

THE ANATOMY OF DISTRESSED DEBT MARKETS

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Introduction

We have often observed, e.g. Altman, Hotchkiss (2006), that the market for investing in distressed securities, (the so-called “vulture” markets), had captured the interest of increasing numbers of investors and analysts. These investors, sometimes categorized as “alternative asset” institutions, mainly hedge funds, now can convincingly argue that the market has matured into a genuine asset class, with a reasonably long history of data on return and risk attributes. And, we have been there every step of the way, researching its growth and performance, documenting its dynamics and nurturing the asset class growth with statistics and analytics.ⁱ

Our fascination with distressed firms and their outstanding securities began when the Chairman of an investor enterprise, *The Foothill Group* (now part of *Wells Fargo*), came to me (Altman) with an assignment to provide a descriptive and analytical “white” paper on what was generally known as “distressed” debt. This resulted in two monographs, one on Distressed Bonds (Altman, 1990) and a second on Distressed Loans (Altman, 1992). Our first task was to carefully define this market, after getting several interesting, but not sufficient, definitions from practitioners, such as bonds selling for

less than 80% of par value. We established essentially two precise categories: (1) bonds or loans whose yield to maturity (later amended to option-adjusted yield) was equal to or greater than 10% (1,000 bps) above the 10-year U.S. government bond rate (later amended to be the U.S. government bonds with comparable duration) and (2) those bonds or loans of firms who have defaulted on their debt obligations and were in their restructuring, usually Chapter 11, phase. The former was categorized “Distressed” and the latter as “Defaulted”. We also included the equity securities of those firms, but did not attempt any documentation on distressed equity at that time.

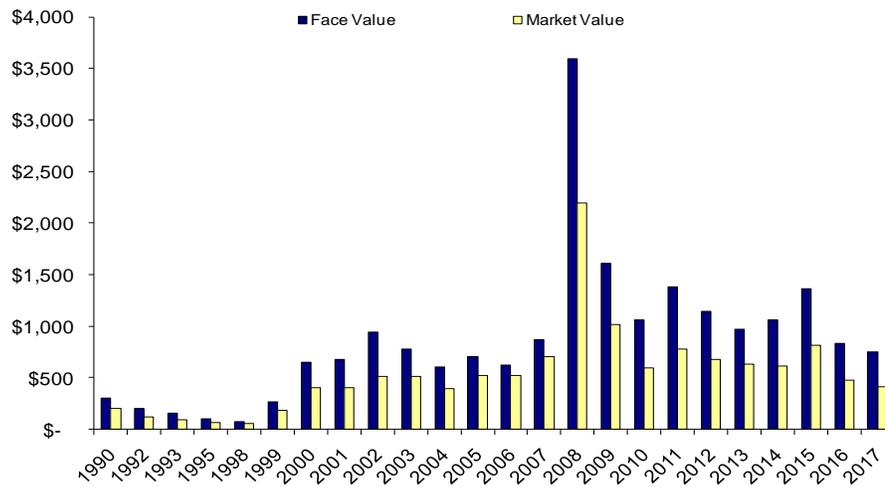
In addition to an increasing number of articles and reports on the Distressed Securities market and to the two aforementioned studies, several books related to the subject have been published (see our Literature Review, later). The purpose of this article is to document the descriptive anatomy of the distressed debt markets size, growth, major strategies, characteristics, and participants, and then to explore its performance attributes, reviewing the relevant 30-year period from 1987-2017.

Size of the Distressed and Defaulted Debt Market

When we first defined and investigated the overall Distressed and Defaulted Debt market in 1990, we estimated that the publicly traded and privately issued market was about \$300 billion (face value) and \$200 billion (market value) – see Figure 1. The huge increase in distressed firms in the 1989-1991 period, from the fall-out of the highly leveraged restructuring movement in the U.S. in the 1980s, was the primary contributor to these totals. Coupled with huge excess returns to distressed investors of over 40% in

1991, the market's growth gave birth to a professional asset class that was heretofore populated only by investors who specialized in unique situations (event driven) and

Figure 1. Size of the Defaulted and Distressed Debt Market, 1990–2017 (Dollars in Billions)



Source: Professor Edward I. Altman estimates, NYU Salomon Center, and Altman & Kuehne (2018).

sporadic, anecdotal references to those events, like railroad bankruptcies or LBO flame-outs in the 1980s (see some excellent “stories” by Rosenberg (1992 and 2000)). The next great growth catalyst was the massive defaults in 2000-2002, when the market’s size again surged, this time to \$940 billion (face value) and \$500 billion (market value) in 2002.

The face value size of the market then remained at between \$700-1,000 billion until the next major spike in defaults and bankruptcies during and immediately after the great financial crisis (GFC) of 2008-2009, when the face value of Distressed & Defaulted debt zoomed to about \$3.6 trillion and the market value increased to over \$2.0 trillion. These totals notably included Lehman Brothers’ \$600+ billion in liabilities. Indeed, the number of billion dollar liability bankruptcies in 2009 surged to 49 filingsⁱⁱ. The median number of these mega-billion dollar filings has been 21 per year over the last 30 years, with about that number even in benign credit years like 2017. Indeed, as of the first-half of 2018, already 14 firms filed for Chapter 11 reorganization with more than \$1 billion in liabilities. Since the GFC, the US high-yield and distressed debt market have been in a benign credit cycle with much below average default rates and high recovery rates, low yield-spreads and abundant liquidity, even for the seriously distressed firms. Hence, the 2017 total of Distressed and Defaulted Public & Private debt has decreased to an estimated \$747 billion (face) and \$414 billion (market value) from the record levels of 2008/2009 – see Table 1 for these totals and the methodology

for our estimates. This is still a substantial market size poised to grow considerably when the next credit crisis hits!

DISTRESSED SECURITIES INVESTORS

We observed that the number of distressed debt investors grew impressively following the massive defaults of 1990-1991, and our 1992 estimate was as much as \$100 billion under dedicated management in this sector. In the early 1990s, there were about 60 of these alternative investment companies, see Altman (1991). These institutions, mainly hedge funds, ranged from assets of a few hundred million dollars to mega-firms with scores of portfolio managers and analysts and as much as \$10 billion to \$15 billion under management. We estimate that the number of so-called “vulture” investors has grown to over 200 in the U.S. and 100 operating internationally in 2018. Usually, they are now called “credit” or “event driven” strategic investors.

