System, and Standard & Poor's.

RETURNS

Perhaps the most striking feature of high-yield returns is their extraordinary dispersion compared with investment-grade returns. For example, in March 2016, returns on 82% of the bonds in the A rated ICE BAML US Corporate Index were within a 4 percentage point range (−0.999% to 3.000%). Capturing a comparable percentage (83%) of the B issues in that month required a 14 percentage point range of returns (−1.999% to 12.000%).

Sector returns were similarly widely dispersed in March 2016. Among 20 major industries in the BAML US High Yield Index, returns ranged from 0.33% on health care to a

staggering 16.07% on energy. In all, returns on 15 of the 20 industries were outside the range of ±1 percentage point versus the full index's 4.42%.

Duration, a mainstay of fixed-income analysis in the investment-grade world, explains comparatively little of the variance in returns of individual high-yield issues. For example, in June 2016, the correlation, *R*, between **effective duration** and price changes of A rated bonds was 82.2%. The comparable figure for B issues was only 9.5%.

The Nobel Prize–winning economist Robert Merton has provided a theoretical groundwork that helps explain the weak connection between duration and price change in the speculative grade. He modeled a corporate bond as a package of a default-risk-free Treasury bond and a short position in a put option on the issuer's equity.[2] The put is triggered when asset value declines to the point of being equivalent to the value of the company's liabilities, thereby reducing the value of the equity to zero. When that happens, the wiped-out shareholders see no benefit in continuing to pay debt service, so they put (surrender) the equity to the residual claimants, the bondholders. In other words, the company defaults on its debt. The closer the put is to being in the money, the more the bond's price is affected, leaving less room for the influence of duration. A speculative-grade bond is closer to default than an investment-grade bond; hence, the greater the impact the equity put option has on its price.

DEFAULT RATES

High-yield returns and spreads are heavily influenced by the default rate. The average rate, however, has little bearing over the short run. As **Figure 1.2** shows, few years have experienced a rate close to the mean of 4.79%. (These statistics are reported in percentage-of-issuers, as opposed to face amount, terms.)

Default rates can also be used to confirm that bond ratings define discrete risk categories. For example, global statistics compiled by Moody's Investors Service for the period 1998–2016 show that the one-year **probability of default** increases with each step down the speculative-grade alphanumeric scale, from 0.329% for Ba1 issuers to 20.388% for Caa3 issuers and 32.706% for issuers in the Ca to C range. Key thresholds commonly incorporated into funds' investment restrictions—for example, downgradings from Baa to the highest speculative-grade rating of Ba, as well as from B to Caa— are validated by significant jumps in the default rate at those breakpoints.

Incidentally, the rating categories are also supported by average financial ratios. For example, Standard & Poor's (S&P) reports that for 2016's high-yield new issues, the

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[2]R. C. Merton, "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates," *Journal of Finance* 29 (2): 449–70.

FIGURE 1.2.   DEFAULT RATE IN VARIOUS ECONOMIC CONDITIONS, 1986–2016 (ANNUAL)

Issuer-Weighted Default Rate (%)
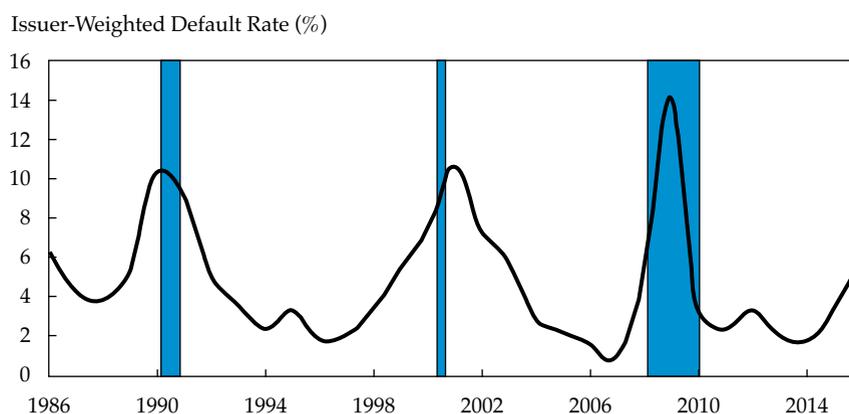
Notes: Mean = 4.79%. Shaded periods indicate recessions.

Sources: Moody's Investors Service; National Bureau of Economic Research.

mean debt/***EBITDA*** rose with each step down the rating scale—from 3.83× for the BBs to 7.07× for the CCCs. Similarly, EBITDA/cash interest declined monotonically from 5.21× on BBs to 3.23× on CCCs. Rating agency critics sometimes cite anecdotal evidence involving issuers with ratings that are out of line in rankings of this sort. The suggestion, however, that the rating agencies have simply failed to notice such discrepancies is ludicrous. Some of these supposed anomalies are explained by qualitative considerations that override the numbers. In other instances, a seemingly strong financial ratio merely represents a cyclical peak for a company that is subject to wide swings in EBITDA as economic conditions vary.

Forecasts of long-run default rates need not consider the mix of the speculative-grade universe between ***fallen angels*** and ***original-issue*** high-yield bonds. Moody's measured global default experience over the period 1993–2013 on a matched sample of fallen angels and original issues and found the five-year cumulative default rates to be essentially identical—9.7% and 9.6%, respectively.[3] Fallen angels do offer an advantage, however, when it comes to credit quality *improvement*. In the same 1993–2013 observation period, 26.7% of the fallen angels in the matched sample rose to investment grade over a five-year horizon versus only 20.7% of the original issues. That superior credit performance contributed to fallen angels' long-run edge over original issues in total return, both absolute and risk adjusted, as measured by Sharpe ratios.

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[3]Each fallen angel issuer was matched with an issuer that had the same rating as the fallen angel upon its descent to speculative grade.

Although the mix between fallen angels and original issues does not affect the default rate, the degree of concentration of **PIK-toggle** issues within the high-yield population does. Moody's found that in the record-high-default year 2009, a sample of PIK-toggles experienced a 29.6% default rate. The rate on a matched sample of conventional speculative-grade issuers was 17.0%.

RECOVERIES ON DEFAULTED BONDS

Returns are influenced not only by probability of default (PD) but also by **loss given default** (LGD). LGD equals PD minus the recovery rate. Reflecting the rule of **absolute priority**, recoveries generally decline with each step down in the capital structure. For the period 1987–2016, Moody's reported average recoveries on bonds of 52.8% for first lien, 44.6% for second lien, 37.2% for senior secured, 31.9% for subordinated, and 23.2% for junior subordinated.[4]

In projections of returns, analysts commonly assume a recovery rate of 40%–45% on the bonds that will default in a given year. This assumption is based on historical averages calculated over various historical periods. Like the default rate, however, the recovery rate varies widely around the average from year to year. According to historical data reported by Altman and Kuehne, the recovery rate commonly exceeds 60% at cyclical lows in the default rate and falls below 30% at cyclical highs in the default rate.

CONCLUSION

Based on the analysis presented here, you should be skeptical of even widely accepted methods of analyzing and forecasting the performance of high-yield bonds. You should also be conscious of the wide variation around averages in describing high-yield default rates, recoveries, annual returns for the asset class, and returns of sectors and individual issues within a given period. Finally, you should be cautious in applying traditional fixed-income analytical techniques to high-yield bonds.

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[4]Moody's reported a 31.1% recovery rate for senior subordinated bonds, which have a higher **priority** than plain subordinated bonds, which had a rate of 31.9%. This seeming anomaly probably represents statistical noise arising from a comparatively small sample size combined with the fact that not all capital structures with senior subordinated bonds also contain plain subordinated bonds.

2. THE ART OF HIGH-YIELD CREDIT ANALYSIS

Bill Hoffmann
Senior Analyst
Investcorp Credit Management US LLC
New York City

The high-yield and leveraged loan markets are frequently influenced by a variety of extraneous factors that need to be considered in an investment decision. Often, it is the external market forces that create tremendous investment opportunities. For example, volatility in the energy industry from 2014 through 2016 led to attractive opportunities but also produced substantial risk in the energy and related sectors of the high-yield markets. During that period, despite relatively sound underlying economic conditions globally, investors witnessed some of the most significant volatility since the financial crisis in 2008–2009. Economic growth was somewhat anemic for several years following the financial crisis, contrary to normal recovery patterns, but the economy steadily improved from 2014 through 2016. In the following sections, I discuss an interesting case involving external market forces that occurred in the chemical industry, a sector that is significantly affected by the volatility of oil-based and natural gas–based raw materials.

CASE STUDY: KRATON PERFORMANCE POLYMERS' ACQUISITION OF ARIZONA CHEMICAL, 2015

This case study illustrates the decision process by which a high-yield analyst determined whether to recommend a significant investment in support of Kraton Performance Polymers' debt-financed acquisition of Arizona Chemical. The analyst worked for a major long-only high-yield fund that is well diversified across industry sectors.

The chemical industry is influenced by many macroeconomic factors, including the volatility of prices for raw material feedstock, global supply and demand in specific product lines, and overall global economic growth. In addition, high-yield markets are affected by technical factors that result from changes in investor sentiment and capital flows in and out of high-yield mutual funds. Pricing of new issues is normally determined by the investment community on a relative-value basis. The process consists of comparing the new security with issues of other, similar credits on a variety of factors.

Yield differentials related to these factors vary according to technical conditions. This valuation is most definitely an *art*, not a science.

Investors in the high-yield market generally deal with the following characteristics of the asset class:

- High-yield bonds are typically a permanent part of the capital structure, like equity, with debt reduction usually accomplished through term loan repayments.

- Valuation relative to other bonds is affected by underlying macroeconomic factors, industry fundamentals, business-specific risks, and the issuer's financial strategy. The assessment of a company's financial strategy includes the analysis of ***free cash flow***, deleveraging potential, and the risk of additional leveraging transactions. Liquidity is always important.

- Relative-value analysis is typically based on the yield of one security versus another, comparable security. During periods of company-specific or market-wide stress, however, some bonds trade according to dollar price levels on a relative basis.

- The industry analyst's goal is to generate alpha within the sector and the high-yield market.

In 2015, global financial markets were being driven largely by the energy sector, which was experiencing a major oil price correction. Crude prices were beginning to drop well below the profitability levels of US shale producers. As a result, ***bankruptcy*** risks were skyrocketing in the energy sector. Investor sentiment shifted to an increasingly cautious stance, and the high-yield market came under pressure as significant losses mounted across most portfolios. High-yield funds began to experience significant outflows, and new issuance became severely constrained toward year-end. The chemical sector was also strained because of its sensitivity to the general level of economic activity and its dependence on the primary feedstocks of oil and natural gas.

Kraton Performance Polymers was slated to come to market to complete a proposed financing by year-end 2015. The bonds failed to clear the market, however, and the underwriters were forced to fund the transaction at the cap rates (maximum level provided from the underwriters) early in 2016. The underwriters brought the deal back to market in March 2016 following the term loan launch in February. By this time, the high-yield market had begun to thaw, but energy markets remained under significant pressure.

The Transaction: 28 September 2015

Kraton Performance Polymers announced its intention to acquire the private company Arizona Chemical for $1.37 billion in cash, or 7.4× the latest-12-months (LTM) adjusted EBITDA. The company announced at the time that it saw potential for $65 million of synergies, which would bring the acquisition multiple down to a more attractive 5.5× LTM EBITDA. Funding for the transaction was supported by committed debt facilities from a group of underwriters. The timing of the offering was affected by the need for approval by antitrust authorities in the United States and other jurisdictions in which the two companies had operations. Consequently, the deal was expected to close by the end of 2015 or early 2016. Total leverage was expected to be 5.4× LTM EBITDA, before synergies and excluding the Kraton-guaranteed debt at KFPC, a joint venture created to build production capacity in Asia.

The Companies

Kraton Performance Polymers is a leading global specialty chemical company that manufactures styrenic block copolymers (SBCs) and other engineered polymers. SBCs are highly engineered synthetic elastomers that are used to enhance the performance of other products by imparting to them greater flexibility, resilience, strength, durability, and processability. SBCs have a wide range of applications, including adhesives, coatings, consumer and personal care products, sealants, lubricants, medical products, packaging, automotive products, paving and roofing, and footwear products. The company also sells complementary products—isoprene rubber and isoprene rubber latex, which are not SBCs but are used in medical products, personal care products, adhesives, tackifiers, paints, and coatings.

