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Research Paper

Covid-19 and the credit cycle

Edward I. Altman

Max L. Heine Professor, Emeritus, Salomon Center, NYU Stern School of Business,
44 West 4th Street, Suite 9-160, New York, NY 10012, USA;
email: ealtman@stern.nyu.edu

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ABSTRACT

The Covid-19 health crisis has dramatically affected just about every aspect of the economy, including the transition from a record long benign credit cycle to a stressed one, with still uncertain dimensions. This paper seeks to assess the credit climate from just before the unexpected global health crisis catalyst to its immediate and extended impact. We analyze the performance of several key indicators of the nature of credit cycles: default and recovery rates on high-yield bonds, and the number of large firm bankruptcies that we expect over the next twelve months and beyond; yield spreads and distress ratios; and liquidity. Our focus is primarily on the nonfinancial corporate debt market in the United States, which reached a record percentage of gross domestic product at the end of 2019 as firms increased their debt to take advantage of record low interest rates, and investor appetite grew for higher promised yields on risky fixed-income assets. We also examine the leveraged loan and collateralized loan obligation markets, as well as the increasingly large and important BBB tranche of the corporate bond market. Specifically, we discuss the latter's vulnerability to downgrades over the expected downturn in the real economy and this vulnerability's potential impact on expected default rates by "crowding out" low-quality debt of other firms (some of which we believe are "zombies"). Using Z-scores for a sample of BBB companies between 2007 and 2019, we analyze this largest component of the corporate bond market to provide some evidence on the controversial debate

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as to whether there has been ratings inflation or, perhaps, persistent overvaluation of the nonfinancial corporate debt market since the last financial crisis.

Keywords: Covid-19; credit cycle; high-yield bonds; default rates and recovery rates; rating inflation; zombies.

1 INTRODUCTION

With global health concerns about the coronavirus dominating the news, this paper gauges the financial health of the credit market both before and after the onset of the Covid-19 pandemic. We begin with an examination of where we were in the credit cycle during the pre-pandemic period, culminating at the end of 2019; at the end of 2019, the credit cycle was apparently in a benign state, albeit with some unmistakable storm clouds on the horizon. By our definition, benign credit cycles are periods when most, if not all, of four particular market conditions are incentivizing major growth in the supply and demand for credit. That means three or more of the following:

(1) low and below-average default rates and forecasted rates;

(2) high and above-average recovery rates on actual defaults;

(3) low and below-average yields and spreads required from issuers by investors;

(4) highly liquid markets in which the riskiest credits can issue considerable debt at low interest rates.

At the end of 2019, at least three of these signals indicated we were still in a benign credit cycle, one that, assuming 2016 was an energy industry anomaly, was well into its eleventh year. That is the longest benign cycle by far in the history of modern finance. As of the end of 2019, the benign indicators were: a corporate high-yield (HY) bond default rate of 2.87% (US dollar-denominated) compared with the historical average of 3.3%; yield spreads required by investors in HY bonds and leveraged loans about 100 basis points (bps) below the historical average; and extremely high liquidity in the risky debt segment. The recovery rate on defaulted bonds was 43.5%, slightly below the historical average of 46.0%. Indeed, during the first two months of 2020, new HY issues were at record levels on top of new HY bond issues that totaled US$250 billion in 2019, and newly issued leveraged loans amounted to almost US$500 billion (Altman and Kuehne 2020).

Further, the stock market had just had an extremely profitable year, rising by about 30% in 2019, with HY bond investors enjoying a return of about 14%. The US economy was growing at a reasonably high rate, certainly at a level above most

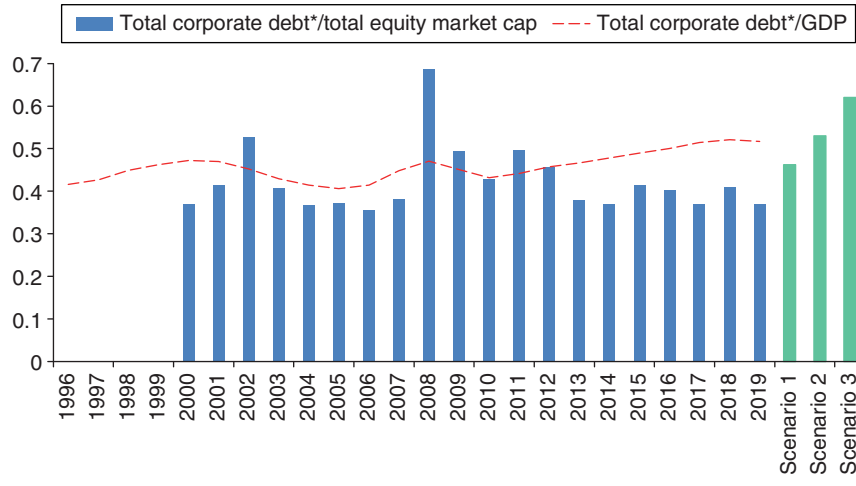
of the developed world. The outlook for 2020 was still fairly rosy, despite the coronavirus ravaging the Wuhan area in China and some other countries. Indeed, the Fed's forecast for gross domestic product (GDP) growth in the United States was in the 2.0–2.2% range (Board of Governors of the Federal Reserve System 2019).