There is no definitive estimate of the total funds under distressed securities management, but an educated guess is about \$400-\$500 billion at the start of 2018. Periodically, large investors and private equity firms may become interested in these securities and possibly the control of distressed or bankrupt companies. Our estimate does include hedge funds and private equity groups and a few mutual funds,ⁱⁱⁱ as part of a number of different investment strategy portfolios. And with so many sharp penciled investment analysts, pricing has become more efficient and anomalies more difficult to detect.

Table 1. Estimated Face and Market Values of Defaulted and Distressed Debt, 2015-2017 (Dollars in Billions)

| | Face Value (\$) | | | Market Value (\$) | | | Market/ Face Ratio ^d |
|---------------------------------|-----------------|---------------|---------------------|-------------------|---------------|---------------|------------------------------------|
| | 31 Dec 15 | 31 Dec 16 | 31 Dec 17 | 31 Dec 15 | 31 Dec 16 | 31 Dec 17 | |
| Public Debt | | | | | | | |
| | | | a | | | | |
| Defaulted | 287.97 | 298.03 | 270.91 ^b | 86.39 | 119.21 | 94.82 | 0.35 |
| Distressed | 395.26 | 119.78 | 102.49 | 256.92 | 77.86 | 66.62 | 0.65 |
| Total Public | 683.23 | 417.81 | 373.40 | 343.31 | 197.07 | 161.44 | |
| Private Debt | | | | | | | |
| | | | c | | | | |
| Defaulted | 287.97 | 298.03 | 270.91 ^c | 172.78 | 193.72 | 176.09 | 0.65 |
| Distressed | 395.26 | 119.78 | 102.49 | 296.44 | 89.83 | 76.87 | 0.75 |
| Total Private | 683.23 | 417.81 | 373.40 | 469.23 | 283.56 | 252.96 | |
| Total Public and Private | 1,366.46 | 835.63 | 746.80 | 812.54 | 480.63 | 414.40 | |

^a Calculated using: (2016 defaulted population) + (2017 defaults) - (2017 Emergences) - (2017 Distressed Restructurings). ^b Based on 6.11% of the size of the high-yield market (\$1.677 trillion). ^c Based on a private/public ratio of 1:1. ^d The market/face value ratio was 0.40 for public defaulted debt, 0.65 for public distressed debt, 0.65 for private defaulted debt and 0.75 for private distressed debt in 2016.
Source: NYU Salomon Center and estimates by Professor Edward I. Altman.

INVESTMENT STRATEGIES

Despite unique episodes, of spectacular returns, usually involving large bets on corporate turnarounds, the formula for successful distressed and defaulted debt investing has always been and will continue to be a complex set of skills involving fundamental valuation of debt and equity assets and technical, legal, and fixed income knowledge, complemented by a patient, disciplined, and, at times, highly proactive approach to asset management. We always tell our students that in order to be successful in distressed investing, one should not consider this field solely as a fixed income credit or an equity play, but rather as a combination of both with a number of credit-related sub-strategies that provide a more modern, rigorous risk-return framework.

The attraction of this asset class is not only in its stand-alone individual security performance but also, very importantly, in its extremely low return correlation with other asset classes. Typically during stressed credit cycles (and the subsequent recovery), correlations between the stock market and risky debt markets are quite low, e.g. 12% in 1990/1991, 23% in 2001/2002, and, not shown, -16% and 43% in their subsequent recoveries. Over the entire sample period since we have been tracking defaulted debt as an asset class, the correlation between the S&P 500 and defaulted debt returns as an asset class (1987-present), is only 39%, and a moderate 59% for the high-yield bond market and stock market returns. However, since the most recent economic and financial collapse of 2008-early 2009, the latter's correlation spiked enormously. In

the most recent cycle (January 2010 – June 2018), the correlation between defaulted bonds and bank loans and the S&P 500 Stock Index was 37%, but 72% between the S&P 500 and FTSE's High-Yield Bond Index!^{iv} It is interesting to note that the same correlation of 0.72 was found between the European high-yield bond market and the STOXX 600 stock market index in the post 2009 period. Of further significant interest, is the *correlation* between distressed and defaulted debt and government bonds returns which is *negative* in all time periods.

With respect to investment strategies, Table 2 illustrates three major types, and several additional sub-strategies, as well as target returns for distressed debt investors. The portfolios of these investors typically consist of public defaulted bonds, private loans, high yield bonds and leveraged loans that are distressed. In addition, investors may hold other instruments for hedging purposes, such as credit derivatives or short-sale positions.

Active Control Investors

The active control strategy involves mainly the “big boys and girls” of the distressed debt buy-side industry. The strategy requires a significant capital investment in specific company securities so that the investor can get control of the entire entity. In essence, this is basically a private-equity strategy except that the initial vehicle for getting involved, and eventually gaining control, is usually bank loans and/or public bonds. In addition, control often requires a subsequent injection of equity capital to help ensure the successful rehabilitation and turnaround of the firm. There have been some

spectacular successes of distressed firms control in such industries as movie cinemas, steel, and retailing. See our discussion later in the Literature Review section for studies that focus on the active-control strategy.