The target, Arizona Chemical, refines and upgrades two primary feedstocks into value-added specialty chemicals. Crude tall oil and crude sulfate turpentine are pine-based chemicals that Arizona Chemical upgrades to produce complementary products for adhesives, roads and construction, and the tire markets. In addition, Arizona Chemical produces a broad range of chemical intermediates for use in fuel additives, oilfield chemicals, coatings, metal-working fluids and lubricants, inks, flavors and fragrances, and the mining industry.

Transaction Rationale Provided by Kraton

- Arizona Chemical is an industry-leading supplier of specialty chemicals and high-value products derived primarily from nonhydrocarbon, renewable resources.

- Arizona Chemical is complementary to Kraton's existing business because more than 50% of its sales come from common end-markets. The acquisition expands Kraton's organic growth opportunities into adjacent markets.

- Kraton and Arizona Chemical have similar business philosophies, with a focus on product differentiation and portfolio shifts.

- Arizona Chemical has attractive margins; adjusted EBITDA margins are above 20%.

- Arizona Chemical has strong free cash flow.

- The acquisition satisfies a Kraton strategic goal of portfolio diversification in adjacent markets.

- Projected synergies total approximately $65 million.

Financing Plan

Kraton presented a financing plan in conjunction with announcing the deal. The plan included a $1.35 billion term loan and $440 million of senior notes. Pro forma leverage was a bit aggressive—4.0× secured debt and 5.4× total debt—but the company was known to the market and its free-cash-flow generation appeared adequate to support a relatively aggressive capital structure. More leveraged companies already in the market made the analysis of pricing relative to other comparable credits look more favorable for Kraton. Existing bondholders were happy with the prospect of a likely take-out loan to support the new transaction.

ANALYSIS OF THE DEAL

The high-yield market in September 2015 had been weakening since midyear. Oil prices appeared to be under renewed pressure, and investor concerns about defaults in the oil sector were increasing. The average yield in the high-yield market had increased by more than 100 bps from the beginning of the year, and the spread versus Treasuries had increased by 180 bps because of risk averse investor movement into US Treasuries. New issuance had dried up midyear, but by late September, there were signs of recovery in the high-yield market.

The chemical sector had largely been tracking the broader high-yield index given the positive economic outlook. Weak crude oil prices promised to reduce raw material costs dramatically while end-market demand was still supported by moderate GDP growth globally.

Market sentiment for leveraged chemical credits was tested in mid-September by Olin Corporation's launch of its financing for the acquisition of the Dow Chemical chloralkali business. The underwriters originally marketed that transaction by "whispering" a yield in the high 6% range, but it ultimately took a 10% coupon to clear the market,

which indicated a significantly strained high-yield market. The pricing also precipitated a broad selloff of the higher-risk credits in the chemical sector, effectively repricing risk. Fortunately, Kraton Performance Polymers had to await approvals and thus had time to allow the markets to settle. In addition, the company had an underwritten deal.

Credit Analysis

Corporate credit analysis encompasses many layers of evaluation of company-specific items, all within the context of the broader concepts of competitive analysis and analysis of global economic and trade factors. Chemical cycles are typically driven largely by supply-and-demand balances. Capacity utilization is an important metric because of the significant capital investment required. Supply additions can generate ongoing shocks to the system as a result of the large scale of the assets and the need to run at high utilization rates to maintain profitability. Demand shocks arise from global GDP fluctuations, currency, inventory cycles, and product substitutions, to name a few factors. The impact of new entrants is easier to anticipate because of the long lead times for constructing and ramping up complex chemical facilities, but it still must be monitored.

Analysis of the financials includes investigation into a number of layers of the company's performance over time, including revenue and cost drivers within the context of macro factors and fundamental conditions in the industry. In addition, the analysis focuses on the company's ability to generate cash flow for its financial requirements, including interest, taxes, capital spending, and working capital, as well as its financial flexibility and liquidity for managing cycles, seasonality, and business shocks. **Table 2.1** provides a pro forma look at the proposed combination from the point of view of Kraton Performance Polymers.

To simplify the case discussion, I focus on the cash flow outlook and the company's ability to support its operations and grow. The combined company would generate approximately $100 million of free cash flow on an LTM basis. This conclusion takes into account the expected interest expense and estimated combined capital spending, which Kraton Performance Polymers indicated would be approximately $100 million. The company also anticipated $47 million of additional capital spending for the KFPC joint venture, however, which would be financed at the joint venture level. The combined company's free-cash-flow estimates included a limited level of taxes because of significant net operating losses that the company carried. Working capital was expected to be neither a use nor a source of cash because of the outlook for relative stability of raw material costs and the assumption of improved working capital management at the acquired Arizona Chemical business.

TABLE 2.1.   KRATON PRO FORMA FOR THE COMBINATION

Factors	2012	2013	2014	LTM[a] to 30 September 2015	With Synergies
Sales volume Kraton (mm lbs.)	313.0	314.0	306.0	304.0	
Sales volume Arizona Chemical (mm lbs.)	657.0	676.0	620.0	612.0	
Revenue ($mm)	2,465.0	2,284.0	2,168.0	1,893.0	1,893.0
Adjusted EBITDA (estimated current replacement cost)	364.0	346.0	339.0	355.0	420.0
Margin	14.8%	15.1%	15.6%	18.8%	22.2%
Interest expense ($mm)				130.0	130.0
Capital expenditures (capex)[b] ($mm)	103.0	130.0	127.0	131.0	131.0
Total debt (ex Kraton debt) ($mm)				1,828.7	1,828.7
Leverage				5.2×	4.4×
Interest coverage				2.7×	3.2×
EBITDA-capex/int				1.7×	2.2×

[a]Latest 12 months.

[b]Capex for Kraton had been elevated in the past several years.

Notes: mm lbs. = million pounds. $mm = millions of US dollars.

Source: Company reports.

Deal Synergies

Kraton Performance Polymers management indicated that the company had identified the potential for approximately $65 million of **run-rate synergies** that could result from the merger with Arizona Chemical. Kraton believed that manufacturing costs could be reduced and efficiencies enhanced by applying best practices, focusing on energy consumption, lowering maintenance spending, and improving productivity and yields. In addition, Kraton foresaw significant potential savings in selling, general, and administrative expenses; in the supply chain; and in logistics. Some $25 million was expected to be achieved in Year 1 (2016), and the Year 2 target was $50 million–$60 million. The projected cost to achieve the synergies was approximately $50 million, with 50% expected in Year 1.

Summary of the Credit Analysis

In summary, the deal could be characterized as offering the following:

- an attractive business combination,

- a positive fundamental outlook,

- manageable business risks,

- a path to deleveraging and adequate free-cash-flow generation,

- synergistic benefits and cost reductions sufficient for upside potential in the credit area, and

- price talk on the bonds in the range of comparable credits' trading levels and 125 bps behind the Olin bond's level in the secondary market.

RELATIVE VALUE: THE ART OF PRICING IN THE NEW-ISSUE MARKET

This analysis starts with a comparison of similar businesses in the company's industry sector—primarily, intermediate and specialty chemical companies. The analysis also considers similar stories—that is, leveraged acquisitions in support of growth and diversification. Specifically, similar stories are those of Olin and Platform Specialty Products. Higher-risk commodity producers, such as Tronox and Chemours, are more cyclical than Kraton Performance Polymers but also provide useful benchmarks. They were struggling in a cyclical trough, so their leverage (total debt/EBITDA) was higher than usual, but their midcycle leverage would be fairly comparable to that of Kraton. Olin was probably the credit on which investors were most focused because of its

leveraged acquisition of a Dow business and the fact that its new issue had triggered a repricing of the chemical sector. Riskier credits were trading at approximately a 200 bp premium to the market averages. Kraton's underwriters indicated price talk in the 9.5% area, 125 bps wide of Olin and closer to the range of Platform Specialty, despite Kraton's higher leverage. The price talk was appropriate, but investor appetite for additional risk was still shaky, especially toward the end of the year. **Table 2.2** provides the financial information for comparables drawn from a mix of "higher-risk" capital structures in the high-yield market at the time of the new issuance:

- PQ Corporation is another leveraged specialty chemical company, but its bonds were privately placed in 2015 and had no secondary market. The company's term loans provided a reference point for pricing the Kraton term loans.

- Platform Specialty Products is a leveraged specialty chemical company specializing in performance solutions and agricultural solutions. Its total leverage is significantly higher than Kraton's, but its business is built on an asset-light, high-touch model, which reduces the capital requirements.

- Chemours and Tronox are commodity chemical companies that were experiencing cyclical trough conditions and high leverage. They do, however, provide an indicator of where the market was pricing higher-risk credits.

- Olin was leveraged similarly to Kraton but had proven that it was in a cyclical recovery. Its bonds were issued at a greater concession to investors than market conditions ordinarily could have warranted, a consequence of poor timing and difficult technical conditions in the high-yield market in September 2015.

Note that the chemical sector average index yield was approximately 9% and the average YTW of the broad high-yield market was 8.5%.

THE RESULT

As explained previously, because of market conditions, the Kraton issue could not be completed in December 2015. At that time, a full "risk-off" mentality prevailed in the market. Moreover, in early 2016, the financial markets continued to deteriorate and no new issues were coming to the market. Risk spreads widened by an additional 100–200 bps in January 2017.

Then, Kraton Performance Polymers announced a potential asset sale that might help reduce leverage. Subsequently, the company completed the acquisition of Arizona Chemical, and the underwriters financed the entire deal, probably pricing the loans and the bonds at the caps in the underwriting agreement. Kraton's bonds were priced

TABLE 2.2. RELATIVE-VALUE ANALYSIS: CHEMICAL SECTOR COMPARABLE CREDITS, 17 MARCH 2016

Company	Issue	Ratings	YTW[a]	Sector Leverage	Sector Debt	Enterprise Value (EV)[b]	EV/ EBITDA
Loans							
Kraton	1st *lien* term loan B L+ 500	Ba3/B+	7.2%	4.1	1,406.9	2,304.1	6.7
PQ Corporation	1st lien term loan B L+ 550	B2/B+	7.0	4.2	1,221.1		
Platform Specialty	1st lien term loan B L+ 450	B2/BB−	6.5	4.5	3,349.0	7,433.8	10.0
Chemours	1st lien term loan B L+ 300	Ba1/BBB−	4.5	2.6	1,489.0	4,719.0	8.2
Tronox	1st lien term loan B L+ 350	B1/BB+	6.9	4.4	1,627.0	3,809.4	10.4
Bonds							
Kraton	10.5% senior notes due 2023	B3/CCC+	12.0%	5.3	1,848.5	2,304.1	6.7
Platform Specialty	6.5% senior notes due 2022	Caa1/B+	10.2	7.8	5,794.5	7,433.8	10.0
Chemours	6.625% senior notes due 2023	B1/BB−	10.8	7.0	3,992.0	4,719.0	8.2
Tronox	7.5% senior notes due 2022	Caa1/B+	13.5	8.5	3,127.0	3,809.4	10.4
Olin	9.75% senior notes due 2023	Ba1/BB+	7.4	5.2	3,974.9	6,456.6	8.5
BAML US High Yield Chemical Sector Index			9.3				

[a]Yield to worst.

[b]Enterprise value is defined as Market value of a company's common stock + Face value of debt + Minority interest − Cash and investments.

Sources: TRACE (Trade Reporting and Compliance Engine) and author estimates.

at 10.5%, 100 bps higher in yield than the original price talk. The outcome was similar for the bank loans.

After the Energy sector declined by 23.5% in 2015, it fell another 19% through mid-February 2016. High yield consequently became a buyer's market. In early March, however, oil prices began to firm and the high-yield market found a bottom. By March 2016, investors knew that the underwriters were growing eager to move out of the Kraton paper.