However, was this upbeat scenario indicative of a benign credit cycle or of a credit bubble that created a false sense of security, even as risk built up in the system? Even before the pandemic struck, there were signs of excess associated with a credit bubble or a "risk-on" attitude in credit markets. For example, the amount of corporate bonds, of both investment and noninvestment grades, in the United States had doubled from 2009 levels to more than US$9 trillion at the end of 2019. The largest growth in US dollar amount was in the BBB-rating class, with almost US$3 trillion in marginally investment-grade bond issues. And, with a similar growth in leveraged loans to over US$1.2 trillion, most without any meaningful protective covenants for investors, and with historically low interest rates and even the lowest quality, CCC-rated issues easily refinanced with ample new issues of at least US$20 billion each year from 2014 to 2019 (Altman and Kuehne 2020), most indicators were of a "risk-on", low default rate scenario. In addition, nonbank lending to commercial borrowers, mostly leveraged buyout companies, exploded to an estimated 42% of all commercial lending, amounting to almost US$1 trillion (Bank of America Merrill Lynch (2019) estimate). In short, we believe that corporate and government debt was increasing enormously to perhaps dangerous levels, almost without pause as of the end of 2019 and into the first two months of 2020; this, despite the number of Chapter 11 and Chapter 7 bankruptcy filings with liabilities above US$100 million spiking in 2019 to a total of ninety-eight, the highest amount since 2009 (except for 2016). Further, the number of billion dollar bankruptcies increased from twenty-one in 2018 to twenty-six, which was almost double the median (fourteen) over the thirty-year period from 1989 to 2019. The continuing issuance of high risk debt despite these ominous signs points to a debt bubble.

Skeptics of the debt bubble theory assert that if the levels of corporate debt were considered relative to equity measured in terms of market values instead of book values, the corporate debt level was actually lower than it was ten years ago. While that is true, Figure 1 shows that if you simulate the debt/equity ratio with a 20–40% decline in market equity values, the levels in 2019 would be the highest in modern cycles, with the exception at the height of the global financial crisis (GFC) in 2008.

A related storm cloud over the pre-pandemic horizon involved the US levels of nonfinancial corporate debt (NFCD) as a percentage of GDP. Figure 2 shows this percentage from 1987 to 2019, with three peaks in that ratio over this sample period (1990–91 (43%), 2001–2 (45%) and 2008–9 (45.2%)). Also shown in Figure 2 are the levels of HY bond default rates over the same sample period. Note that peaks in the NFCD/GDP ratio were followed within twelve months or less by peaks in the

FIGURE 1 US total nonfinancial corporate debt as a proportion of GDP and market cap of equity.



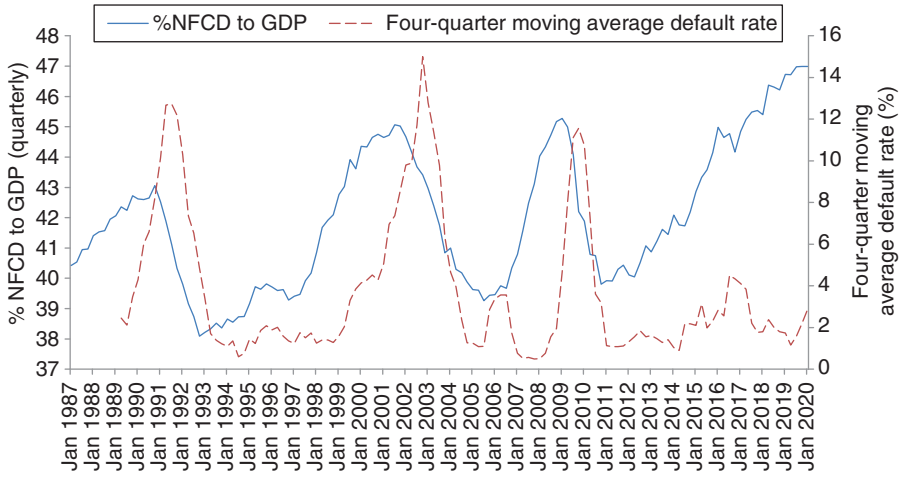
Scenarios 1–3 assume equity market cap lower by 20%, 30%, 40%, respectively. *Debt and equity do not include financial firms. Market cap includes New York Stock Exchange and Nasdaq companies. *Sources:* Bank of America, Federal Reserve Economic Data, World Federation of Exchanges, Volatility and Risk Institute, NYU Stern.

default rate three times during the period from 1987 to 2019. In 2019, we observed a new peak at the highest ever level (47%) of NFCD/GDP. Yet the default rate at the end of 2019 was still below average. Would that low-risk default rate continue into 2020 and beyond? Figure 3 suggests that without a recession the benign credit cycle may have continued; that is, without the Covid-19 economic downturn, we could still have been in an environment of low default rates, high recovery rates, low yields and liquid debt markets. Was the benign credit cycle another victim of the coronavirus? Our analysis shows that the benign credit cycle was dying even before the pandemic levied the death blow.

2 CREDIT AND ECONOMIC CONDITIONS DURING THE GLOBAL PANDEMIC

We will never know what would have happened to the credit cycle if the pandemic had not triggered economic collapse. At the time of writing (May 2020), most economists were predicting that the Covid-19 crisis would likely result in unemployment in the United States reaching perhaps 20–25% in Q2, with an economic recession in the United States, and globally, by the end of 2020 Q3. Indeed, both Morgan Stanley (predicting a 30% drop in GDP in Q2) and Goldman Sachs (24%

FIGURE 2 US nonfinancial corporate debt (credit market instruments) to GDP: comparison with four-quarter moving average default rate, January 1, 1987 to December 31, 2019.