Table 2. Investment Styles and Target Returns in Distressed Debt Investing

| Active Control | Active/Noncontrol | Passive |
|--|---|--|
| <p>Requires one-third (market value) minimum to block and one-half (in number of debt securities) to control; may require partner(s). Take control of company through debt/equity swap. Restructure or even purchase related businesses; roll-ups. Equity infusion; run company. Exit two to three years. Larger or mid-cap focus. Target return: 15-25% per year, higher in emerging markets.</p> | <p>Senior secured, senior Unsecured. Active participation e.g. creditor committee, in restructuring process, influence process, Exit via debt or equity (post-Chapter 11) Markets. Generally do not control. Holding period of one to two years. Larger or mid-cap focus. Target return 12% to 20%.</p> | <p>Invest in undervalued securities trading at distressed levels Substrategies-trading/ buy-hold/senior or senior secured/sub debt/"busted converts" / capital structure arbitrage/ long-short, value. Trading oriented; Sometimes get restricted Holding period of six months to one year generally; longer Sometimes. Firms of all sizes. Target return: 12% - 15%.</p> |

Source: Authors' Compilation

A related strategy to active control investing involves the purchase of several companies in the same industrial segment, leading to a combined “roll-up strategy” and eventual running of, or sale of, the combined company. An example of this is W.L. Ross’s roll-up of the U.S. steel industry in the early 2000s, involving such major bankrupt firms as *LTV Corporation*, *ACME Steel*, *Bethlehem Steel*, *Weirton*, and *Georgetown Steel*, and the eventual sale of the roll-up, *International Steel Group (ISG)*, to another entity, the *Mittal Steel Group*. The objectives of these bankruptcy acquisitions was to unlock dormant earning power, restructure the firms’ liabilities, and reduce costs dramatically. The resulting success, if any, shows up in the aftermarket of the emerging equity, which was exchanged for the debt purchased earlier at a significant discount to par value.

The active control strategy through distressed security acquisition requires significant ownership of at least one of the major impaired liability classes (e.g., unsecured bonds and/or loans), and frequently an equity infusion by the distressed debt investor. This may also involve either managing the company for an indefinite period of time or the selling of the, hopefully, now rehabilitated company in two to three years, with a target return on investment of at least 15 to 25 percent per year. In most cases, the focus is on larger or mid-cap companies. Indeed, a number of prominent private-equity firms entered the distressed debt market after the huge growth years of 2001 and 2002 and again after 2009.

Lately, there has been a surge of activity in large, emerging markets, like India and Brazil, whereby new and also existing hedge funds have moved into the Distressed

Debt, mainly non-performing loans, market to exploit opportunities made available by changes in the nation's Bankruptcy Code. In these cases, due to the need for substantial capital and the uncertainty of the new legislative process, target returns are even higher than in developed markets, perhaps 25-30% per year for 3-5 years.

Active Non-Control Investors

A second strategy also involves active involvement by the distressed investor, but does not require controlling the entity after the reorganization period. The investor will actively participate in the restructuring process by being a member of the creditors' committee and/or by arranging for post filing, e.g. DIP, financing. The investor will often retain the equity for a period of perhaps six months to two years after the firm emerges and even place a member of its firm on the board of directors of the emerged company. Since the capital requirement is less than the control strategy, the target return is lower, perhaps 12 to 20 percent per year. Again, the focus is typically on larger or mid-cap companies.

Passive Investors

A fairly common type of passive strategy followed by distressed investors is to purchase a distressed company's bonds or loans expecting that the firm will turnaround and not go bankrupt. The upside potential is to purchase the debt at a heavily discounted price, say 50 to 60 percent of par, and see it increase either to par value, or to at least a significant increase in price. Passive distressed investors also invest in the

securities of bankrupt companies, waiting until the condition of the company is so drastic that a formal reorganization structure has commenced. The prospect of an increase in value after reaching some price nadir is the motivating factor.

Related to the distressed, but not defaulted, debt strategy is the ability *to forecast*, whether the firm will go bankrupt. Such techniques as our Z-Score models, Kamakura's (2012) and Janosi, Jarrow and Yildirim (2003) reduced form models, those based primarily on equity prices and volatility, e.g., KMV's (now Moody's) EDF model, or perhaps other failure prediction methods, could be used to assess default probability. The prospect of an increase of value from a distressed state to par value in a relatively short period of time (e.g., 6 to 12 months) was achieved in many cases by both active and passive investors or outsized returns on securities of firms already in bankruptcy, in such years as 2003 and 2009. In 2009, the rate of return on Defaulted Bonds was an incredible 96.4% and 32.8% on Defaulted Loans (based on the Altman/Kuehne Defaulted Debt Indexes –see our discussion later).

After bankruptcy, the firm's prospects become clearer, many times assisted by debtor-in-possession (DIP) financing, and the prices of debt securities start to rise based on the anticipated valuation of the reorganized firm. After a plan is submitted and confirmed by the court, based either on the affirmation of the creditors or, in some cases, by a "cram-down" by the bankruptcy judge, the firm emerges, usually one to three months after confirmation. New securities are exchanged for the old debt and, in some cases, the old equity, which may also participate in the newly emerged entity.

Upon emergence, those still holding the debt securities will usually receive new debt and/or new equity.

The passive investor usually has an investment time horizon of less than one year. Hedging techniques are often utilized to protect against positions moving dramatically against the investor. These may include a short-sale of the underlying equity of the company following the purchase of a distressed bond or loan that is thought to have a good chance for improvement, but could default instead. The hedge can also be achieved by purchase of credit insurance, usually via the credit default swap market, whereby the distressed investor will receive par plus interest if the firm defaults. Of course, all of these hedging instruments are costly and may not need to be exercised. Altman, et. al. (2019) analyze one of these hedging strategies, often referred to as “capital structure arbitrage”.

Valuation of Distressed Securities

As in most investment strategies, the key to successful results is a careful and comprehensive valuation process, whether the security be debt or equity. And, distressed investing is no exception. Only, the process is more complex, since it usually considers both bond and equity issues, as well as capital structure nuances.

The next sections will assess the development of the Distressed Debt Market by first reviewing several relevant empirical studies on the risk/return attributes of distressed debt portfolios. In addition, we will document the returns on Defaulted Debt based on the Altman/Kuehne Indexes of monthly total return performance for bonds

(1987-2018) and loans (1995-2018) and a combined Index of Bonds & Loans. Finally we present some recent empirical work on the pre-and post-default performance of Defaulted Bonds and Loans. This, will provide a fairly complete profile of Distressed Debt investing.

Literature Review

The profit-making potential of securities selling at discount prices makes distressed securities very attractive to the educated and aggressive investor. Altman (1991) published the first definitive guide to this market. Materials for this guide were derived from his first practitioner monograph-white paper, (Altman (1990) that documented and analyzed the unique class of distressed debt.