Underwriters relaunched the term loans in February and the bonds in March 2016. The comparable credits were at much different levels than in December, with Platform Specialty 75 bps wider and Olin, interestingly, having tightened further following solid financial results. Also, the underwriters' preliminary price talk on the Kraton bonds were indicated at significant discounts to par. Kraton's bonds ultimately cleared the market at $93.0, equivalent to a 12% YTW, making them an attractive relative value.

In this case, the market technical factors created an exceptional opportunity to generate alpha, excess returns relative to the market. The Kraton bonds delivered in excess of a 25% one-year return, with an ongoing interest carry well above the market rate. We believed that the credit risks appeared to be sufficiently manageable to support the purchase of the bonds at the discounted price. We had confidence in the combined company's fundamental outlook, and the baseline free cash flow was adequate to buffer credit risks. Kraton management was committed to deleveraging the balance sheet and had the free cash flow to do it. As technical factors began to improve, the offering's potential for attractive returns was realized.

3. FORECASTING THE HIGH-YIELD DEFAULT RATE

Diane Vazza
Head, Global Fixed Income Research
Standard & Poor's Global Ratings
New York City

Figure 3.1 shows the actual trailing-12-month US corporate speculative-grade default rate from 1982 to 2018. S&P's Global Fixed Income Research expects this default rate to decrease to 2.7% by September 2018—from 3.1% in September 2017 and 5% in September 2016. S&P's forecast for the US default rate is based on current observations and on expectations of the likely path of the US economy and financial markets. In addition to the baseline projection, we forecast the default rate in optimistic and pessimistic scenarios. We foresee a rate of 2.2% for September 2018 (39 defaults in the trailing 12 months) in our optimistic scenario and 3.4% (61 defaults in the trailing 12 months) in our pessimistic scenario.

FIGURE 3.1.   TRAILING-12-MONTH SPECULATIVE-GRADE DEFAULT RATE AND SEPTEMBER 2018 FORECAST
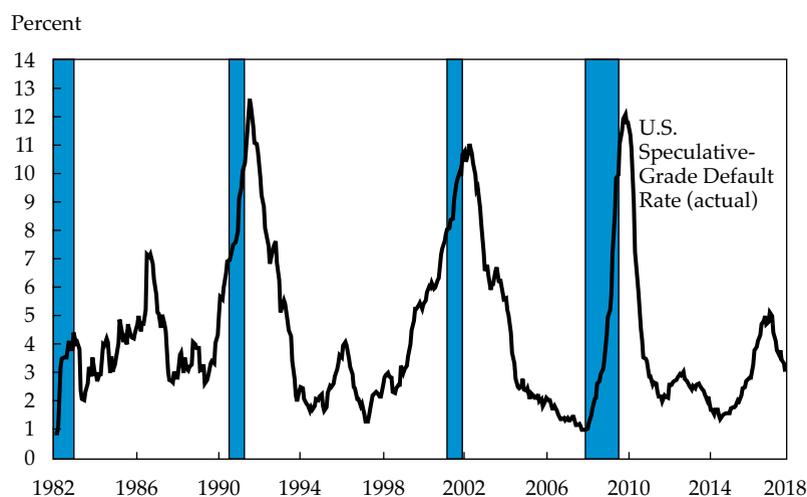
Note: Shaded areas are periods of recession as defined by the National Bureau of Economic Research.

Sources: S&P Global Fixed Income Research; S&P Global Market Intelligence's CreditPro.

The energy and natural resources sector, which accounted for more than half of all defaults in the United States in 2016, and the consumer service sector have been experiencing heightened credit stress. These sectors account for 25% of the current speculative-grade (rated BB+ or lower) entities in the United States and more than 55% of all companies rated CCC+ or lower.

Since 2015, the energy and natural resources sector has been the primary contributor to the overall default rate. Little spillover to other sectors has occurred, however, and since the start of 2017, the sector's default tally has been declining, which has brought the overall default rate back in line with the default rate ex energy and natural resources.

Fundamental shifts in operations for many retailers globally are causing stress within the consumer service sector, which led to an increase in retailer defaults in 2016. The trend toward increased online shopping has caused traditional brick-and-mortar retailers (particularly, apparel producers) to shutter many storefronts. Online shopping has led to transparency in prices for consumers, squeezing profit margins for traditional retailers. These patterns are unlikely to reverse, so many retailers may be forced to fundamentally change their operations or close.

The consumer service sector's ratings profile is heavily speculative grade, and many sector companies have high debt loads that could pose challenges as they approach maturity and these structural shifts progress. The pace of net downgrades (upgrades minus downgrades) in the sector has increased markedly in the past 12 months, which could be a prelude to increased defaults. The consumer service sector now leads in net downgrades and has eclipsed all other sectors by a wide margin. Moreover, it is still on a downward trajectory while other leading sectors are showing signs of recovery.

The relatively low default rate globally that has prevailed since the 2008–2009 financial crisis has been partly the result of abundant liquidity supporting the market and partly the result of yield-hungry investors looking for returns amid very low interest rates.

Access to credit markets has been easy, which allows companies to raise capital to refinance debt and extend maturities, and low interest rates have kept debt-service costs stable. If interest rates rise significantly, therefore, many issuers could face difficulty servicing their debt because many issued debt to finance leveraged buyouts (LBOs), share buybacks, and increased equityholder dividends rather than to fund business growth, which would afford them greater financial flexibility. Purchase-price multiples on LBOs have reached historic highs, which could slow mergers and acquisitions in the speculative-grade segment.

Secondary market yields on industrial debt have been falling since 2016. After hitting a high of 14.3% in late January 2016, the yield on B rated industrials fell to 6% in October 2017.

S&P's Global Fixed Income Research bases its forecasts on a variety of factors, including our proprietary default model for the US corporate speculative-grade bond market. The main components of the model are economic variables (e.g., unemployment rate), financial variables (e.g., corporate profits), the Federal Reserve's Senior Loan Officer Opinion Survey on Bank Lending Practices, interest burden, slope of the yield curve, and credit-related variables (e.g., negative bias). We update our outlook for the US corporate speculative-grade default rate each quarter after analyzing the latest economic data and expectations.

At the time of this writing, the interaction between the dependent variable—the US speculative-grade default rate—and the input variables is in line with our expectations. Increases in the unemployment rate and in negative bias are positively correlated with the speculative-grade default rate: As the unemployment rate increases or as negative bias (the proportion of entities with negative outlooks or ratings on CreditWatch with negative implications) rises, default rates usually increase.

After declining from a record high at the end of 2014, the total number of speculative-grade entities in the United States rose to 1,789 in September 2017. Most of this rebound is attributable to 495 new issuers receiving initial ratings after the start of 2016. The energy and natural resources sector has accounted for about 14.1% of this number, but 54% of new issuer ratings in the sector have reemerged from prior defaults. Since 2016, 95% of new speculative-grade issuers from the consumer service, health care/chemicals, and high-tech/computers/office equipment sectors were rated for the first time by S&P Global Ratings. Since 2016, the newly minted first-time issuers from these three sectors have accounted for more than 40.6% of all new issuer ratings.

Speculative-grade companies represent 55.7% of all rated entities. Based on our study of historical data, default occurrences are not only more frequent among lower-rated companies, but the time it takes those companies to default is also shorter. This characteristic is not surprising given that the lowest-rated companies tend to be the smaller, less diversified, and more highly leveraged companies with less financial flexibility in stressful economic conditions.

Of the 1,789 speculative-grade-rated entities, 278 are currently rated B– and 138 are rated CCC+ or lower, for a combined 23.1% of the total. From 1981 to September 2017, an average of 8.4% of entities rated B– and 28.7% of entities rated CCC or lower defaulted within 12 months. If these averages are applied to the current entities rated B– or lower, a projected 62 defaults could result in the next 12 months, excluding any

defaults of entities with other ratings. To put this prediction in the perspective of our baseline forecast, 48 entities would need to default in the next 12 months from a total pool of 1,789 US speculative-grade entities for the default rate to reach 2.7%. This scenario does not incorporate historical default rates for other speculative-grade ratings and longer time horizons (such as 24 months or 36 months), which are even higher, as **Figure 3.2** shows, than rates for the B– and CCC grades. Entities rated B make up 32.2% of all speculative-grade entities, and if the 3.8% weighted-average historical trailing-12-month default rate for B ratings is applied, an additional 22 defaults would occur.

Despite many of the leading indicators of default pressures pointing toward fewer defaults in the near future, risks remain. Global uncertainties include the Brexit process in Great Britain, North Korea tensions, and the Fed raising rates and unwinding its balance sheet holdings of US Treasuries and mortgage-backed securities. In the event of an unexpected shock or if markets react negatively to any of these situations, defaults may stay at their current 3.1% level or even rise. The riskiness is especially accurate in light of the current ratings mix in the US speculative-grade market. The small companies with low ratings and little financial flexibility are particularly vulnerable to unexpected market disruptions. The share of issuers rated B– or lower shot up quickly after

FIGURE 3.2. US AVERAGE DEFAULT RATES BY TIME HORIZON AND SPECULATIVE GRADE, JANUARY 1981–SEPTEMBER 2017
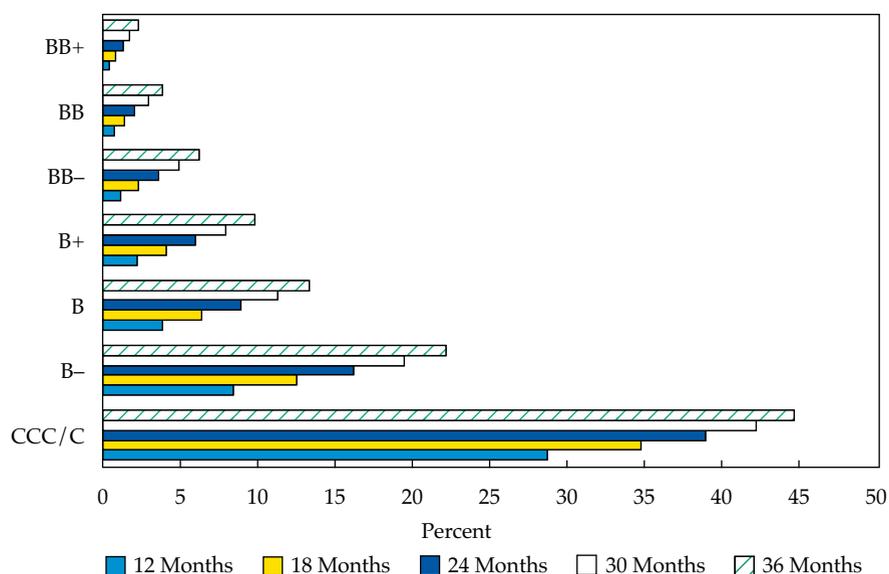
Sources: S&P Global Fixed Income Research; S&P Global Market Intelligence's CreditPro.

June 2014 when the price of oil started to slide and is now, at 23.1%, at its highest point in more than seven years.

Companies with upcoming debt maturities are at the greatest risk of default if the economy or financial markets deteriorate. Based on the maturity schedules of all US speculative-grade fixed- and floating-rate corporate bonds and bank debt, upcoming maturities are set to increase significantly beginning in 2019. In the near term, refunding needs appear manageable because $21.3 billion in speculative-grade debt is maturing in 2017 and $115.6 billion, in 2018.

Despite challenges ahead for certain sectors, many economic and financial indicators remain positive. The Fed's third-quarter 2017 Senior Loan Officer Opinion Survey on Bank Lending Practices continued to show easing lending conditions, with banks reporting a net 3.9% loosening for commercial and industrial loans in the second quarter of 2017 (Q2 2017). This easing trend appeared in the prior three surveys, as **Table 3.1** shows, and as a leading indicator, supports S&P's view of a declining default rate.

After year-over-year (yoy) declines following Q3 2015, Table 3.1 indicates after-tax corporate profits have increased on a yoy basis in every quarter since Q4 2016. In Q3 2017, profits continued to grow at a healthy 7.8%. Following the same trend as profits, industrial production posted a yoy gain of 1.6% in September, marking four quarters in a row of yoy growth. Equity market volatility (as measured by the VIX) has been low through 2017.