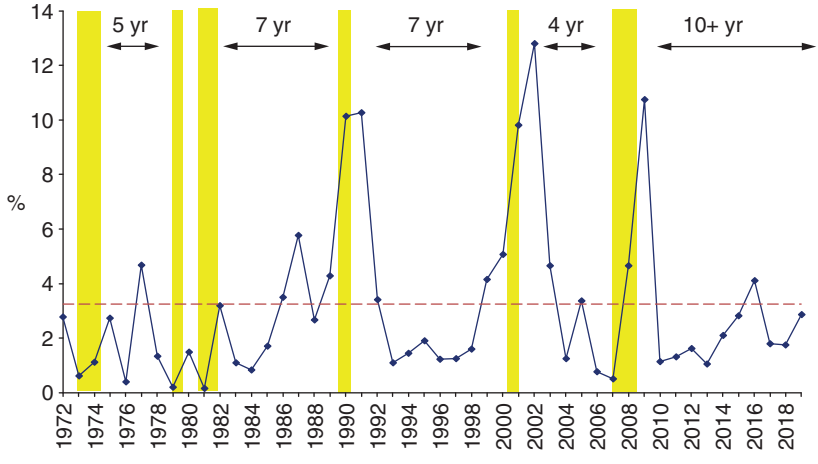


Sources: Federal Reserve Economic Data, Federal Reserve Bank of St Louis and Kroll Bond Rating Agency/Altman HY default rate data.

drop) forecasted in March an annualized recession for several more quarters, if not years, with the highest unemployment rate since the Great Depression. JP Morgan's forecast in March for a recession in 2020 was 55% (JP Morgan 2020). This large expected downturn was not just in the United States. Most foreign analysts expected China to have reduced growth in 2020 even before the awareness of Covid-19, and many parts of Europe were already in a recession, including those that depend on China to buy their goods, such as Germany.

However, the buoyant but fragile credit markets that we observed at 2019 year-end continued their "risk-on" market confidence until early March 2020, despite ominous warnings about the virus in China and some other countries. Perhaps the catalyst for a change in the credit cycle, from benign to distressed, could have come as a result of China's GDP decline even before the coronavirus crisis became evident. However, the proliferation of the virus on a global scale was clearly the catalyst for a major shift in the market environment. Yield spreads that were 100 bps below average as of year-end 2019 had spiked by more than 150 bps by March 6, 2020. In the fortnight that followed, spreads doubled to over 1000 bps. New issues in the leveraged finance market that were setting monthly records in early 2020 essentially dried up in mid-March, with firms postponing new debt issues due to much higher investor-required interest rates. The distress ratio (HY bonds trading at more than

FIGURE 3 Historical default rates, benign credit cycles and recession periods in the US HY bond market (1972–2019).



Periods of recession: November 1973 to March 1975, January 1980 to July 1980, July 1981 to November 1982, July 1990 to March 1991, April 2001 to December 2001, and December 2007 to June 2009. Benign credit cycles are approximated. All rates annual. *Sources:* National Bureau of Economic Research and author data.

1000 bps over Treasuries) jumped from 8.2% as of the end of 2019 to almost double that level by early March, approaching the historical average. Indeed, the distress ratio actually reached 40% in late March. Returns on HY bonds went from +1.5% in the first months of 2020 to −14% in late March. These declines were only the beginning of the negative trends, which became much more severe by the end of March 2020. Further, the stock market's enormous decline caused the declaration of a bear market (20% decline).

The stock market and most (but not all) risky debt markets rebounded strongly in April 2020, mainly due to the Fed and the US government's enormous support and the hope for an early end to the health crisis. However, the post-realization of Covid-19 has produced a bifurcation in the markets for leveraged loans versus corporate bonds. Both markets had immediate large declines in prices and consequent increases in yield spreads in March, but thanks to unprecedented Fed support for the corporate bond market, the HY bond market regained much of its losses by mid-May 2020. HY bond spreads settled at about 750–800 bps, about 250 bps above its historical average, and liquidity resumed its early-2020 record levels of new issues, albeit at higher interest rates than before Covid-19. Leveraged loans, on the other hand, have continued to languish since the declines of March 2020, and yield spreads have remained high as the bank loan and collateralized loan obligation (CLO) markets

lagged other asset classes. Despite the enormous support of the Fed and the US Treasury extended to the corporate bond market, new issues of leveraged loans were very low during April and May 2020, falling to perhaps one-third of the normal monthly amounts over the past five years (LCD News 2020).

One interpretation of the cause of differences in the performance of leveraged loans versus HY bonds is that the CLO market is constrained in its ability to add new leveraged loans to existing structures due to increased downgrades to CCC and defaults in the existing pools of collateral loans. Since CLOs had purchased as much as 70% of new leveraged loans from banks in recent years, this constraint caused banks to reduce their own lending, especially to high risk borrowers. Thus, the "risk-on" bubble conditions that were prevalent before the coronavirus outbreak have contributed to the depressed credit conditions in the leveraged loan market during 2020.

A key question is whether the corporate bond market or the leveraged finance market provides the better early warning of economic conditions on the horizon. Prior research suggests that the loan market provides an earlier and clearer forecast of economic recovery than does the bond market. Altman *et al* (2010) analyzed loan prices versus bond prices in the secondary market for a large sample of defaulted companies that had both sources of debt outstanding. The evidence was conclusive that loan price movements declined significantly earlier than bond prices. Further, the LCD News (2020) report noted above stated that "leveraged loan performance has been a leading indicator of when an economic recovery has begun, much more so than equity prices". Finally, the dramatic recovery of corporate bond prices can be attributed to Fed intervention rather than indicators of fundamental economic conditions. Thus, analysis of current credit market indicators suggests that the US economy will remain in a deep recession for longer than the HY bond and equity markets are indicating.

3 FORECASTING COVID-19 DEFAULT AND RECOVERY RATES AND BANKRUPTCIES

Against this backdrop, we update our forecasts of credit conditions over the next twelve months. We estimate default rates on US dollar-denominated North American HY bonds using three different methods: the mortality rate approach, the required yield spread demanded by market investors and the distressed ratio method.

Mortality rate analytics (based on Altman (1989)) have been maintained and updated annually for thirty years. This actuarial technique records the frequency of default of newly issued bonds from every major rating category, including investment and noninvestment grades, for one to ten years after issuance. Our latest estimates cover 3578 corporate bond defaulting issues from 1971 to 2019 (Table 1). A similar

TABLE 1 Mortality rates (%) by original rating: all rated corporate bonds, 1971–2019.