A comprehensive discussion on the evolution of distressed debt, corporate bankruptcy, and credit default is provided by Altman and Hotchkiss (2006), and Altman, et.al. (1019), where the costs of bankruptcy, credit default prediction, and the post-emergence performance of bankrupt firms are addressed. Additionally, they discuss models for estimating default probabilities, with applications to distressed debt investing and turnaround management.

An early book by Ramaswami and Moeller (1990) undertook a study to examine the impact of the 1978 Bankruptcy Reform Act on investors who own shares or bonds in distressed corporations. Demonstrating that high average returns often accompany wise investment choices, the authors explain how to spot potential investment targets, assess

investment risk, and profit from investing in firms undergoing reorganization following a bankruptcy filing.

Branch and Ray (1992) added to the early works on the risky, but lucrative, opportunities to invest in the securities of troubled companies. As companies in distress go through an informal or formal workout of problems, the investment implications for the securities of firms in each of these stages are considered. An expanded book by the same authors (2007) presented their unique perspective on the valuation of distressed securities. Moyer's (2005) book also concentrated on valuation issues of distressed firms' securities as did Jefferies (2003), Whitman & Diz (2009), and Altman, Hotchkiss & Wang (2019). Finally, Stark, et.al. (2011) edited a compendium of articles on contested valuation issues in corporate bankruptcy.

Altman (2014) explored the scope and importance of the distressed debt market and its market participants, and presents new and potentially important data on recent trends in the outcomes of Chapter 11 bankruptcy reorganization filings, that will possibly contribute to the current investigation by the "bankruptcy industry" on the possible revision of the U.S. Bankruptcy Code. Such questions as to the relative success, or not, of the Chapter 11 process, the time in bankruptcy for various outcomes of the process, the impact of prepackaged restructuring on the outcomes and the recovery rate to various creditor classes were examined.

Rosenberg (1992 and again in 2000) described the big-profit-world of distressed investing, where active "vulture investors" cast their sights on distressed concerns. Vulture investing became more common during the period involving major

bankruptcies in the 1980s and 1990s when declaring bankruptcy became commonplace among debt-heavy companies. Schultz and Lewis (2012) also share their insights and experience as “vulture” investors, advocating this type of investing as critical to the economic ecosystem.

Altman and Eberhart (1994) showed that despite reasonably good average return performance for defaulted bonds, there are some stark differences between bonds with different seniorities. Only the two most senior tranches of defaulted bonds, *i.e.*, senior secured and senior unsecured, did well. The junior defaulted bonds, *i.e.*, subordinated and discounted bonds, however, did not do well at all. Fridson and Gao (2002) pursued this same theme by analyzing data on defaulted bonds during the period January 1980 - July 1992. Specifically, they found that less risky senior issues produced higher returns than the riskier subordinated issues. However, they later updated their analysis and showed that this anomaly became less pronounced. Also, as the prior results became more publicized, the demand for the most senior debt securities increased, making excess returns less likely.

Hotchkiss and Mooradian (1997) provided a rigorous analysis of 288 bankrupt firms and separated their sample by analyzing the role of activist distressed investors and their post-emergence operational performance vs. those filings that did not have an active-control investor. The activist investors firms significantly outperformed those firms that did not have any activist investors. Jiang, Li and Wang (2012) followed-up on this theme with their study on hedge funds presence in the Chapter 11 process. Analysis of 474 Chapter 11 cases revealed that the debtor was (1) more likely to lose

their exclusivity to file a reorganization plan, (2) have their CEOs removed during the process, (3) result in a higher probability of emergence and (4) higher payoffs to junior claimants, when hedge funds were actively involved. At the same time, they argued that these outcomes do not, usually, come at the expense of other claimholders.

Lim (2015) also assessed the role of activist hedge funds in distressed firms by analyzing 469 firms with out-of-court or in-court restructurings. He concluded that activist hedge fund involvement was associated with a higher probability of prepackaged Chapter 11s and these restructurings were faster than those without an active-control investor. His conclusion was that activist hedge funds can create value by enabling efficient contracting.

Wang (2011) also studied bond returns in bankruptcy. Collecting prices on the 1st and 2nd month after Chapter 11 filing and in the month of plan confirmation, his study showed that senior bonds had a 20% annualized average gain while junior bonds had more than 20% annualized average *loss* during the restructuring period.

Altman and Benhenni (2017) undertook a more up-to-date empirical performance analysis of defaulted bonds from default to emergence covering the time periods 1987-2016 and also after the 2005 Bankruptcy Code's extensive revision. Results showed excess return performance over the period from the default date to emergence, especially in the period after the bankruptcy code was revised. We will expand on these results at a later point.

Some recent research has concentrated on the influence that the ownership structure and the type of claims have on the outcome of bankruptcy plans. Ivashima,

Iverson and Smith (2016) analyzed a sample of 136 filings, covering 71,000 investor-claimants. The authors conclude that trading claims during the reorganization leads to (1) higher concentration of ownership, particularly of those claims which are eligible to vote on the bankruptcy plan; (2) that active investors, are the largest net buyers of these claims; (3) that while the initial concentration of investor claims is most important for the coordination of a prepackaged or prearranged plan, it is the concentration of claims during the process that has the most influence on the speed of the restructuring, the probability of a successful emergence or (unsuccessful) liquidation and for the size of the recovery rates for the different claim classes. Ivashima and Iverson (2018) focus on the role of trade claimants in the bankruptcy process. (For a primer on the overall role of trade claims in bankruptcy, see Altman's (1991) chapter in his early book). The current authors find that large trade creditors' decision to sell their receivables of bankrupt firms are predictive of lower recovery rates and oftentimes sell ahead of less-informed other creditors.