Table 3.1 also provides the following insights. It indicates that the labor market has shown strong demand for employees in 2017. The unemployment rate fell to 4.2% in September from 4.9% a year earlier and is at its lowest since December 2000. The distress ratio (the percentage of speculative-grade bonds trading at 1,000 bps or higher relative to Treasuries) remained low in 2017. It reached only 7.6% in October—one of the lowest levels in three years and below the long-term average of 12.5%.

Despite positive conditions, some credit market factors indicate increased stress. The yield curve remained positive at the end of the first quarter of 2017 but has declined noticeably since then. Historically, an inverted yield curve has been considered a recessionary warning signal.

Downgrades as a proportion of all rating actions held steady from the second quarter of 2017 to the third quarter, after descending from a high of 81% in Q1 2016. Negative bias, hovering around 20% since 2016, has been higher than in recent years but eased recently.

TABLE 3.1.   EARLY WARNING SIGNALS OF US CORPORATE DEFAULT PRESSURE

Measure	Q3 2017	Q2 2017	Q1 2017	Q4 2016	Q3 2016	Q2 2016	Q1 2016	2015	2014
US unemployment rate	4.2%	4.4%	4.5%	4.7%	5.0%	4.9%	5.0%	5.0%	5.6%
Fed survey on lending conditions	−3.9	−2.8	1.4	1.5	8.5	11.6	8.2	7.4	−10.5
Industrial production (% chya)	1.6%	2.1%	1.4%	0.8%	−1.2%	−0.8%	−2.4%	−3.3%	3.2%
Slope of the yield curve (10-year less three-month, bps)	127	128	164	194	131	123	157	211	213
Corporate profits (nonfinancial, % chya)		7.8%	3.7%	14.1%	−2.2%	−8.0%	−4.2%	−15.1%	9.2%
Equity market volatility (VIX)	9.5	11.2	12.4	14.0	13.3	15.6	14.0	18.2	19.2
High-yield spread (bps)	353.6	376.5	383.9	405.0	507.9	603.2	674.8	630.6	555.5
Interest burden		10.5%	10.6%	10.4%	10.4%	10.6%	10.3%	11.0%	10.0%
S&P distress ratio	7.9%	7.4%	7.1%	8.0%	13.2%	17.1%	24.8%	24.5%	13.8%
S&P US speculative-grade negative bias	19.3%	19.8%	19.9%	21.6%	22.5%	23.5%	21.5%	17.7%	13.9%
Ratio of downgrades to total rating actions	60.0%	58.8%	62.0%	65.8%	68.2%	70.7%	81.0%	68.6%	50.5%
Proportion of speculative-grade initial issuer ratings B− or lower	24.7%	19.7%	23.8%	21.6%	29.7%	35.8%	32.6%	18.6%	20.4%
US weakest links* (#)	148	148	151	168	171	174	157	115	83

Notes: "Fed survey on lending conditions" refers to net tightening for large companies. VIX is the Chicago Board Options Exchange Volatility Index. The interest burden is defined as net interest payments as a percentage of S&P's EBITDA profit proxy (the sum of profits, consumption of fixed capital, and net interest payments). % chya = Percentage change from a year ago.

*Weakest links are issuers rated B− or lower with negative outlooks or ratings on CreditWatch with negative implications.

Sources: IHS Global Insight; S&P Global Fixed Income Research.

The US corporate interest burden has averaged 10.4% since 2013, marking an unusually long period of relative stability. Despite the large borrowings in recent years, low interest rates and strong corporate profits have kept interest payments (as a percentage of income) at historically modest levels. The increase in total borrowing, however, has also kept the interest burden higher than previous post-recession levels, potentially fueling a spike in defaults if either interest rates rise or revenues fall for a protracted period. With pending maturities manageable, my colleagues and I do not believe this potentiality is a near-term threat.

The relative risk of holding corporate bonds can be a major contributor to future defaults because companies face pressure if they are unable to refinance maturing debt. A measure of this risk is the US corporate speculative-grade spread, which reflects near-term market expectations for overall stress in the speculative-grade market. After the speculative-grade spread reached its five-year high in 2008, a wave of defaults pushed the default rate to its November 2009 peak. The speculative-grade spread has tightened considerably, so it is not surprising that the default rate has also declined.

The speculative-grade spread is a good indicator of broad market stress, but defaults are generally rare during most times in the economic cycle that are not downturns. Even in placid conditions, however, the United States has never experienced a 12-month period with no defaults. So, instead of the speculative-grade spread, a more targeted indicator of future defaults across all points in the credit and economic cycles is the corporate *distress ratio*. The distress ratio reflects market sentiment in much the same way as the overall spread does, but it focuses on those issuers perceived as facing extraordinary stress even in relatively benign periods. A leading indicator of the default rate, the distress ratio has a nine-month lead time as opposed to one year for the speculative-grade spread. The distressed market has proved to be a good predictor of future defaults during periods of favorable lending conditions. As Table 3.1 shows, this indicator has been falling.

4. CORPORATE BANKRUPTCY: PRIMER ON PROCESS AND PROSPECTS

Anders Maxwell
Managing Director
PJ SOLOMON
New York City

Bankruptcy reorganizations—and related out-of-court restructurings—represent an opportunistic niche in high-yield credit markets. The reason is the dynamics of corporate restructurings, including the varied causes and consequences of business failure. Restructurings are a complex and often opaque process, and the value of the securities is volatile and uncertain because of a highly inefficient market. Often perceived as synonymous with loss, business restructurings can afford outsized investment returns while offering valuable insights into how businesses can change and the pivotal role of management. Corporate failures hold at least as many lessons as the success stories chronicled in such business school staples as *In Search of Excellence* and *Good to Great*.[5]

This primer introduces bankruptcy's legal underpinnings and process, the relationship between a reorganization's cause and effect, the importance and challenge of distressed company valuations, patterns of default over the business cycle, and current trends in corporate bankruptcies. Keep in mind that reorganizations vary based on whether undertaken in or out of court. Most of what follows relates to in-court bankruptcy, but the principles apply broadly. A list of resources recommended for specific topics is at the end of this article.

BACKGROUND

A useful starting point for understanding the restructuring process is the basic foundation and practice of bankruptcy law. Codified in the United States in the 19th century and based on English law, bankruptcy is meant to balance a ***debtor's*** right to rehabilitation with a creditor's right to a recovery. Reflecting a public policy of rescuing and rehabilitating failing companies and maintaining employment, bankruptcy serves as a

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[5]Thomas J. Peters and Robert H. Waterman, Jr., *In Search of Excellence: Lessons from America's Best-Run Companies* (New York: HarperCollins, 1982 and 2004); Jim Collins, *Good to Great* (New York: HarperCollins, 2001).

"court of equity." **Bankruptcy court** affords a degree of discretion to the court's judgment in order to achieve a fair and equitable resolution. This practice is in contrast to the more common "courts of law," where adjudication is based solely on contract rights and obligations.

In 1978, the US Congress enacted a major revision to the **Bankruptcy Code** (the Code). Key provisions include a company's ability to act as "debtor in possession" and assume the role of trustee of its estate for the benefit of creditors. This provision allows a debtor to continue operation in bankruptcy and limits business disruption while respecting the rights and interests of creditors. The Code provides for a court-appointed trustee should the debtor's actions warrant it. It provides for multiple creditor committees, shareholder committees, a valuation of the business in support of a **plan of reorganization**, and ministerial actions (government actions performed according to legal authority, established procedures, or instructions from a superior that do not entail individual judgment), including retention of bankruptcy professionals, interim financing in bankruptcy, assumption or rejection of contracts, and releases.

WHY AND HOW COMPANIES REORGANIZE

The reasons companies fail are complex and vary significantly from case to case. Failure can be classified, however, into four categories. In order of their frequency of occurrence, these categories are as follows:

(1) overleverage associated with financing or refinancing of buyouts, expansions, or acquisitions

(2) mismanagement that is eventually exposed by secular or cyclical volatility or competitive pressure

(3) adverse capital markets, including credit tightening or commodity price dislocation

(4) tort **claims** litigation or fraud

The magnitude and scope of these precipitating factors and the size and complexity of a company's capital structure and ownership profile generally determine how companies reorganize. Three approaches to restructuring are generic. In the vernacular of distressed investing, they are out-of-court restructurings designed to mitigate the cost and disruption of in-court proceedings; prepackaged or prenegotiated bankruptcy filings based on an agreement among claimants in advance; and a "free-fall" voluntary or involuntary filing when a consensus is lacking between debtor and creditors as to a plan of reorganization (a Plan).

As a generalization, out-of-court proceedings are practical when companies are small, issues are well recognized, capital structure is simple, and ownership of debt is concentrated. Instances of mismanagement, market reversals, and tort claims typically pose more complex issues with greater divergence of interests between stakeholders. In these circumstances, in-court proceedings are probably required to reach resolution. The three forms of restructuring, the corresponding case characteristics, and their relative applicability based on cause are summarized in **Figure 4.1**.

FIGURE 4.1. RESTRUCTURING: APPROACHES REFLECTING CASE CHARACTERISTICS AND CAUSES

Approach	Out of Court	Prepackaged	Free Fall
Case Characteristics / **Cause**	• Reasonable business visibility • Limited number of holders • Savings from avoiding Ch. 11	• Majority creditor support • Adequate time to negotiate • Available financing	• Business or case complexity • Large/tiered capital structure • Diverse holder base
Overleverage	●	●	●
Mismanagement	◐	●	●
Market Reversal	○	◐	●
Tort Claims	○	○	●
Legend			
● Cause of restructuring fits approach indicated	◐ Cause is a possible fit to approach	○ Cause not suited to approach	

Note: Ch. 11 refers to **Chapter 11**.

THE BANKRUPTCY PROCESS

The restructuring process, although founded in law, reflects evolving business practices. In out-of-court cases, negotiations between a company and its key constituents are relied on to reach agreement and avoid a filing. In contrast, an in-court proceeding, whether or not it is prenegotiated, uses the structure and authority of the court to reach a consensual plan. It benefits from setting deadlines, encouraging compromise, and when necessary, requiring mediation.

Myriad legal issues arise and must be addressed during a case. Nevertheless, bankruptcy reorganization can be viewed in stages. First is preparation, including identifying issues and objectives, arranging interim financing, selecting advisers, preparing motions, and establishing budgets, communications, a timetable, and the court venue. Second is building consensus among management, creditors, investors, and customers regarding a new business plan, recapitalization, and a proposed allocation of equity value. The court, using the process to temper divergent interests and achieve compromise, functions as an effective forum for these negotiations. Third is codification of these understandings, as supported by a majority of the claimants, as the basis for emerging from bankruptcy. This codification takes the form of a ***disclosure statement*** and a Plan.

VALUATION: CORNERSTONE OF A PLAN

Valuing a business is key to reorganization. Valuation frames the basic court actions, such as committee appointments. It is necessary to justify reorganizing the business as a going concern rather than a liquidation, and it supports postpetition financing, possible asset sales, and in due course, a Plan. Fundamentally, the value of the estate must be determined for purposes of a division of that value under the Plan among secured and ***unsecured*** creditors, other claimants, and old stockholders. That is, valuation of the enterprise defines the size of "the pie" to be shared.

Given differing economic interests based on claims, the stakeholders have conflicting views on valuation. For example, a senior creditor may anticipate receiving new equity in the emergent company in consideration for a fixed, prepetition obligation. That creditor will argue for assigning a low value to the equity to justify a greater ownership interest to settle the obligation. In turn, subordinated creditors and old stockholders have incentives to propound a higher equity value to reduce the percentage required to settle senior claims and to leave greater residual value for the subordinated creditors and old stockholders.

In light of the centrality of valuation, a bankruptcy court's most important contribution is often to vet views on value to resolve distributions under a Plan. The machinations that ultimately lead to establishing that value, however, can be extraordinary. Valuation

methodologies are well established, but analyses are as much art as science and subject to considerable judgment. To address inherent ambiguities, the court process can include examining accounting standards, projections, and the key assumptions on which valuations are based. The court may require direct testimony and cross-examination of conflicting parties' views on value. Achieving consensus is the basis for restructuring under a Plan and emerging from bankruptcy.