		Years after issuance									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AAA	Marginal	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.00
	Cumulative	0.00	0.00	0.00	0.00	0.01	0.03	0.04	0.04	0.04	0.04
AA	Marginal	0.00	0.00	0.16	0.04	0.02	0.01	0.03	0.03	0.03	0.04
	Cumulative	0.00	0.00	0.16	0.20	0.22	0.23	0.26	0.29	0.32	0.36
A	Marginal	0.01	0.02	0.08	0.09	0.07	0.03	0.02	0.21	0.05	0.02
	Cumulative	0.01	0.03	0.11	0.20	0.27	0.30	0.32	0.53	0.58	0.60
BBB	Marginal	0.28	2.23	1.19	0.94	0.47	0.19	0.20	0.20	0.18	0.30
	Cumulative	0.28	2.50	3.66	4.57	5.02	5.20	5.39	5.58	5.75	6.03
BB	Marginal	0.88	2.11	3.77	1.94	2.36	1.50	1.40	1.05	1.36	3.05
	Cumulative	0.88	2.97	6.63	8.44	10.60	11.94	13.18	14.09	15.26	17.84
B	Marginal	2.82	7.60	7.70	7.70	5.70	4.42	3.66	2.01	1.68	0.68
	Cumulative	2.82	10.21	17.12	23.50	27.86	31.05	33.57	34.91	36.00	36.44
CCC	Marginal	8.03	12.35	17.64	16.17	4.85	11.56	8.37	4.74	0.59	4.20
	Cumulative	8.03	19.39	33.61	44.34	47.04	53.16	57.08	59.12	59.36	61.07

Rated by Standard & Poor's at issuance. Based on 3578 issues. *Sources:* S&P Global Ratings and author's compilation.

analysis and compilation is done for mortality losses and can be used to estimate loss given default (LGD), which includes our observations of recovery rates on defaulting issues. These mortality statistics can be used to forecast default rates or probability of default (PD). The technique involves the impact of bond aging by adjusting the base population over time for other nondefault bond disappearances, such as bonds "called" by the issuer, maturities or merger-related activities. Thus, if we observe the US dollar amount of new issues by rating category for the past ten years and apply the marginal mortality rate estimates from Table 1, we can aggregate the amount of defaults in a subsequent year and then divide that into the forecasted population of HY bonds (as of the mid-year of the next twelve months) to obtain our first forecast of the annual default rate over the next twelve months.

Using the above mortality methodology, our forecast for the next twelve months as of December 31, 2019, was 5.75%. Note that we aggregate estimates based on all initial ratings, even investment-grade bonds. Since the last fifty years of default and new issuance data do not include a pandemic environment, and the number of crisis years was only about six out of fifty, our forecast of 2020 defaults will probably be on the low side. We prefer, however, not to ignore this actuarial method, especially since our other two methods do incorporate expectations based on current market conditions.

Our second and third techniques rely on the current yield spread in the market compared with ten-year Treasury bonds and the distress ratio. We started using the ten-year US Treasury bond benchmark before the market adopted a similar method, called the option-adjusted spread (the results of the two are very similar). The yield spread method observes the historical annual relationship between current (time-t) yield to maturity spreads and a default rate on HY bonds in $t + 1$ (one year in the future). We update results annually, and the latest regression estimate is based on data from 1978–2018 yield spreads and 1979–2019 defaults, resulting in the following default rate estimate equation:

$$\text{default rate}(t+1) = -3.15 + 1.28(\text{yield spread}(t)), \qquad \text{adjusted } R^2 = 59.6\%.$$

Plugging in the yield spread of 9.84%, as of March 26, 2020, results in a next-twelve-month forecast default rate of 9.45%. Note that due to extreme market volatility in late March and April 2020, the yield to maturity spread fluctuated from as low as 7.5% to about 11.0%, so our forecasted default rate is likewise volatile, depending on when the data is accessed.

Our final technique is the so-called distress ratio method, a measure we developed (Altman 1990) to assess the segment of the HY market that is most likely to default should either specific firms' conditions and/or the real economy deteriorate significantly. Under these circumstances, default rates, in general, increase. We originally

used the benchmark of 10% above the ten-year T-bond rate as our distress ratio criterion, but we have now adopted the market standard of 1000 bps above the comparable duration Treasury rate (the option-adjusted spread). Since 2000, this distress ratio's median annual rate has been 10.35%, with an average ratio of 16.38%. This ratio has been as high as 81.2% (in December 2008) and as low as 1.62% (in December 2006).

Based on market data for 2000–18 for the distressed ratio and 2000–19 for default rates, our linear regression estimated equation is

$$\text{default rate}(t+1) = 0.923 + 0.240(\text{distress ratio}(t)), \qquad \text{adjusted } R^2 = 75\%.$$

R^2 was not increased by using nonlinear estimates.

Plugging in the distress ratio of 33% as of March 26, 2019 (the ratio reached as high as 40.0% earlier in March and as low as 22% in early May), our PD estimate for the next twelve months is 8.84%. Averaging the three methods, our preliminary forecasted default rate for the twelve-month period as of March 2020 is 8.01%, which is about 2.4 times the comparable rate in 2019. Summarizing the results of the three models yields

$$\begin{aligned} \text{mortality rate} &= 5.75\%, \\ \text{yield spread} &= 9.45\%, \\ \text{distress ratio} &= 8.84\%, \\ \text{average} &= 8.01\%. \end{aligned}$$

Finally, we have added a new element to our 2020 post-pandemic forecast, based on the huge increase in triple-B-rated debt and the likely "crowding-out" effect caused by the almost certain increase in downgrades to "junk" status, ie, fallen angels. These downgrades, we posit, will have a negative impact on marginal firms' ability to survive in a downturn (see further discussion in Section 3). This new factor, not considered in our historical time series models, will add perhaps an additional 1% to our forecasted default rate, bringing the forecast for 2020 to about 9%. This implies that the forecasted total US dollar amount of defaults would be US$135 billion in the post-pandemic period. For comparison, defaults in 2009 totaled US$123 billion.