Eberhart, Aggarwal and Altman (1999) were the first, and one of the few studies, to analyze the post-emergence performance of equity securities from 131 cases. These equities, similar in many respects to equity IPOs, did extremely well in the 240-day post-emergence period and demonstrated excess returns compared to the overall stock market using a two-factor asset pricing model. Although the post-emergence performance was not superior in some benign credit cycle periods, e.g. 1993-1999 and 2009-2010 (see Barron's (2010)), emerging equities had amazingly positive returns in other years. These returns encouraged one market participant, Jefferies & Co., to start

an index of post-emergence equities called “The Jefferies Re-Org Index (SM)” (2006). This firm’s interest in this niche asset class cooled considerably in subsequent benign credit periods and the index was discontinued.

Li and Zhong (2013) analyzed the trading pattern and performance of bankrupt firm equities during the Chapter 11 reorganization period and found that, in general, equities incurred significant excess losses, especially those stocks with higher levels of uncertainty and more binding short-sale constraints. The authors assessed performance of 602 filings from 1998-2006, the former year when daily data was first available from the stock market “pink-sheets”. They found active trading in many stocks and returns were positively related to asset values, asset volatility, the risk-free rate and the expected duration of the reorganization period and negatively related to the amount of liabilities.

Using credit spread volatility, Altman et al (2014) showed that, for the analysis period from July 1997 to December 2012, the mean annualized return value of a lower-volatility distressed portfolio outperformed that of a higher-volatility distressed portfolio by 12.22%. Additionally, the lower-volatility portfolio also significantly outperformed the High-Yield Index and Distressed Bond Index. Controlling for market volatility by normalizing each individual bond’s spread volatility by the market’s overall volatility, the lower-volatility portfolio outperformed the higher-volatility portfolio by 11.09%.

Gande, Altman, and Saunders (2010) found that the loan market is informationally more efficient than the bond market around events such as loan default,

bond default, and bankruptcy dates. Specifically, risk-adjusted loan prices were found to fall more than risk-adjusted bond prices of the same borrower *prior to* an event date, but to fall less in the periods *surrounding* an event date. Controlling for security-specific characteristics, such as maturity, size, seniority, collateral, covenants, and for multiple measures of cumulative abnormal returns, they find that the results are highly robust, based on different empirical methodologies.

Das and Kim (2014) discussed how to restructure a portfolio of distressed debt, and attribute portfolio gains to restructuring and portfolio effects. They develop a model for the pricing and optimal restructuring of distressed debt portfolios and show that even under moderate deadweight costs of bankruptcy, restructured debt return distributions are very attractive to fixed-income investors. They also discuss how investing in portfolios of distressed debt involves divergence from standard portfolio construction paradigms in two ways. First, the return distribution of distressed debt itself depends on restructuring efforts by the investor, and is therefore no longer exogenous. The gains to constructing portfolios of distressed debt come from: (a) the adjustments and restructuring of individual loans by the investor, and (b) the diversification and optimal portfolio construction across all loans. Second, the distribution of returns is highly non-Gaussian, and the Markowitz mean-variance paradigm is not applicable.

Measuring and Investing in Defaulted and Distressed Debt Securities

The main focus of academic and professional investment research in the risky corporate credit market has typically been on the performance of high-yield bonds, including, importantly, the default and recovery rates of those bonds that default. There is very little similar work on defaulted bonds and loans. This is understandable, as the high-yield bond market is significantly larger and has a 40-year track record, with coverage and data from many sources.^v To address this issue, we have accumulated data on the monthly performance of defaulted bonds and loans. The performance data is based on the Altman/Kuehne indexes of monthly returns for securities from default to emergence (or liquidation).^{vi} These indexes, originally constructed in Altman (1990), are used extensively by distressed debt investment managers as an important benchmark of their performance, as well as by analysts and researchers.

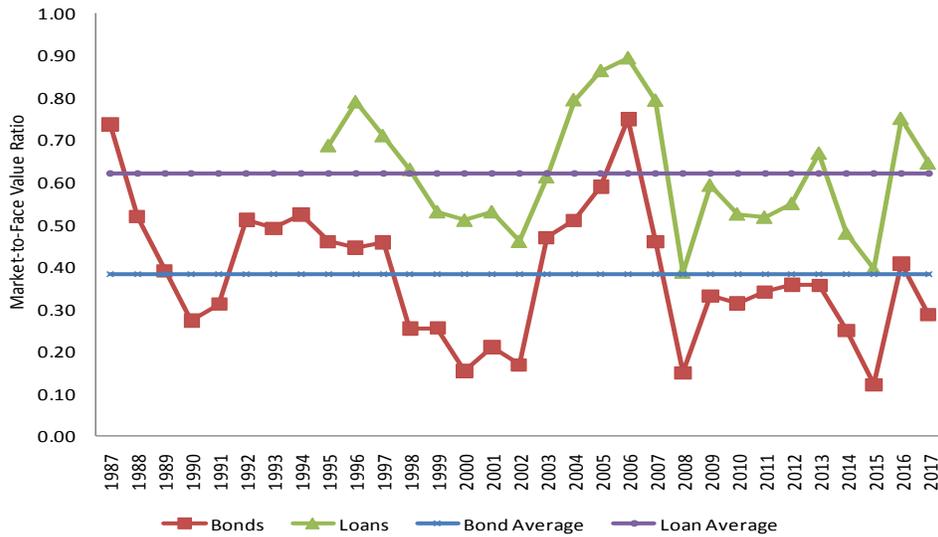
Our performance statistics on bonds goes back to 1987, and on defaulted loans from 1996. As of December 31, 2017, the number of *issues* in the defaulted bond index was 55, only slightly more than half the number at year-end 2016 (101), and about one-quarter of its previous highs in the early 1990s and 2001. Over the 31-year period 1987-2017, the average number of bond issues ranged from a high of 231 in 1992 to a low of 36 in 1998. It should be noted that the number and amount of defaulted issues is considerably greater than those aggregated in Altman/Kuehne (2018), since the index totals are limited to any one issuer comprising no more than 10% of the index's total

market value, and we only include issues for which we find consistent monthly quotes.^{vii}

Market-to-Face Value Ratios

Figure 2 shows the time series trend in the market-to-face value ratios of defaulted bonds and bank loans. As of year-end 2017, the market-to-face value ratio for defaulted bonds was 29%, and was approximately ten percentage points lower than the historical average of 38%. The market-to-face value ratio for defaulted loans was 65%, two percentage points higher than the historical average of 62%. Market-to-face value ratios

Figure 2. Altman-Kuehne Default Debt Indexes — Market-to-Face Value Ratios, Annual 1987–2017



Note: The loans median market-to-face value is 0.61 and average market-to-face value is 0.62. Bonds median market-to-face value is 0.36 and the average market-to-face value is 0.38.