To assist in the valuation, discernible patterns evident from the public markets for debtors' bonds may be useful. These prices are frequently relied on in bankruptcy proceedings as indicators of the value of the subject business. For valuation purposes, the patterns require considerable qualification, however, because of distortions arising from market mechanics and the vagaries of restructuring.

Regarding the workings of the market, although distressed securities' prices are assumed to reflect an efficient market, they often do not. Trading over the counter, bond markets are highly illiquid. Specific issues trade infrequently and are subject to order imbalances. Because of low volumes, a trade representing a small fraction of bonds outstanding is an inadequate basis for valuing 100% of an enterprise. Compounding these deficiencies are a number of complicating factors particular to companies in the throes of restructuring. These factors include uncertain business prospects because of a company's transitional situation, changes in ownership and management, complex accounting and extraordinary charges, and the vagaries of legal proceedings.

Daily price indications for distressed securities are often misleading at the outset of a case. Later in the process, as information is more widely disseminated and markets for the securities become more stable, trading generally better reflects intrinsic enterprise value. The 1984 bankruptcy case of Storage Technology Corporation is illustrative of the challenge of relying on markets. **Figure 4.2** shows a traditional pre- and post-filing pricing pattern in subordinated debentures for this manufacturer of disk drives. Prices form a U-shaped curve—declining precipitously in the months before filing in expectation of dire consequences, then rising significantly with the arrival of new management, anticipated recovery in the company's product markets, and case resolution.

Figure 4.2 also shows the contrasting case of the 2014 bankruptcy of Texas Competitive Electric Holdings (TCEH), the generating subsidiary of TXU Energy. The TCEH pattern is one of prices rising prior to filing but falling thereafter.

Setting aside other possible factors, there are two overriding explanations for the divergence shown in Figure 4.2: basic changes in credit markets since the 1980s and very different business prospects for the two companies. First, as to market conditions, the

FIGURE 4.2.   DISTRESSED DEBT SECURITY PRICES: STORAGE TECHNOLOGY AND TEXAS COMPETITIVE ELECTRIC HOLDINGS

Bond Price (% par)

2014 -6
Texas Competitive
Electric Holdings
11.5% Notes
(filed 29/Apr/2014)

1984 -6
Storage Technology
9% Subordinated Debentures
(filed 31/Oct/1984)

Months Prior to and Post Filing
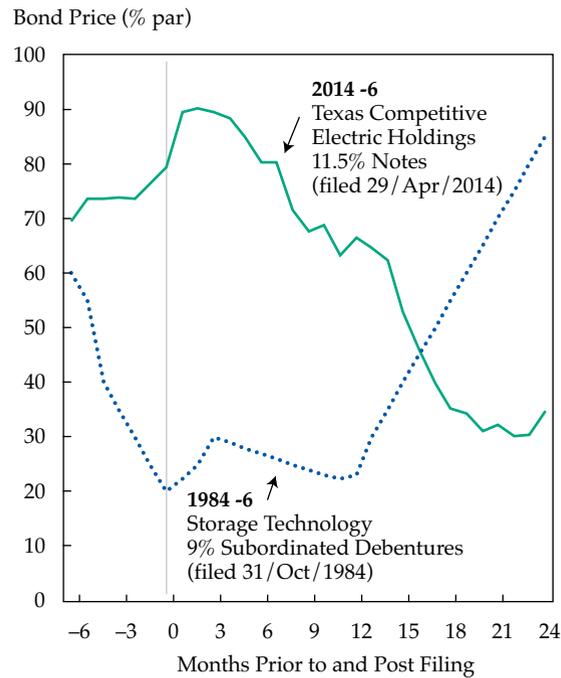
Sources: Bloomberg; Merrill Lynch.

contrast between these trading patterns is based, in part, on a paucity of distressed investment capital, which often resulted in oversold markets for distressed securities in the 1980s. This condition contrasts with a vastly *expanded* market for these securities 30 years later, which supported much higher valuations early in the distressed investing life cycle. The contemporary risk of overvaluation is aggravated by a low volume of deals. Second, as to contrasting business prospects, TCEH (unlike Storage Technology) confronted underlying structural challenges weighing on its power markets, including declining commodity prices, increasing competition, and weak demand growth. As a result, the value implied by the company's senior secured notes declined significantly as the case moved toward resolution. Considering these two factors—market mechanics and uncertain outcomes inherent in restructuring—clearly, the relevance of the securities markets must be qualified when divining intrinsic value.

THE FUTURE OF CORPORATE BANKRUPTCY

Global corporate default rates are currently around 2% a year, reflecting a stable business environment and benign credit conditions. **Figure 4.3** shows that these rates move with macroeconomic events and stock market indexes. The relationship between business cycles and distressed volumes reflects changes in the availability of credit and business prospects, magnified by financial leverage. Viewed in the context of historical patterns, distressed company defaults will eventually rise from current levels. Distressed volumes will increase over time to the extent of growth in corporate debt outstanding and indications of greater concentration by issuer. US corporate debt now exceeds $6 trillion, a two-fold increase since 2007. Tempering expectations of growth is the pressure to reduce corporate leverage in light of heightened operating risks. Recently enacted legislation to lower corporate tax rates and limit interest deductions should also encourage deleveraging.

FIGURE 4.3.   CORPORATE DEFAULTS, 1981–2016
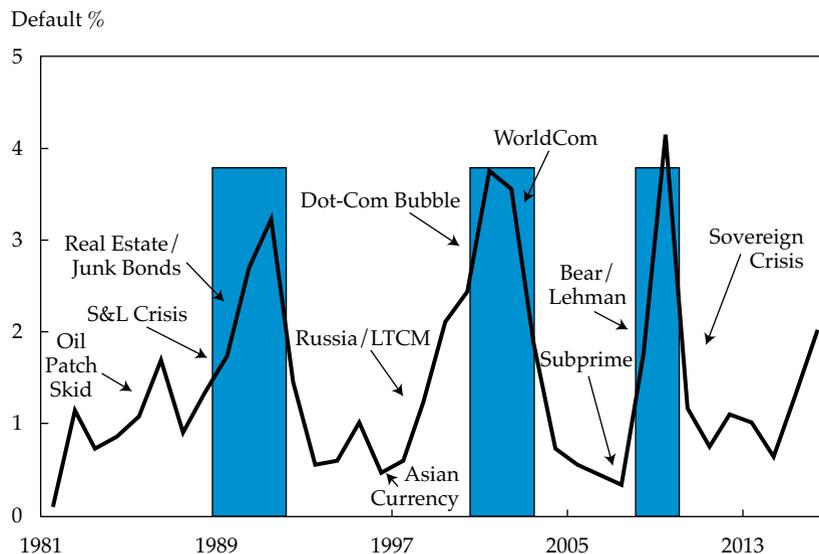
Notes: "Default %" is the number of issuers defaulting as a percentage of total issuers. Shaded bars reflect US recessions. S&L is savings and loan. LTCM is Long-Term Capital Management. Bear/Lehman refers to Bear Stearns and Lehman Brothers. The Sovereign Crisis is the European Sovereign Debt Crisis, which peaked in 2012.

Source: Standard & Poor's Global Fixed Income Research.

As security markets continue to grow, not only has restructuring volume increased, but also the process has continued to evolve. Trends to watch include the growing emphasis on Plan support agreements designed to expedite the process, increased focus on repositioning a business to mitigate the underlying causes of its distress through asset sales, mergers or acquisitions, and lower leverage ratios to offset the risks given the rapidity of change.

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5. AN INTRODUCTION TO HIGH-YIELD BOND COVENANTS

Saish Setty
Director, Reorg Covenants
Reorg Research
New York City

High-yield bonds are governed by indentures, which are dense (and often difficult to interpret) contracts that lay out the obligations and rights of the involved parties, including the issuer, the trustee, and bondholders. Among the most important indenture provisions are covenants. The two general types of debt covenants are (1) affirmative covenants, which are provisions that obligate the issuer to take certain actions, and (2) negative covenants, which prohibit the issuer from taking certain actions.

Bond covenants are an important part of the broad analysis of a credit investment. These provisions are intended to protect bondholders' investments, so weaknesses may create substantial risks.

Although covenants are also present in investment-grade issues, those covenant packages are generally less robust than their high-yield counterparts. Because they are viewed as less risky, investment-grade issuers are afforded greater operational flexibility. High-yield issuers are often subject to more restrictive and onerous covenants; most of the covenants discussed here are present *only* in high-yield indentures.

This piece discusses (1) a theoretical framework for understanding the need for covenants, (2) the main risks to a creditor, and (3) some common covenants and potential pitfalls.

CONFLICT NECESSITATES COVENANTS

When a company's operations are financed through a mix of debt and equity, an inherent conflict exists between the interests of shareholders and the interests of lenders because of the different incentives motivating them. Inter-creditor conflicts of interests also exist. Covenants are intended to address the issues and risks created by these conflicts.

Shareholder–Creditor Conflict

Shareholders are generally more risk loving and willing to make aggressive bets than bondholders because their shares capture all of an investment's upside. Creditors are typically more conservative and concerned about a borrower's ability to service its debt. They are more focused on preserving a borrower's enterprise value (EV) and its ability to maintain a stable asset base and cash flow.

For a simplified example of shareholder–creditor conflict, consider Company A, with $100 of debt and $100 of equity ($200 of EV). If Company A's EV collapses to $100, creditors will probably still be repaid in full but the equity is now effectively worthless. Suppose the company could undertake a project with a 90% chance of failure, in which case Company A's EV would drop to zero (rendering both the debt and equity worthless), and a 10% chance of success, in which case Company A's EV would increase to $500, leaving the debt's value at $100 but the equity worth $400. From the creditors' perspective, this project is unattractive. The shareholders, however, have an incentive to pursue the project because from their perspective, it has a positive expected value. This hypothetical example is simplified and stripped of nuance, but it illustrates the general principle that *shareholders may have incentives to act to the detriment of creditors.*

Shareholders and creditors are also subject to different legal frameworks. Shareholders' interests are protected to some extent by corporate law. Ordinarily, directors and officers have a fiduciary duty to shareholders and must act to maximize shareholder value. In addition, shareholders may have the ability to elect directors, providing them with a measure of control over the company. In contrast, protection for creditors' interests is generally provided by the provisions in the contracts governing their loans or bonds. *Creditors will seek to minimize their risks by obtaining some measure of control over the borrower through covenant protections.* If a covenant breach matures into a default, the creditors are allowed to **accelerate** the debt.

The differences between the legal protections afforded to shareholders and creditors can be illustrated in the context of an acquisition. For shareholders of a target company, (1) directors and officers generally have duties to protect and maximize shareholder value, (2) shareholders are often afforded appraisal rights under state law, and (3) shareholders may have the right to vote on the acquisition. In contrast, creditors of a target company must rely on their contractual protections, which for bondholders may include change-of-control provisions (which typically require the issuer to repurchase the notes in the case of an acquisition) and merger covenants (which may obligate the acquiring company to assume the notes in the case of an acquisition).

Inter-Creditor Conflicts

Conflicts among creditors also help explain the need for covenants. For example, as discussed in greater detail later, some creditors may be concerned that they will be forced into a more vulnerable position in the capital structure. Covenants, including ones limiting the amount and nature of additional debt that a company is able to incur, are often structured to address these risks.

MAJOR RISKS TO A CREDITOR

To analyze and interpret covenant packages, a helpful step is to distill shareholder–creditor and inter-creditor conflicts into the following risks that a creditor may be concerned with:

- *Risky investments.* As illustrated by the example in the shareholder–creditor conflict discussion, creditors may worry that a company will pursue aggressive strategies that will increase the risk that their loan will not be repaid.

- *Subordination and dilution.* Creditors are wary of being placed in a more vulnerable position in a company's capital structure. These concerns may be organized into three related risks:

  - *claim* dilution—increased leverage in a capital structure may dilute a creditor's potential claim;

  - *lien* subordination—unsecured and junior lien-secured creditors may be disadvantaged if a company incurs additional senior secured debt; and

  - structural subordination—debt incurred by nonguarantors may be structurally senior, at least with respect to such nonguarantor assets, to existing debt.