Further, the estimated population of HY bonds at the beginning of 2020 was US$1.5 trillion. As of May 2020, the HY population had already swelled a fair amount based on increases from fallen angels and a significant amount of new issues, especially in January/February and April/May, even net of defaults. Admittedly, the triple-B-related element added to the forecast default rate is somewhat arbitrary, but to ignore it would, we feel, be an oversight. Forecasting an increase in defaults due to the crowding-out effect of BBB downgrades is a tricky exercise.

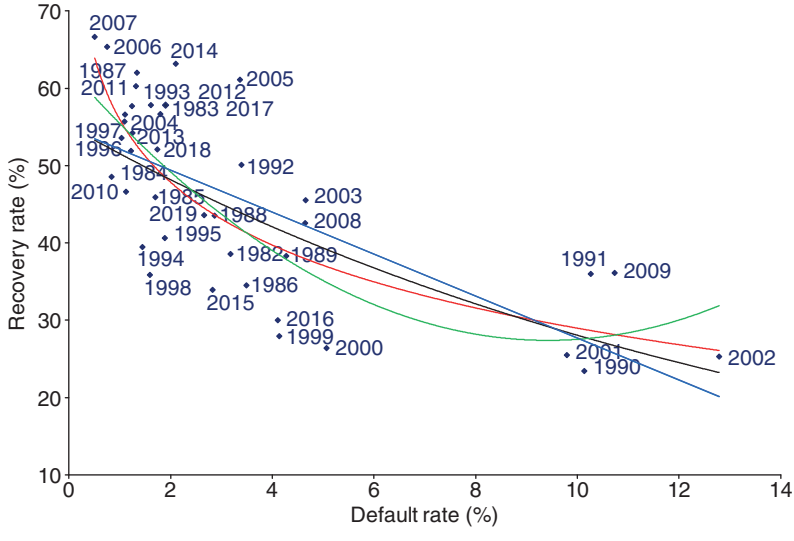
We are cognizant that both the numerator and denominator in the default rate calculation will be increased by fallen angels. Already, between March and mid-May 2020, about 18 BBB issuers were downgraded to junk-bond status, amounting to about US$150 billion face value. So, while there will no doubt be an increase in default amounts due to any crowding-out effects, it is not clear if the default rate will increase; it depends on the timing of the downgrades and the consequent increase in the HY bond population compared with the increase in new defaults. We clearly expect that the default rate for the first half of 2020 will increase, since the HY population base will only be impacted by first-half-year fallen angels. For all of 2020, however, the mid-year population base, which is our annual default rate benchmark, will be more widely affected. In summary, we are comfortable with our fallen angel default rate estimated adjustment of $+1\%$ over the next twelve months (until May 2021).

During the pandemic, financial markets have witnessed unprecedented short-term volatility in both equity and debt markets. A related consequence is that default rate forecasts which partially depend on market conditions will have a good deal of volatility, even from month to month. To indicate this, our recent next-twelve-month default rate forecasts based on an average of our three methods plus the adjustment factor have fluctuated from 4.6% as of the end of 2019 to 9.0% as of March 26, 2020, and to 8.6% as of May 15, 2020. As of the end of May, the preliminary calculation of default rates, year to date (YTD), is about 2.33%, based on about US$35 billion of defaults.

3.1 Forecasting Covid-19 recovery rates

Another forecast of credit conditions relates to the recovery rate, which is based on the price of the bond issue just after default. Utilizing regression estimates on the concurrent relationship between default and recovery rates, we can estimate the recovery rate on defaults implied by our default rate forecasts. Recovery rates are extremely important for many reasons, including estimates for LGD, now necessary to meet Bank for International Settlements (BIS) bank capital requirements, for prices of distressed investor strategies, credit default swap (CDS) prices and lender decisions, among others. Our measure of recovery rates (Altman *et al* 2005) is based on the weighted (by amount outstanding) average of the prices on defaulting issue from just after default. This price reflects approximately what existing creditors of the debt could sell their holdings for and what distressed investors would have to pay. As such, it provides a market clearing estimate based on supply and demand conditions at the time of default as well as the present value of expected future values of the reorganized debt at the end of the restructuring period, usually when emerging from Chapter 11. Our recovery rate measure and alternatives, primarily those calculated

FIGURE 4 Recovery rate/default rate association: US dollar weighted average recovery rates to US dollar weighted average default rates, 1982–2019.



Linear (blue line): $y = -2.7129x + 0.5483$, $R^2 = 0.4803$. Log linear (red line): $y = -0.117\ln(x) + 0.0196$, $R^2 = 0.5863$. Quadratic (green line): $y = 39.526x^2 - 7.4502x + 0.625$. $R^2 = 0.5748$. Exponential (black line): $y = 0.5514\exp(-6.756x)$. $R^2 = 0.5303$. *Source:* Altman *et al* (2005).

by rating agencies or the thirty-day, post-default auction price used in the CDS market, are discussed in Altman *et al* (2004, 2019). Our default recovery rate estimates are based on any one of the four regression structures shown in Figure 4: linear, log linear, quadratic and exponential associations between default and recovery rates on an annual basis for all corporate bond defaults.[1]

Updating the model through 2019, Figure 4 (from Altman *et al* (2005)) shows that our approximate 9% forecast of the default rate in 2020 implies an average recovery rate on these defaults of 30%, about 16 percentage points below the weighted average historical recovery rate (46%). Note that almost all of the regression constructs forecast a 30% recovery for 2020. If this materializes, the weighted average recovery rate in 2020 will be lower than the rate in the GFC. Results through April 2020 gave recovery rates of 30.2%, which is about what we forecast for all of 2020.[2]

[1] Color figures are available in the online version of this paper.