Source: Altman & Kuehne (2018).

are potentially an important indication of trading opportunities, especially if one believes in “regression to the mean.”

The return history shows that the seniority of the bond issue is an extremely important characteristic of the performance of defaulted securities over specific periods, whether from issuance to emergence or from default to emergence. On the other hand, bank loans in default, which are primarily senior-secured, do not do well during reorganization, as our analysis below will show, although their returns are far less volatile.

The performance measure is based on average quotes from market makers and a fully invested, long-only strategy. Returns are calculated from individual bond and bank loan price movements. Returns are gross returns and do not reflect manager fees and expenses. There are, however, several distressed debt hedge fund indexes that reflect samples of investment funds’ average performance and do include management fees.

Table 3 shows the time series returns on Defaulted Bonds compared to common stocks and high-yield bonds from 1987-2017. The arithmetic average returns on all three asset classes are quite similar, averaging between 9.25% for HY bonds to 11.94% for common stocks, with Defaulted Bonds in the middle at 10.90%. However, the compounded average annual rate of return (+5.82%) for Defaulted Bonds is considerably lower, reflecting its time series negative performance in thirteen of the 31 years, compared to just five negative performance years for the S&P 500 and six for

high-yield bonds. Using the time series' compounded annual returns as a basis of comparison, the stock

Table 3. Altman-Kuehne Defaulted Bond Index Comparison of Returns, 1987–2017

| Year | Altman-Kuehne Defaulted Bond Index (%) | S&P 500 Stock Index (%) | Citigroup High-Yield Market Index (%) |
|---|---|--|--|
| 1987 | 37.85 | 5.26 | 3.63 |
| 1988 | 26.49 | 16.61 | 13.47 |
| 1989 | -22.78 | 31.68 | 2.75 |
| 1990 | -17.08 | -3.12 | -7.04 |
| 1991 | 43.11 | 30.48 | 39.93 |
| 1992 | 15.39 | 7.62 | 17.8 |
| 1993 | 27.91 | 10.08 | 17.36 |
| 1994 | 6.66 | 1.32 | -1.25 |
| 1995 | 11.26 | 37.56 | 19.71 |
| 1996 | 10.21 | 22.96 | 11.29 |
| 1997 | -1.58 | 34.36 | 13.18 |
| 1998 | -26.91 | 28.58 | 3.60 |
| 1999 | 11.34 | 20.98 | 1.74 |
| 2000 | -33.09 | -9.11 | -5.68 |
| 2001 | 17.47 | -11.87 | 5.44 |
| 2002 | -5.98 | -22.08 | -1.53 |
| 2003 | 84.87 | 28.70 | 30.62 |
| 2004 | 18.93 | 10.88 | 10.79 |
| 2005 | -1.78 | 4.92 | 2.08 |
| 2006 | 35.62 | 15.80 | 11.85 |
| 2007 | -11.53 | 5.50 | 1.84 |
| 2008 | -55.09 | -37.00 | -25.91 |
| 2009 | 96.42 | 26.46 | 55.19 |
| 2010 | 25.76 | 15.06 | 14.32 |
| 2011 | -3.66 | 2.11 | 5.52 |
| 2012 | 2.63 | 15.99 | 15.17 |
| 2013 | 29.25 | 32.39 | 7.22 |
| 2014 | -12.98 | 13.69 | 1.83 |
| 2015 | -39.54 | 1.38 | -5.56 |
| 2016 | 75.39 | 11.96 | 17.82 |
| 2017 | -6.66 | 21.83 | 7.05 |
| Arithmetic Average (Annual) Rate, 1987–2017 | 10.90 | 11.94 | 9.25 |
| Standard Deviation | 34.16 | 17.00 | 14.66 |
| Compounded Average (Annual) Rate, 1987–2017 | 5.82 | 10.52 | 8.32 |
| Return (Arithmetic)/Standard Deviation Ratio | 0.32 | 0.70 | 0.63 |
| Arithmetic Average (Monthly) Rate, 1987–2017 | 0.59 | 0.93 | 0.69 |
| Standard Deviation | 4.85 | 4.27 | 2.40 |
| Compounded Average (Monthly) Rate, 1987–2017 | 0.47 | 0.84 | 0.67 |
| Return (Arithmetic)/Standard Deviation Ratio | 0.12 | 0.22 | 0.29 |

Sources: NYU Salomon Center, Standard & Poor's, and Citi, now FTSE, High-Yield Index.

market outperformed high-yield bonds, which outperformed defaulted bonds, over the last 31 years.

The volatility of the defaulted bond index is considerably greater than either high-yield bonds or common stocks when measured on an annual basis, but only slightly greater than common stocks, when measured on a monthly basis. No doubt, the “calming” influence of coupon payments on high-yield bonds is a major reason why that index’s volatility measure (both annual and monthly) is considerably below those of defaulted bonds and common stocks. Indeed, defaulted bonds are “no-yield” bonds since they trade “flat.” Still, as we have shown earlier, this high relative volatility of defaulted bonds is somewhat mitigated by its low correlation with most other asset classes, and spectacular returns in selected years, e.g. 1991, 2003 and 2009.

From a return/risk standpoint, the average annual return to standard deviation ratio favored the high-yield bond market and the stock market. Using arithmetic average returns, the ratios are 0.63 for High-Yield Bonds, 0.70 for the S&P 500 and 0.32 for Defaulted Bonds. On a monthly return basis, the Defaulted Bond Index performs relatively better, as does the High-Yield Bond Index (which performs best).