- *Value leakage.* Value may be transferred away from the reach of creditors, potentially through transfers of assets or property to shareholders, other creditors, third parties, or nonguarantor subsidiaries.

This list is hardly exhaustive, but focusing on these three will allow the reader to grasp what a given covenant is intended to protect against. With these risks in mind, the reader is also prepared to identify weaknesses and pitfalls in a covenant package.

Before considering some specific types of covenants, note that high-yield indentures typically include two types of subsidiaries: restricted subsidiaries and unrestricted subsidiaries. Generally, the issuer and its restricted subsidiaries will be governed by the restrictive covenants but unrestricted subsidiaries are not subject to the restrictive

covenants and are not guarantors. Although not all restricted subsidiaries are guarantors (foreign subsidiaries, for example, are typically exempt from guarantee requirements), indentures generally allow restricted subsidiaries broad flexibility to transact among themselves, whereas transactions with unrestricted subsidiaries are limited. Contributions to and transactions by unrestricted subsidiaries may create another source of potential leakage of value.

MAJOR COVENANTS AND PITFALLS

A negative covenant is often structured as (1) an overarching prohibition followed by (2) permissive baskets that allow the issuer some flexibility. The example in **Figure 5.1** is an excerpted debt covenant that begins by prohibiting the issuer and its restricted subsidiaries from incurring debt but then details a number of exceptions to that prohibition.

FIGURE 5.1.   EXAMPLE NEGATIVE COVENANT

Source: Reorg Research.

Covenant baskets may be structured as either (1) fixed-dollar-amount baskets (for example, a basket permitting $100 million of debt), (2) grower baskets, which may be based on a percentage of assets or tied to other financial metrics, such as income or EBITDA, or (3) a combination of the two—that is, a basket permitting the greater of $50 million and 5% of total assets.

This introductory piece cannot cover the entire universe of restrictive covenants, but a number of widely used restrictive covenants and common pitfalls are discussed in the following subsections—namely, covenants relating to debt, liens, investments, restricted payments, and asset sales. Of the many other covenants, ones related to changes of control, payments for consent, and future guarantors are common.

Debt Covenants

Debt covenants are primarily intended to address the risks of claim dilution and structural subordination. This type of covenant is often structured to have a general prohibition on the incurrence of debt, a ratio debt basket, and other debt baskets.

The ratio debt basket generally allows the company to incur debt subject to its ability to satisfy a leverage- or interest-coverage test. A common formulation allows the incurrence of debt subject to satisfaction of a fixed charge coverage ratio (FCCR) of 2.0×, with the FCCR representing the ratio of fixed charges to some measure of cash flow. Fixed charges may be defined to include interest expense and dividends. This type of basket allows a company to incur additional debt while providing creditors with some assurance that the company is able to adequately service all of its outstanding debt.

One potential pitfall with respect to the ratio debt basket is the failure to limit incurrences by nonguarantors. Some ratio debt baskets include language stating something like the following:

> The amount of indebtedness that may be incurred . . . pursuant to the foregoing by Restricted Subsidiaries of the Issuer that are not Guarantors shall not exceed $200.00 million at any one time outstanding.

By limiting the amount of ratio debt that can be incurred by nonguarantors, this proviso helps limit the risk of structural subordination.

Other baskets under a debt covenant may include baskets for credit facilities, existing debt, refinancing debt, *capital leases*, general debt, and nonguarantor debt. As discussed previously, such baskets may be structured to have fixed dollar amounts, grower baskets, or both.

Another potential pitfall stems from the interaction between the ratio debt basket and these other debt baskets. Many indentures include reclassification mechanics that allow issuers to reclassify debt between the baskets, including the ratio debt basket. The most protective formulations do not allow reclassification after the debt is incurred or allow reclassification only between baskets that are not ratio debt baskets. Under looser formulations, because the credit facilities debt basket is often substantial, if a company is

able to incur debt under its ratio debt basket, it may simply reclassify its existing credit facilities debt as ratio debt. This change would allow a company to free up its credit facilities basket and incur additional debt under the basket in the future, even if it is no longer able to incur debt under the ratio debt basket at such time.

Liens Covenants

Liens covenants are intended to address the risks posed by lien subordination and claim dilution. This type of covenant is typically structured to include a general prohibition and certain permitted lien baskets.

The prohibition often disallows the incurrence or existence of any liens, although it can be drafted more narrowly to apply only to liens securing debt, such as follows:

> The Issuer shall not, and shall not permit any of its Restricted Subsidiaries to, directly or indirectly, create, incur, or suffer to exist any Lien (other than Permitted Liens) that secures any obligations under Indebtedness of the Issuer against or on any asset or property now owned or hereafter acquired by the Issuer, or any income or profits therefrom.

A major pitfall under the lien covenant, which historically was somewhat common in many indentures for oil and gas issuers, is the inclusion of hookie dook provisions that arguably gutted the liens covenant. **Figure 5.2** shows excerpts from an indenture with a hookie dook (in boldface).

The permitted liens basket may have been intended to allow liens securing debt under the credit facilities basket, but it simply permits liens securing "any of the Credit Facilities." The term "credit facilities" is broadly defined, however, to include almost any bank or bond debt. So, this basket may allow the company to secure almost any debt and renders the liens covenant virtually toothless. When some issuers with hookie dook provisions later encountered financial stress, they were able to rely on these provisions to incur substantial amounts of new secured debt, either as a new financing or as part of distressed exchanges, to the detriment of existing noteholders.

Restricted Payments and Investments

Restricted payments and investment covenants are intended to address the risks posed by value leakage and by risky investments. A restricted payments covenant is often structured to prohibit an issuer from paying dividends, repurchasing equity, making investments, or making payments on subordinated debt (all of which are defined to be "restricted payments").

FIGURE 5.2.   HOOKIE DOOK EXAMPLE

- Permitted Liens – "Liens securing any Indebtedness under **any of the Credit Facilities**"

- Credit Facilities Debt Basket – Permits "Indebtedness (including letters of credit) under one or more Credit Facilities, provided that, after giving effect to any such incurrence, the aggregate principal amount of all Indebtedness incurred under this clause … does not exceed the greater of (a) **$2.0 billion** and (b) an amount equal to **35.0% of the Company's Adjusted Consolidated Net Tangible Assets** determined as of the date of such incurrence"

- "Credit Facilities" – defined to be "one or more debt facilities … commercial paper facilities or Debt Issuances, in each case with banks or other institutional lenders or institutional investors providing for revolving credit loans, term loans, receivables financing (including through the sale of receivables to such lenders or to special purpose entities formed to borrow from such lenders against such receivables), letters of credit or other borrowings or Debt Issuances, in each case, as amended, restated, modified, renewed, refunded, replaced or refinanced (including refinancing with any capital markets transaction) in whole or in part from time to time."

Source: Reorg Research.

Indentures generally include a number of restricted payments baskets and permitted investments baskets; a basket of particular note is the *builder basket*. Often referred to as an "income basket," "cumulative credit," or "available amount," this basket allows the issuer to make restricted payments out of a builder basket provided that there is no default and the company is able to incur debt under the ratio debt basket. The builder basket is typically calculated as (1) some portion of net income or cash flow since a specific start date plus (2) proceeds from equity sales and contributions by equity. The builder basket typically also includes a number of other additions and deductions that make it difficult to estimate, based on publicly disclosed information, how much room is available under this basket.

Some pitfalls of a typical builder basket include (1) the basket being structured only to ratchet upward with no deduction for losses, (2) reclassification mechanics allowing the issuer to free up capacity under other baskets by attributing restricted payments to the builder basket, and (3) the start date for the calculation of the builder basket being in the distant past. Often, because the start date is in the past (presumably to ensure that a newer indenture conforms to older ones), the result is a surprising amount of builder basket capacity being available at issuance.

Asset Sales

Asset sale covenants should address the risks posed by value leakage, asset substitution, and risky investments. These prohibitions generally state that the issuer may not sell or transfer assets, subject to a number of exceptions, including ones that permit sales if (1) the asset is sold for fair market value, (2) at least 75% of the consideration consists of cash or cash equivalents, and (3) the net proceeds are used to repay debt or are reinvested in the business.

The cash consideration requirement may present a pitfall because it often includes the purchaser's assumption of debt as "cash consideration" and may allow for asset sales that generate only limited proceeds available to prepay or repurchase debt. Another potential pitfall under this covenant is a broad reinvestment right that undermines the repayment obligations by permitting an issuer to apply proceeds to capital expenditures made in the ordinary course of business.

CONCLUSION

Many pitfalls may lie in wait in the covenants of high-yield bond indentures. When analyzing covenant protections, the reader would be well served to keep in mind the main risks to a creditor. By paying close attention to defined terms, differences between an issuer's various outstanding debt, and how different covenants interact with one another, one is in a good position to uncover potential risks that are hidden within an indenture.

6. DYNAMICS OF THE HIGH-YIELD BOND MARKET

Michael F. Brown
Global Head of Research
Advantage Data Inc.
Boston

High-yield bonds are defined as corporate bonds carrying a rating below BBB by Standard & Poor's or below Baa by Moody's Investors Service. The time series of points that describe these bonds is exemplified by data on yields as a function of time for CenturyLink Inc. in **Figure 6.1**.

FIGURE 6.1. CENTURYLINK BOND PRICES AS A FUNCTION OF TIME, 2013–2018
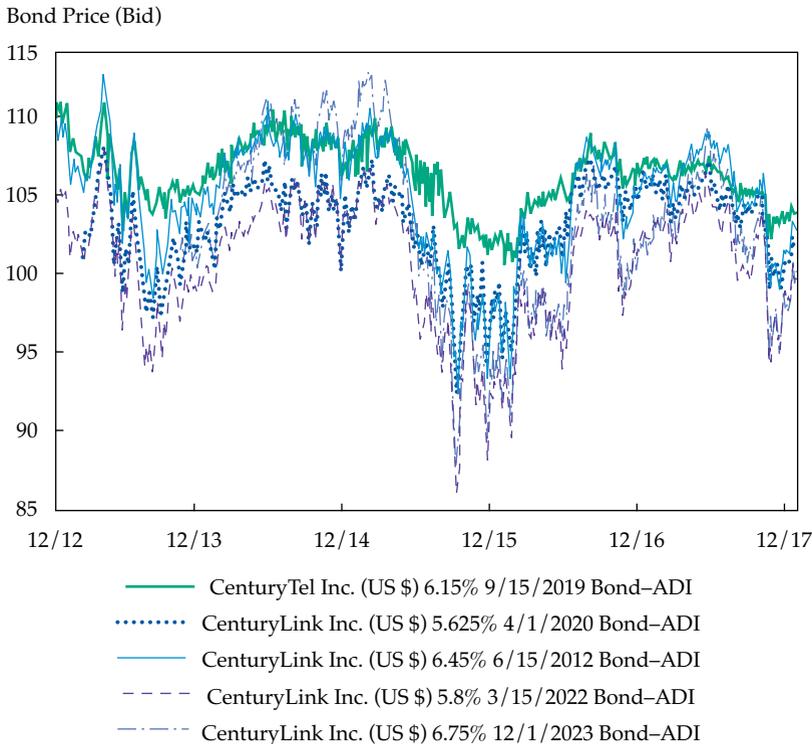
Source: Advantage Data, January 2018.

In order to resolve the drivers of a set of "curves" such as that of Figure 6.1, we first collect variables into an overall function, proceeding along two lines. Denoting this function (or, more precisely, functional—see notes to follow) by P, we note that, in addition to time T, P depends upon other functions of time that have been associated classically with prices. These include macroeconomic forces F_M, microeconomic forces f_m, impulse forces I, and risk r. This function $P = P(T, f_M, f_m, I, r)$ is then extended to include effects associated with technical features of the time series themselves, collected into f_1 and f_2.