[2] Note that through May 2020 the actual weighted average recovery rate on US$35.7 billion YTD defaults was about 30.2%, almost exactly as our regression estimates predict.

3.2 Summary of default rate forecasts at different points in time in 2020

As a result of the pandemic, financial markets have witnessed enormous increases in short-term volatility in both equity and debt markets. A related consequence is that default rate forecasts that partially depend on market conditions will also have a good deal of volatility, even from month to month. Our recent next-twelve-month default rate forecasts, as of several recent dates, based on an average of our three methods plus the adjustment factor, are as follows.

- End of 2019: 4.6%.
- March 26, 2020: 9.0%.
- May 19, 2020: 8.6%.

Note that Table 2 shows the next twelve months' (or end of 2020) default rate estimates on HY bonds by various rating agencies and investment banks.

Our estimate (8.6%) for the next-twelve-month (April 2021) default rate is lower than most of the other forecasters, with the exception of Fitch Ratings (2020). Because of the uncertainty surrounding Covid-19 we do not forecast two-year default rates, but others do (see the summary in Table 2).

3.3 Bankruptcies in the Covid-19 crisis

As noted above, our default statistics include

(1) missed interest payments not cured within the grace period,

(2) out-of-court distressed exchanges in which bondholders receive less than par value in the exchange, and

(3) the most dramatic indication of insolvency: bankruptcy filings.

It is relevant now to discuss all bankruptcy filings, even those that do not involve HY bond-issuing companies. Indeed, one of the current questions in the Covid-19 crisis is whether the number and size of corporate bankruptcies will overwhelm the bankruptcy court system and challenge the ability of firms to successfully restructure in Chapter 11 reorganization; see Ellias *et al* (2020) for a proposal to support the bankruptcy system during the crisis period.

For more than thirty years, the NYU Salomon Center has been compiling and monitoring Chapter 11 filings for relatively large firms with liabilities at the time of filing above US$100 million and so-called mega-bankruptcies above US$1 billion (see Altman and Kuehne 2020). By far, most of the bankruptcy system's creditor exposures are in these large firm categories. This is not to mean that small and

TABLE 2 Default rate estimates on HY bonds (%).

	2020	Cumulative through 2021
Barclay's	9–10	20
Bank of America	9.6	22
Deutsche Bank	9.5	—
S&P Global	10.0–13*	20
Moody's	6.8–16.1**	—
Fitch	5–7	13–17

*Twelve months. **Twelve months, base and severe recession estimates.

medium firm bankruptcies are not important for the impact of Covid-19, but these are not the focus of our analysis.

Even more than bond and loan defaults, the number of corporate bankruptcies so far in 2020 has increased dramatically. As of May 19, 2020, there were sixty-six Chapter 11 filings with liabilities greater than US$100 million, twenty-three of which had liabilities over US$1 billion (mega-bankruptcies; data sourced from BankruptcyData.com (2020)). Since we do not know of any statistical forecasting models specifically developed for Chapter 11 filings, we simply extrapolate current totals. As the statistics in Table 3 show, if we extrapolate these numbers for the rest of 2020, the number of over US$100 million Chapter 11 liability firms will be second only to 2009 and the mega-bankruptcies will easily break the all-time annual record, again recorded in 2009. The extrapolated 2020 total exceeds the record, even when adjusting the 2019 liabilities for inflation. Further, there is reason to believe that the numbers for 2020 will be even greater than the extrapolated amounts, since the YTD totals as of May 19, 2020 include over two months when the credit cycle was still benign (Table 3).

In summary, we firmly expect that the US bankruptcy reorganization system will be severely challenged in 2020, and could perhaps benefit from additional Congressional support.

4 THE BBB DEBT MARKET AND FUTURE CREDIT CONDITIONS

Even before the Covid-19 crisis realization in the United States, much discussion in the financial press was focused on the huge increase in the amount of bonds and loans outstanding that received a BBB rating from the credit rating agencies (CRAs) (see, for example, Celik *et al* 2020). Indeed, Figure 5 shows that the amount of BBB bonds issued exploded to more than US$2.5 trillion as of December 2019, amounting

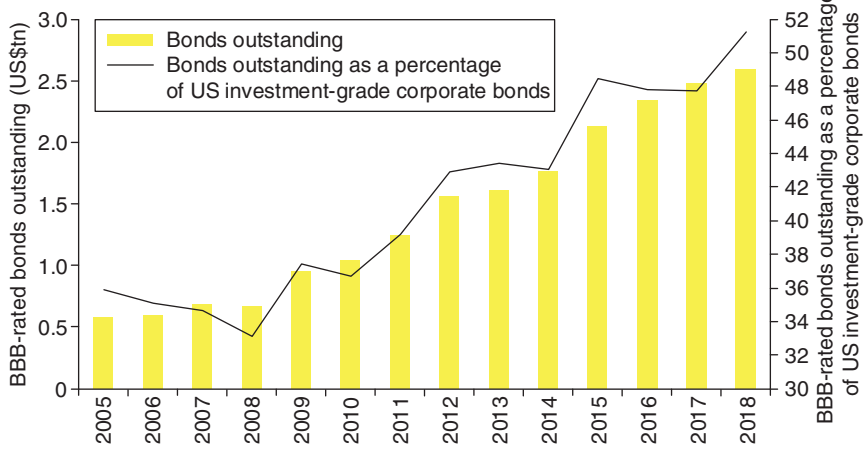
TABLE 3 Large firm bankruptcies in the United States as of May 19, 2020, and extrapolations for 2020.