Post-Default Experience

It is also meaningful to analyze the performance of a large sample of defaulted securities during the post-default period. We cover the period 1987-2Q 2016 and involve a sample including 1,189 issues with bond prices at default and emergence from 803

firms, and the period 1996-2Q 2016 for defaulted loans involving a sample with 730 loan facilities from 398 firms. We also analyze the monthly performance 1-24 months after default, as well as the performance from before and after the major changes to the U.S. Bankruptcy Code in late 2005. Finally, we analyze the six-month prior to default experience.

The default-to-emergence period can last from as little as less than one month to more than 60 months. The average emergence period was about 28 months for defaulted bonds for the period 1987-2016, 34 months for 1987-2005, and much less, only 16 months, for 2006-2016. It will come as no surprise to most practitioners in the bankruptcy industry that the 2006-2016 period witnessed a considerably shorter average reorganization period due to a number of changes in the Bankruptcy Code, most notably the limit of 18 months on plan-exclusivity for the debtor and the popular use of prepackaged Chapter 11s. Many cases take less than 12 months, and some even less than six months, to conclude.

In terms of return performance, Table 4 shows the annualized change in average bond prices for four intervals for our entire sample of defaulted bonds: (1) from default to emergence, (2) from default to 12 months post-default, (3) from default to 24 months post-default, and (4) from the 12-24 months period. These results are shown for both the entire 30-year sample period and for the most recent 10 years. We can observe that the annualized average rate of return for all bonds from default to emergence (1987-2016) was 11.08 percent per year. This is decent, but much lower than the 25.34 percent per year for the more recent 10-year period (2006-2016). If an investor purchased our entire

sample of defaulted bonds at default and held them for 12 or 24 months, the average annualized returns were 8.49 percent for 12 months and 13.58 percent for 24 months on just those bonds that lasted for those intervals. For the most recent 10-year sample period, the

Table 4. Post-Default Average Price Changes on Defaulted Bonds (1987-2Q 2016)

| Default to Emergence | | | | | | | |
|----------------------|--------------------|----------|--------------------|----------|--------------------------|-----------------------|----------|
| | Avg. Px at Default | # Issues | Avg. Px at Emerge. | # Issues | Avg. # Months in Default | Avg. Annual Px Change | St. Dev. |
| 1987-2Q16 | 36.92 | 1,727 | 47.18 | 1,189 | 28 | 11.08% | 70.76% |
| 2006-2Q16 | 34.85 | 635 | 47.09 | 452 | 16 | 25.34% | 106.64% |

| Default to Other Time Periods | | | | | | |
|-------------------------------|-----------------------------|----------|--------------------------|----------|-------------------------|----------|
| | Avg. Px 12 mo. Post Default | # Issues | Avg. Px Change 1-12 mo. | St. Dev. | | |
| 1987-2Q16 | 40.05 | 954 | 8.49% | 81.46% | | |
| 2006-2Q16 | 43.98 | 259 | 26.20% | 147.45% | | |
| | Avg. Px 24 mo. Post Default | # Issues | Avg. Px Change 12-24 mo. | St. Dev. | Avg. Px Change 1-24 mo. | St. Dev. |
| 1987-2Q16 | 47.62 | 493 | 18.91% | 52.84% | 13.58% | 45.54% |
| 2006-2Q16 | 50.12 | 103 | 13.96% | 109.10% | 19.92% | 81.26% |

Source: Altman/Kuehne NYU Salomon Center Defaulted Bond Pricing Database

annualized returns were much greater; 26.20 percent for 12 months and 19.92 percent for 24 months.

Volatility of Defaulted Bond Returns

In general, returns appear to be quite impressive for investing in a broad, diversified portfolio of defaulted bonds. However, while average annual returns are high, there is a considerably high “cost” in terms of volatility. In our standard deviation calculations, we truncated the sample by eliminating the top 5 percent of issues that had exceptionally high returns (mainly “penny” bonds). Even with our truncation of outlier positive returns, the standard errors are quite high, ranging from about 70.8 percent for the default-to-emergence interval for the period 1987-2016 to 106.6 percent for the 2006-2016 period. We also looked at alternative ways to compute returns and volatilities. First, instead of annualizing the returns for those cases where the default-to-emergence period is less than 12 months, we assume that the proceeds at emergence are reinvested at the prevailing 6-month U.S. Treasury bill rate for the remaining time up to 12 months. This lowered the above standard error of 70.8 percent to 56.5 percent. Second, rather than using the traditional standard deviation to measure volatility, we calculated the standard deviation of returns below the mean, the semideviation. The resulting volatility is 34.1 percent in the case when annualizing returns for those bonds with a default-to-emergence period less than 12 months and is 31.6 percent in the case when the proceeds at emergence in these bonds are reinvested at the 6-month Treasury bill rate.

Performance by Seniority

Despite reasonably good average return performance for defaulted bonds, especially in the last 10-year period, there are some stark differences between bonds with different seniorities. Table 5 shows the changes in price performance for the 1-12, 12-24, and 1-24 months periods, and from default to emergence for the entire 30-year sample period, stratified by the four seniority classes.

Senior unsecured bonds demonstrated excellent average annual returns for all four interval periods, ranging from 17.4 percent for default to emergence, to 28.5 percent for the 12-24 months period, while the senior secured sample showed only modest high-single-digit returns. The results for the subordinated class were very disappointing, with the average annual return from default to emergence actually negative, at -2.4 percent, and even lower, at -10.9 percent, during months 1-12. These results are consistent with Altman and Eberhart (1994).