Two of the blatant aspects of the points that define Figure 6.1 are (1) the existence of cycles and (2) "jagged" features of local peaks (i.e., the fractal aspects of the data; see Devaney and Keen 1989). Beginning to quantify these in simple terms may proceed by regarding the series of points as having a wave character. This will be done in sections to follow, which address the arguments of f_1, f_2 of P. In addition, an analysis of the overall salient features of $P(T, f_M, f_m, I, r, f_1, f_2)$ benefits from using the notion of underlying driving forces. In particular, the mathematical structure of linear and nonlinear restoring forces, $f(x) = -kx$ and $f(x) \sim$ higher powers of x, respectively, will be addressed.

The practical aspects of tracking the most important moves in high-yield bond prices and yields—on a daily basis—are then addressed. Finally, we lay out a projected path for the peaks in yields for the bonds of 2018, based upon a study of their previous time series.

$P(T, f_M, f_m, I, r, f_1, f_2)$

Prices of high-yield bonds are a function of time, macroeconomic and microeconomic forces, impulse forces, and additional drivers due to inherent technical features.

Strictly speaking, the respective arguments beyond time T in the above are also functions of time, and hence, P is a functional (roughly, a function of functions). A functional takes in functions for its inputs and maps them to a scalar (number) (Milne 1980). This notion is often useful in the calculus of variations, where one is interested in the function that minimizes a functional such as P (Arnold 2010). We will avoid mathematical complexity and just regard price P as a function of the arguments in the parentheses above. In the following, we address each of these arguments in turn.

PRICES AS A FUNCTION OF TIME

As evident in Figure 6.1, the time series is a complex superposition of oscillations. We see that cycles of these moves occur at various frequencies. The moves, in fact, have a wave character, where a wave is anything that rises above some I_0, its starting point, then falls below I_0, before rising again.

In short time intervals, prices are subject to fluctuations and high noise. They move at higher frequencies ν and may be associated with shorter wavelengths λ. Thus,

$$T_{\text{short}} \sim \nu_{\text{high}} \sim \lambda_{\text{low}}.$$

In contrast, in long time intervals, overall price moves occur at lower frequencies, subject to lower noise and less fluctuations. These lower frequencies may be associated with longer wavelengths. Thus,

$$T_{\text{long}} \sim \nu_{\text{low}} \sim \lambda_{\text{high}}.$$

PRICES AS A FUNCTION OF MACROECONOMIC FORCES, $P(f_M)$

We infer macroeconomic forces influencing bond prices indirectly from such forces' effects on bond spreads (differences in basis points between yields and low-risk benchmarks [Fabozzi 2013]). Among the many important macro factors driving fair value for high-yield bonds, the following have been proven to be very useful (Fridson 2012):

$$P(f_M) \quad Pf_{M^{(1)}}, Pf_{M^{(2)}}, Pf_{M^{(3)}}, \text{ with}$$

$f_{M^{(1)}}$ = industrial production,

$f_{M^{(2)}}$ = capacity utilization, and

$f_{M^{(3)}}$ = credit availability.

In addition to these, the impact of inflation and that of interest rates (in particular, the US Treasury yield curve) may be used. These are often analyzed in conjunction with the following: corporate speculative-grade default rates, OASs (**option-adjusted spreads**), the ICE Bank of America Merrill Lynch (BAML) US High Yield Total Return Index, and a current US five-year Treasury index (BAML GA05).

PRICES AS A FUNCTION OF MICROECONOMIC FORCES, $P(f_m)$

A key thread running through the effect of microeconomic forces on anything is the notion of *elasticity*. In general terms, this refers to how responsive one variable is to changes in another. In securities markets, we are interested in how sensitive price changes are to, say, supply.

The elasticity observed in drawdown (or ramp-up) in response to driving factors (e.g., supply or other quantities that depend on decisions by firms or individuals in allocating scarce resources) occurs to first order as a linear restoring force. Higher order, more precise corrections are observed to include additional nonlinear effects. This has an efficient analogy in the restoring force of a stretched spring, which to first order is linear—that is, $\sim -kx$, where k is the spring constant (measuring stiffness) and x is the displacement of stretch, with a minus sign to indicate the spring pulling back in an elastic response. In a more precise treatment, higher nonlinear terms may be included. Thus, we have for elastic microeconomic forces

$$F(x) = -kx,$$
$$F(x) = -c_1 x - c_2 x^2 - c_3 x^3 - c_4 x^4 \cdots.$$

We will see in $P(f_1)$ to follow that the same equations describe mean reversion.

PRICES AS A FUNCTION OF IMPULSE FORCES, *P*(*I*)

An impulse force is an influence which rises abruptly to a peak, then fades off more gradually. When the high-yield bond market is hit by a "shock" or impulse, monitoring it shows that the effect on prices assumes a form like Gaussian (bell-curve) distributions, although skewed to one side. This may be approximated by ***Poisson distributions*** having the general form shown in **Figure 6.2**.

FIGURE 6.2.   IMPULSE CURVES WITH POISSON FUNCTIONS
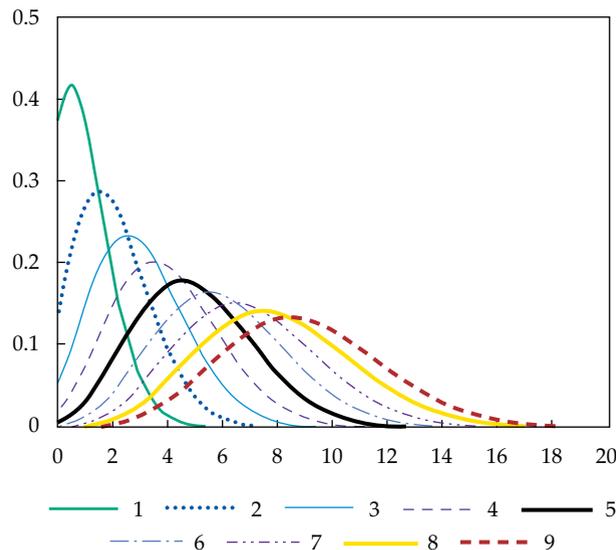
The degree of "roll-off" from the impulse force may be estimated by comparison with previous shock forces. Thus, for example, a fairly sharp trailing slope to the right characterized the aftermath of 9/11/2001, while a succession of gentler trailing slopes characterized the "credit crunch" of 2008.

PRICES AS A FUNCTION OF RISK, $P(r)$

Monitoring risk as it impacts high-yield bonds shows that two of the most incisive sources arise from interest rate risk and political risk. We monitor interest rate risk by looking at the **_Taylor series_** about a point on the convex price–yield curve of a corporate bond,

$$\sum_{n=0}^{\infty} \frac{P^{(n)}(a)}{n!}(y-a)^n, \text{ or}$$

$$P(a) + \frac{P^{(1)}(a)}{1!}(y-a) + \frac{P^{(2)}(a)}{2!}(y-a)^2 + \frac{P^{(3)}(a)}{3!}(y-a)^3 + \cdots,$$

where P is price and y is yield. Thus, here, the first derivative term gives us the duration and the second derivative gives the convexity.

Political risk may be monitored in an analogous way, where the source of this must first be mapped to interest rate risk and the price–yield curve assumes a less simple form.

PRICES AS A FUNCTION OF TECHNICAL FACTORS, $P(f_1)$ AND $P(f_2)$

Observing prices of high-yield bonds shows they move in recurring patterns. The technical analysis of these describes the structure (algebra) and topology (geometry of sets) implicit in the series itself, rather than their underlying causes. In this analysis, the patterns of the series may be resolved into three classes: trends, cycles (at various frequencies), and random fluctuations (noise).

Identifying and subtracting out noise may be done by simulating its contributions using a source of random fluctuations (e.g., although imperfect, a computer-based random number generator), much as in Monte Carlo simulation. Outliers may be efficiently filtered by invoking a median filter, useful in electronic signal processing.

Monitoring high-yield bond prices shows that among the first-order effects of trends and cycles, the most dominant are mean reversion and interval length of cycles.

As for microeconomic elasticity (see above), mean reversion may be taken to be a restoring force, linear to first order; in a more detailed treatment, this may be extended to the nonlinear case. Hence, $P(f_1)$ components go as

$F(x) = -kx$ (linear mean reversion),

$F(x) = -c_1 x - c_2 x^2 - c_3 x^3 - c_4 x^4 \cdots$ (nonlinear mean reversion).

The decomposition of cycles into wave components at various frequencies (spectral analysis) is, in general, a matter of obtaining a particular kind of Fourier integral (Morse and Feshbach 1953). For present purposes, this may be visualized as simply a matter of summing over a large number of sine waves at various amplitudes and frequencies, in order to construct anything from a square wave or sawtooth-shaped wave to the type of series of points seen in Figure 6.1. Stated compactly, the waves that have interval lengths sought for $P(f_2)$ go as solutions of the ordinary differential equation

$$\frac{d^2 x}{dt^2} + \frac{k}{m} x = 0,$$

which are of form

$x = A \cos(\omega t + \varphi),$

where A is the amplitude (height) of the sine (or shifted cosine) wave, $\omega = 2\pi/T$ is frequency, and $\lambda = vt$ is the wavelength at velocity v.

DAILY TRACKING OF HIGH-YIELD BONDS

> It doesn't matter how beautiful your theory is, it doesn't matter how smart you are. If it doesn't agree with experiment, it's wrong.
>
> —*Richard P. Feynman (1918–1988)*

Data points for trades are the starting point for any and all analyses of the high-yield bond market; theoretical pricing is—at best—a very imperfect attempt to capture the dynamics of something much more complex.

In practice, one utilizes a pricing source of actual trades (e.g., TRACE [Trade Reporting and Compliance Engine] data for North American bond trades) as a starting point. The trades may then be ranked according to Δ_{price} (change in price, on an intraday basis), with additional trade-related data. These data include volumes traded and amounts

outstanding (i.e., how many bonds are "out there," left to be traded; a "retail" bond may show a huge move in price but may be offered in a very small block relative to the mainstream). A hierarchy of important bond trades may be made only after all trade-related data are weighted with appropriate coefficients.

TIME EVOLUTION OF PEAKED YIELDS

At times, high-yield bond prices are impacted by shocks to global markets (e.g., the equities "crash" of 1987, the credit crunch of 2008). These shocks are reflected in peaks of the indexes which represent these securities. Such spikes in overall yields are shown in **Figure 6.3**. The highest peaks on the left correspond to 2008; the smaller peaks on the right arose around February 2016, when crude oil futures fell below $27.

FIGURE 6.3. BOND INDEXES AS FUNCTIONS OF TIME, 2008–2018

Yield to Worst

North American High Yield—ADI B+ Rating (US $)
North American High Yield—ADI B– Rating (US $)
North American High Yield—Moody's B3 Rating (US $)
North American High Yield—Moody's Ba1 Rating (US $)
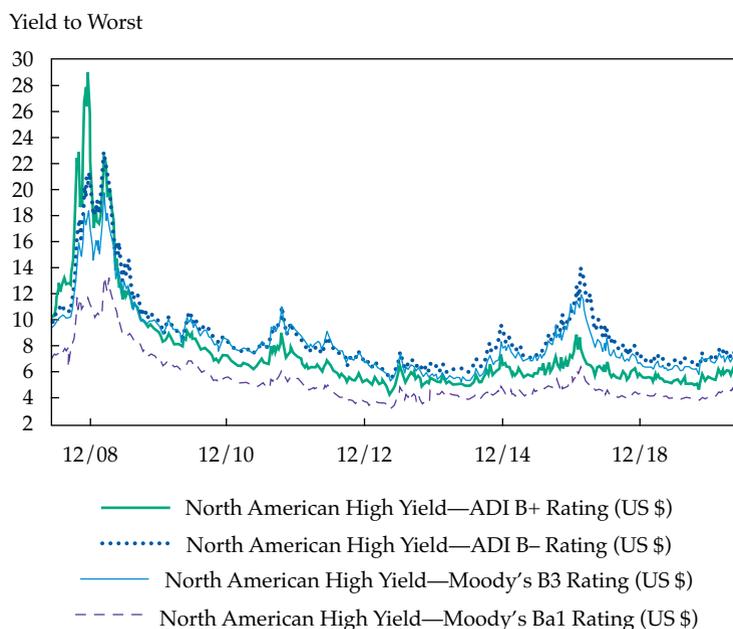
Source: Advantage Data, January 2018.