(a) Chapter 11 filings of more than US$100 million	
Number of Chapter 11 filings	66
Extrapolated number for 2020	173
Extrapolated all time ranking	2nd
All time highest year (2009)	232
Historic annual average (1989–2019)	78
Historic annual median (1989–2019)	66
(b) Chapter 11 filings of more than US$1 billion	
Number of Chapter 11 filings	23
Extrapolated number for 2020	61
Extrapolated all time ranking	1st
Next highest year (2009)	49
Historic annual average year (1989–2019)	17
Historic annual median year (1989–2019)	20

to about 52% of all investment-grade debt. For comparison, in the 2007 credit bubble year there was only about US$700 billion BBB-rated debt outstanding (36% of investment-grade debt in 2007), representing about 28% of the BBB debt outstanding in 2019. The enormous growth in corporate debt in general, and BBB-rated debt in particular, has been carefully documented and commented upon in an Organization for Economic Cooperation and Development study (Celik *et al* 2020). This study emphasized the huge importance of BBB debt in the current market and the role of CRAs in allowing companies to increase their leverage ratios and still maintain their investment-grade BBB rating. This growth raises the question of inflation of ratings, which we will return to shortly.

As we are now in a new crisis period, we address the important question of the percentage and dollar amount of the enormous total of BBB-rated bonds likely to be downgraded to noninvestment-grade, HY bonds, thereby becoming so-called fallen angels. Not only is this amount important for default rate estimates, as we have discussed, but it turned out that all fallen angels after March 23 were eligible for subsequent purchase and for liquidity support by the Fed for the debt markets. When asked, even before the Covid-19 pandemic threat was realized by the markets, what amount of downgrades to below BBB could be expected if the credit markets were to change to a distressed condition, all of the major CRAs and most analysts opined that the impact of these fallen angels on the HY market would be minimal, and that

FIGURE 5 US BBB-rated corporate bonds outstanding, 2005–18.



Source: Bloomberg Barclays US Corporate Investment Grade Index.

the amount would probably not top 10%. This estimate implies about US$250 billion added to the US$1.5 trillion HY bond market over a two- to three-year downturn period. Hence, the inference of a "crowding-out" of marginal, low-quality HY bond issuers by the new fallen angel BBB firms would not be material. This also implies that these marginal firms – including "zombie" companies kept alive somewhat artificially due to forbearance by banks and record low interest rates on new loans with little or no protective covenants and a buoyant new issue market – would default in relatively small numbers. The main basis for the CRA assertions was the observation of what happened to BBBs in the GFC of 2008–9 and other past downturns.

Our assessment of the issue is different. We are concerned about a much larger deterioration of ratings by the rating agencies and/or in the market's perception of BBB firms. It is likely, in our opinion, that a type of credit rationing will take place in a post-2019 downturn when liquidity dries up and any equilibrium interest rates for the lowest-quality credits, mostly CCCs, will not be observed. Hence, we posit that the crowding-out effect will take place in the event of a massive downgrade market. To be fair, we did not observe both a huge BBB downgrade and credit rationing in past financial crises, since the BBB market was then much smaller. For example, in 2007 the BBB market was only US$700 billion, about one-quarter of the current BBB market's size (Figure 5).

We therefore applied our Z-score models to manufacturing and nonmanufacturing industrial firms as of the end of 2019, before the realization of Covid-19. Based on

TABLE 4 Downgrade vulnerability of BBB-rated bonds based on Z-score as of 2019.

	Bond rating equivalents of BBB-rated bonds			
	Z-score determined		Z''-score determined	
From BBB to BB	57/298	(19%)	78/371	(21%)
From BBB to B	45/298	(15%)	56/371	(15%)
Total	102/298	(34%)	134/371	(36%)

Source: author's computations from Capital IQ data.

a sample of 298 BBB+, BBB and BBB− firms for which stock price data, balance-sheet and profit and loss statements were available, and 372 firms with either market or book equity data available, we examined the bond rating equivalents (BREs) of their scores.[3] Our sample includes essentially 100% of the approximately 384 non-financial issuers of the almost US$3 trillion BBB market in 2019. The results of our analysis, presented in Table 4, show that 34% of our sample of BBB firms with BREs based on Z-scores and 36% based on Z''-scores were classified as noninvestment-grade, BB- or B-rated companies as of December 2019. Our analysis also shows that about 15% of the sample had BREs above BBB, so the percentage of BREs below investment grade was more than double that above. For the balance, about half of the sample, we agreed with the rating agency's BBB rating. So, the BREs are not symmetrical below and above the BBB rating.

If, as our analysis implies, the percentage that will be downgraded to junk levels in 2020 and 2021 is 20–25% (35% is not likely over a two-year downturn), then this would result in about US$500–625 billion of new fallen angels or about a 33–42% increase in the US$1.5 trillion HY "junk" market: not a trivial amount. Indeed, Light (2020) estimated that as much as US$1 trillion of BBB bonds would be downgraded to noninvestment grade. We have some doubts that CRAs will actually downgrade this large an amount (20–25%) since their estimate of a maximum of 10% downgrades could be something of a self-fulfilling prophecy. Still, based on our analysis of data at the end of 2019, we project a sizable amount (more than 10%) would be downgraded to noninvestment grade in the next downturn, whatever the catalyst. To be fair to the CRAs, in the early stage of the Covid-19 crisis, at least one rating agency recognized the already large amount of fallen angel downgrades and the even

[3] For a discussion of Z and Z'' models and our experience with these models over the last fifty years, see Altman (2018) and Altman *et al* (2019). BREs are determined by calibrating Z- and Z''-scores to median values of each of the Standard & Poor's (S&P) rating categories for various years over the last fifty or more years. For example, a Z-score below 1.81 in 1968 was classified as a likely bankrupt (Altman 1968), whereas the cutoff level drops to zero (0.0) in recent years.

larger numbers of additional vulnerable BBBs (see Kesh *et al* 2020). Although just about all corporate bonds suffered significant price declines in March, the subsequent support shown by the Fed for corporate bonds, including, notably, fallen angels, contributed to price rebounds for most bonds and the vast amounts of new issue liquidity since.