Defaulted Loan Performance

The defaulted loan performance statistics for all periods indicate much poorer performance than for defaulted bonds (not shown in a Table). Indeed, all average annual returns were in the low to medium single digits for the interval default to emergence. Specifically, the annualized average rate of return for all loans (1996-2016) was 2.76 percent per year. This compares with 4.45 percent per year for the more recent

10-year period (2006-2016). The volatility of these loan returns, as measured by the standard

Table 5. Defaulted Corporate Bonds Return and Volatility Performance by Seniority (1987-2Q 2016)

| Default to Emergence | | | | | | | |
|----------------------|--------------------|----------|--------------------|----------|--------------------------|-----------------------|----------|
| | Avg. Px at Default | # Issues | Avg. Px at Emerge. | # Issues | Avg. # Months in Default | Avg. Annual Px Change | St. Dev. |
| Senior Secured | 48.81 | 335 | 55.26 | 236 | 22 | 6.92% | 66.93% |
| Senior Unsecured | 37.07 | 925 | 53.96 | 631 | 28 | 17.39% | 68.87% |
| Subordinated | 28.46 | 402 | 26.71 | 287 | 32 | -2.35% | 75.61% |
| Discounted Bonds | 23.06 | 59 | 29.91 | 33 | 22 | 14.90% | 74.22% |

| Default to Other Time Periods | | | | | | |
|-------------------------------|-----------------------------|----------|--------------------------|----------|-------------------------|----------|
| | Avg. Px 12 mo. Post Default | # Issues | Avg. Px Change 1-12 mo. | St. Dev. | | |
| Senior Secured | 53.09 | 176 | 8.76% | 61.27% | | |
| Senior Unsecured | 43.87 | 496 | 18.34% | 93.42% | | |
| Subordinated | 25.37 | 241 | -10.85% | 66.49% | | |
| Discounted Bonds | 19.53 | 32 | -15.29% | 55.65% | | |
| | Avg. Px 24 mo. Post Default | # Issues | Avg. Px Change 12-24 mo. | St. Dev. | Avg. Px Change 1-24 mo. | St. Dev. |
| Senior Secured | 56.38 | 85 | 6.21% | 39.13% | 7.48% | 40.67% |
| Senior Unsecured | 56.35 | 259 | 28.46% | 52.03% | 23.30% | 39.20% |
| Subordinated | 25.59 | 130 | 0.86% | 58.28% | -5.17% | 44.52% |
| Discounted Bonds | 27.22 | 13 | 39.33% | 101.22% | 8.64% | 58.37% |

Source: Altman/Kuehne NYU Salomon Center Defaulted Bond Pricing Database

Table 6. Price Changes on Defaulted Corporate Bonds Return and Volatility Performance Prior to Default (2002-2Q 2016)

| Holding Period (Months) Prior to Default (t) | | | | | | |
|--|---------|---------|---------|---------|---------|---------|
| | t-1 | t-2 | t-3 | t-4 | t-5 | t-6 |
| Number of Bonds | 513 | 527 | 523 | 522 | 517 | 510 |
| Average Change | -16.81% | -23.03% | -24.77% | -30.85% | -36.06% | -38.52% |
| Median Change | -27.03% | -40.13% | -42.39% | -45.19% | -52.77% | -54.24% |
| Standard Deviation | 34.62% | 35.18% | 39.32% | 34.71% | 33.11% | 33.52% |

Sources: Altman/Kuehne NYU Salomon Center Defaulted Bond Pricing Database and Pricing Data from Bloomberg

deviation for the 492 issue sample in the 1996-2016 20-year period, was considerably lower than the 30-year period for bonds, but still quite high.

Analysis of Price Movements in Corporate Bonds Prior to Default

Finally, we examine the price behavior of defaulted bonds for a period of 6 months to 1 month *before* the default date. During a holding period from 1 month to 6 months prior to default, as shown in Table 6, using a large sample of bonds with available prices, the percent change in the average price shows a steady monotonic decline across all periods from -38.52% 6-month prior to default to -16.81% 1-month prior to default. The volatility of the returns, as measured by the standard deviation, is fairly stable across all periods ranging from a low of 33.11% to a high of 39.32%. So, despite the fact that distressed debt markets have become increasingly competitive and analyzed by numerous investors, defaulted bond prices still fall significantly from six months prior to default and even from just one month prior.

Conclusion

In looking at our long-term empirical results, one might conclude that distressed investing, except for the senior unsecured seniority class, is not a particularly attractive asset class, at least not in comparison to assets like common stocks and high-yield bonds. On closer observation, however, a number of unique aspects makes this asset class very attractive, especially to hedge fund managers who can move in and out of the securities depending upon the credit cycle. Also, hedging can mitigate the devastating

impact of particularly difficult periods, as well as the ability to switch from debt to equity. And, as mentioned earlier, Distressed and Defaulted debt is compelling to institutional investors due to its relatively low correlation to other asset classes. Finally, big-bet hedge funds will usually find assets that combine hedging possibilities with the opportunity to exploit periods of spectacular returns as incredibly appealing. Not all asset managers have exploited those challenges in the past, however, or have the staying power to survive large negative periods.

Distressed debt as an asset class has matured greatly in the 30 years, or so, that we have been following its development. Still, its popularity and general interest ebbs and flows over the credit cycle. As for the near-term future of this market, based on the record-long benign credit cycle of late and the enormous increase in corporate debt in the last ten years, we expect dramatically heightened interest and importance once the next stressed credit cycle commences.

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ⁱ See the Altman/Kuehne (annually since 1987) Reports, now published by the NYU Stern Salomon Center, e.g., “The Investment Performance & Market Dynamics of Defaulted & Distressed Bonds & Bank Loans: 2017 Review and 2018 Outlook” March 1, 2018 and our latest Companion Annual Report, “Defaults and Returns in the High-Yield Bond Market: 2017 Review and 2018 Outlook,” February 2, 2018.

ⁱⁱ The NYU Salomon Center compiles statistics on Chapter 11 bankruptcies of more than \$100 million in liabilities from 1971-present.

ⁱⁱⁱ For example, Franklin Templeton’s Mutual Series Funds (Short Hills, NJ) have several funds with distressed debt as one of their several value investment strategies.

^{iv} This index was the Citigroup, NY Index until 2017.

^v All of the major rating agencies and many investment banks, as well as some academics like the authors, regularly assess and report on the high-yield bond market.

^{vi} The NYU Salomon Center maintains indexes on monthly returns on portfolios of defaulted bonds (1987-present) and defaulted loans (1996-present). Subscribers receive a newsletter discussing the monthly results as well as quarterly reports.

^{vii} This index, originally developed in “Investing in Distressed Securities,” E. Altman, The Foothill Group, (1990) is maintained and published on a monthly basis by the NYU Salomon Center.