As indicated in **Figure 6.4**, the peaked curves in yield may be described by a sequence of Gaussian (bell-curve) functions. A study of financial time series shows that such peaks evolve in time by decreasing in amplitude (height) and broadening in width. Thus, for example, a in Figure 6.4 will decrease from an initial $a_0 = 16$ to $a = 4$ to $a = 1$.

FIGURE 6.4. BOND INDEXES APPROXIMATED BY GAUSSIAN FUNCTIONS

$$\delta_a(x) = \sqrt{\tfrac{a}{\pi}}\, e^{-ax^2}$$
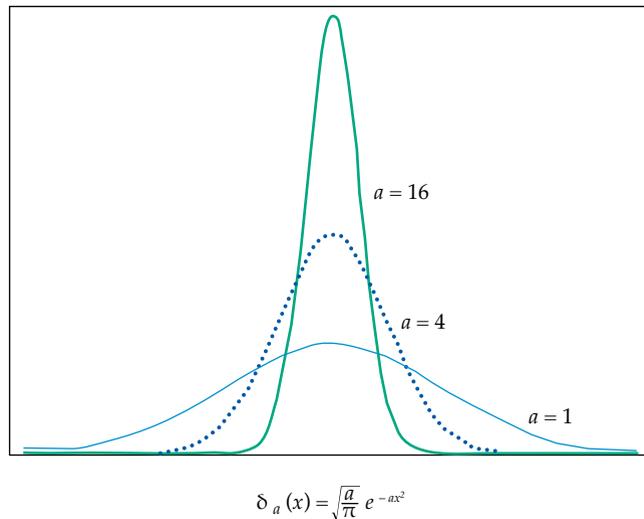
Peaks in yields will most likely decrease in height in the coming months of 2018; in a much less likely scenario, we could see the occurrence of a secondary peak in yields of the type seen in February 2016. Even less likely is a much higher primary peak of the form seen in the credit crunch of 2008.

CONCLUSION AND SUMMARY

In the coming months of 2018, peaks in the indexes which gauge the overall impulse response of high-yield bonds will most likely decrease, relative to a secondary peak marking February 2016. We infer the above from the time series of actual trades in high-yield bonds extending over the decade from 2007 to 2017. This inference also draws upon resolving price moves of a functional *P* for the bonds in terms of seven classes of functions. The structure and topology of these functions have been resolved in terms of particular physical configurations—for example, linear and nonlinear restoring forces and superposition of simple waves.

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Glossary

Absolute priority: A provision of the US Bankruptcy Code whereby a plan of reorganization is deemed fair and equitable if, when a class of creditors is not paid in full, no payment will go to any more junior class.

Accelerate: To demand immediate repayment of principal.

*Adversary proceeding: A lawsuit arising in or related to a bankruptcy case that is commenced by filing a complaint with the court.

*Automatic stay: An injunction that automatically stops lawsuits, foreclosures, garnishments, and all collection activity against the debtor the moment a bankruptcy petition is filed.

*Avoidance: The Bankruptcy Code permits the debtor to eliminate (avoid) some kinds of liens that interfere with an exemption the debtor has claimed. The trustee may also avoid a preferential transfer to a creditor made before the bankruptcy case was filed.

*Bankruptcy: A legal procedure for dealing with debt problems of individuals and businesses—specifically, a case filed under one of the chapters of Title 11 of the US Bankruptcy Code.

*Bankruptcy Code: The informal name for Title 11 of the US Code (11 U.S.C. §§ 101-1330) of the federal bankruptcy law.

*Bankruptcy court: The bankruptcy judges in regular active service in each district; a unit of the district court.

Capital lease: A lease in which the lessor finances only the leased asset, with all other rights of ownership transferred to the lessee. The property is accounted for as a fixed asset of the lessee.

*Chapter 7: The chapter of the Bankruptcy Code providing for "liquidation" (i.e., the sale of a debtor's nonexempt property and the distribution of the proceeds to creditors).

Note: Underlined terms are cross-referenced in this Glossary.

*Term that is verbatim from the Administrative Office of the US Courts.

*Chapter 9: The chapter of the <u>Bankruptcy Code</u> providing for reorganization of municipalities (which includes cities and towns, as well as villages, counties, taxing districts, municipal utilities, and school districts).

*Chapter 11: The chapter of the <u>Bankruptcy Code</u> providing (generally) for reorganization, usually involving a corporation or partnership. (A Chapter 11 <u>debtor</u> usually proposes a <u>plan of reorganization</u> to keep its business alive and pay creditors over time. Individuals can also seek relief in Chapter 11.)

*Chapter 15: The chapter of the <u>Bankruptcy Code</u> dealing with cases of cross-border insolvency.

*Claim: A creditor's assertion of a right to payment from the <u>debtor</u> or the debtor's property.

Composite rating: A rating assigned by the BAML index system that averages the ratings of Moody's Investors Service, Standard & Poor's, and Fitch Ratings. Composite ratings are expressed in notation that blends the notation systems of the three agencies—for example, AA1, BB2, CCC3.

*Confirmation: Bankruptcy judges' approval of a plan of reorganization or liquidation in <u>Chapter 11</u>, or <u>Chapter 7</u> respectively, or payment plan in Chapter 12 or 13.

*Debtor: A person who has filed a petition for relief under the US <u>Bankruptcy Code</u>.

Default loss rate: Default rate minus <u>recovery rate</u>.

Default rate: The percentage of issuers in the sample at the beginning of a period that fail to make scheduled payments of principal or interest during the period. Default rates may also be calculated on the basis of amounts of debt outstanding.

*Disclosure statement: A written document prepared by the <u>Chapter 11</u> <u>debtor</u> or other plan proponent that is designed to provide "adequate information" to creditors to enable them to evaluate the <u>Chapter 11</u> <u>plan of reorganization</u>. The statement is required to solicit consents.

Distress ratio: Percentage of issues in the <u>high-yield</u> index with yield spreads of 1,000 bps or more above Treasuries.

EBITDA: Earnings before interest, taxes, depreciation, and amortization.

Effective duration: A duration calculation used for callable bonds. It takes into account the impact of future interest rate changes on a callable bond's expected cash flows.

*Executory contract or lease: Generally includes contracts or leases under which both parties to the agreement have duties remaining to be performed. (If a contract or lease is executory, a <u>debtor</u> may assume it or reject it.)

Fallen angel: A bond issued with <u>investment-grade</u> ratings and subsequently down-graded to <u>speculative grade</u>. The term is also sometimes applied to the issuer based on the "issuer rating" or "corporate family rating" assigned to it irrespective of a particular issue's priority within the issuer's capital structure.

*Fraudulent conveyance: The illegal transfer of property to another party in order to defer, hinder, or defraud creditors or to put such property out of the reach of a creditor, taken within a certain amount of days since filing.

Free cash flow: Cash flow minus capital expenditures. This amount is the cash that a company can generate after required expenditures for maintenance or expansion of its asset base.

High-yield bonds: The asset class composed of nondefaulted, nonconvertible bonds rated <u>speculative grade</u>.

Investment grade: A rating in the range of Aaa to Baa3 on Moody's scale or AAA to BBB– on the scale used by Standard & Poor's and Fitch.

*Lien: The right to take and hold or sell the property of a <u>debtor</u> as security or payment for a debt or duty.

Loss given default: The inverse of the <u>recovery rate</u>.

Option-adjusted spread (OAS): The yield spread that must be added to a benchmark US Treasury yield curve to discount a bond's stream of payments so as to match its price, after embedded call options have been taken into account. An index's OAS is the market-weighted average OAS of its constituent issues. The key point is that the spread is not calculated as the average yield of the constituent issues minus the yield on one particular Treasury maturity, such as 7 or 10 years—a common practice in earlier times.

Original issue: A bond that has speculative-grade ratings at time of issue. An original issue that is subsequently upgraded to investment grade is called a "rising star."

*Party in interest: A party who has standing to be heard by the court in a matter to be decided in the bankruptcy case. The <u>debtor</u>, the US trustee or bankruptcy administrator, the case trustee, and creditors are parties in interest for most matters.

PIK-toggle: A variant of the payment-in-kind (PIK) provision that permits a bond's issuer to elect, usually within the first few years after issuance, to pay interest in cash, by issuing more bonds, or by some combination of the two methods.

*Plan of reorganization: A <u>debtor</u>'s detailed description of how the debtor proposes to pay creditors' <u>claim</u>s over a fixed period of time.

Poisson distribution: The discrete probability distribution of the number of times of an event occurring in a given time period, given the average number of times that event occurs over the time period.

*Preference or preferential debt payment: A debt payment made to a creditor in the 90-day period before a <u>debtor</u> files bankruptcy (or within one year if the creditor was an insider) that gives the creditor more than the creditor would receive in the debtor's <u>Chapter 7</u> case.

*Priority: The <u>Bankruptcy Code</u>'s statutory ranking of <u>unsecured claims</u> that determines the order in which unsecured claims will be paid if there is not enough money to pay all unsecured claims in full.

Probability of default: A measure of default risk that takes into account only that the company will fail to make scheduled interest and principal payments on time and in full, without considering the percentage of face value that the investor will recover through either <u>bankruptcy</u> proceedings or an exchange for new securities.

Quantitative easing: An unconventional monetary policy in which a central bank purchases government bonds or other securities to reduce interest rates rather than restricting its open market operations to short-dated instruments.

Recovery rate: For a period of time or a class of issues, the average percentage of principal that bondholders recover through either <u>bankruptcy</u> proceedings or an exchange for new securities.

Run-rate synergies: The cost efficiencies to be realized from a merger, at an annualized rate based on the most recent period.

Speculative grade: A rating in the range of Ba1 to C on Moody's scale or BB1 to D on the scale use by Standard & Poor's and Fitch.

Spread vs. Treasuries (SVT): The yield on a corporate bond minus a yield on a comparable default-risk-free US Treasury note. A corporate bond index's SVT is the market-weighted average of the SVTs of its constituent issues (see also <u>option-adjusted spread</u>).

*Substantive consolidation: Putting the assets and liabilities of two or more related <u>debtors</u> into a single pool to pay creditors. (Courts are reluctant to allow substantive consolidation because the action must justify not only the benefit that one set of creditors receives but also the harm that other creditors suffer as a result.)

Taylor series: A representation of a function as an infinite sum of terms calculated from the values, at a single point, of the function's derivatives.

*Unsecured: The state of a <u>claim</u> or debt for which a creditor holds no special assurance of payment, such as a mortgage or <u>lien</u>; a debt for which credit was extended based solely upon the creditor's assessment of the <u>debtor</u>'s future ability to pay.

Yield to worst (YTW): For a bond that is redeemable prior to maturity, the YTW is the lowest of the yield to maturity and yields to all call dates. For bonds that are puttable or exchangeable or contain other such options, the YTW calculation also takes those features into account.

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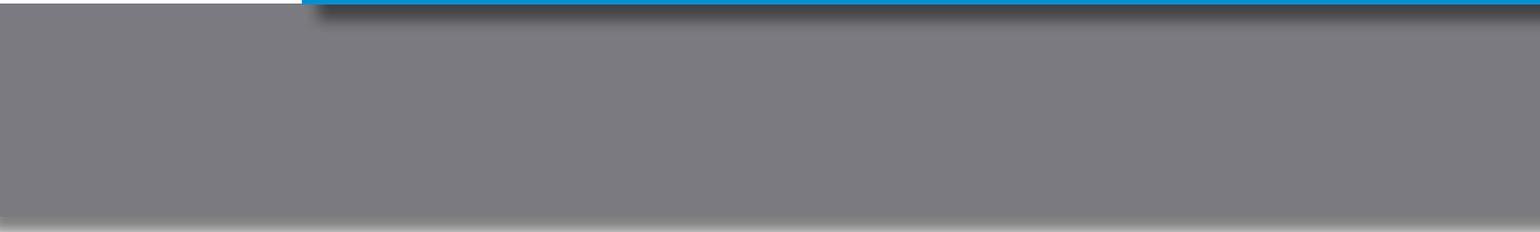
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