In the first two months after the Covid-19 crisis realization, estimates of reported US downgrades of BBB bonds to "junk" ranged from US$135 billion (Bank of America 2020) to US$158 billion (*Economist* 2020; CreditSights 2020), and others estimate that another US$280 billion (Bank of America 2020) will be downgraded by May 2021, bringing the fifteen-month total to US$430 billion. Recall that we believe that a two-year downgrade total in the current downturn credit cycle could reach US$500–625 billion. We also observed that every one of the downgraded fallen angel bonds from March to mid-May 2020 had a BRE below investment grade, based on Z-scores, and all but three of the eighteen companies based on the Z''-score model (Table 5); the latter three recorded a Z''-score BRE of BBB, the same as their actual CRA rating in 2019. Therefore, our analysis implies that the expected default amounts, and possibly the short-term default rate, will be increased by the recent explosion of BBB-rated debt and subsequent downgrades in a major and sustained downturn.

4.1 Ratings inflation or persistent rating overvaluation?

Since the GFC, credit rating agencies have been criticized by regulators, lawmakers and market practitioners for being too lenient in their assessment of credit instruments. In particular, mortgage-backed securities received sudden and massive downgrades from high investment grades to CCC and sometimes to default during 2008 and 2009. We have heard some of the same criticisms of late with respect to corporate debt ratings (see, for example, *Economist* 2020). In order to assess this critique, we extended our analysis of the aforementioned BBB investment grade segment of the corporate bond market to various times over the last dozen years. This category is particularly relevant due to its enormous growth and its position on the borderline between investment and below investment grade. Thus, this rating category represents a particularly good opportunity to assess possible rating inflation in the bond market in recent periods.

Herpfer and Maturama (2020) investigate the rating inflation issue by analyzing US$900 billion of "performance sensitive loans," whereby the interest paid is a dynamic function of the CRA rating. They conclude that, despite the lawsuit settlements with the government over conflicts of interest during the GFC in the securitized mortgage-backed security market, rating inflation of those interest rate sensitive loans had been prevalent and remained unchanged after the lawsuit settlements. They

TABLE 5 Fallen angel Z- and Z''-scores and their bond rating equivalents, May 2020.

General information				Financial information				
Issuer name	FI ticker	Industry	Face downgrade (US$m)	Date of data	Z-score	Z-score BRE	Z''-score	Z''-score BRE
Ford Motor	F	Autos	34 572	12/31/2019	0.91	CC+	4.13	B
Occidental Petroleum	OXY	Energy	29 059	12/31/2019	0.80	CC	4.71	B+
Western Midstream Partners	WES	Energy	7 820	12/31/2019	0.77	CC	3.95	B
Continental Resources	CLR	Energy	5 300	12/31/2019	1.54	B	5.73	BBB
Cenovus Energy	CVECN	Energy	4 781	12/31/2019	1.39	CCC+	5.18	BB
Delta Air Lines	DAL	Transportation	4 100	12/31/2019	1.30	CCC+	3.04	CCC+
Macy's	M	Retail	2 456	11/02/2019	2.05	B+	5.63	BB+
ZF NA Capital	ZFFNGR	Autos	1 699	12/31/2019	—	—	5.15	BB
Methanex	MXCN	Chemicals	1 550	12/31/2019	1.28	CCC+	5.30	BB
Adani Abbot Point Terminal	ADAABB	Transportation	500	03/31/2019	—	—	3.87	B
Marks & Spencer	MARSPE	Retail	300	09/28/2019	2.36	BB	5.76	BBB
Pemex	PEMEX	Energy	58 621	12/31/2019	—	—	−2.93	D
Rockies Express Pipeline	ROCKIE	Energy	2 050	12/31/2019	—	—	5.37	BB+
Royal Caribbean Cruises	RCL	Leisure	1 450	12/31/2019	1.81	B+	4.25	B
Trinidad Generation	TRNGEN	Utility	600	12/31/2019	—	—	5.68	BBB
Growthpoint Properties	GRTSJ	Real estate	425	12/31/2019	0.81	CCC	5.02	BB
Hillenbrand	HI	Capital goods	375	12/31/2019	1.37	B	4.94	BB

Source: author calculations from NYU Salomon Center and Capital IQ data.

also concluded that CRAs are reluctant to downgrade the issuers when the costs of the downgrade are high (in other words, there is continued "stickiness" in downgrading clients), and that CRAs are slow to downgrade, or avoid downgrades entirely. Our own results from prior periods (Altman and Rijken 2004) demonstrated that CRA downgrades lag point-in-time models, such as Z-score-type models, by more than one year, indicating this same stickiness. Further, Posch (2011) investigated the timeliness of rating changes in the wake of the GFC and found that several factors result in stickiness of rating actions and that default probability estimates have to change by at least two notches before a change, up or down, takes place.

Our past experience and observations before Covid-19 were that the aforementioned stickiness would continue, especially with respect to fallen angel downgrades. The current cycle's early results, however, may prove us wrong, as fallen angels have been numerous and, as shown above, at least one rating agency (S&P Global) recognized that lots more are vulnerable. Curiously, Herpfer and Maturama (2020) conclude there was no evidence from their sample that this stickiness at the border between investment grade and HY took place. Bruno *et al* (2016) assessed results comparing the symmetry between upgrades and downgrades crossing the investment-grade threshold in a traditional issuer-paid CRA model firm and an investor-paid CRA model firm. They showed that the certification of the investor-paid CRA firm affects the issuer-paid CRAs, which become more symmetrical in their subsequent up- and downgrade rating changes.

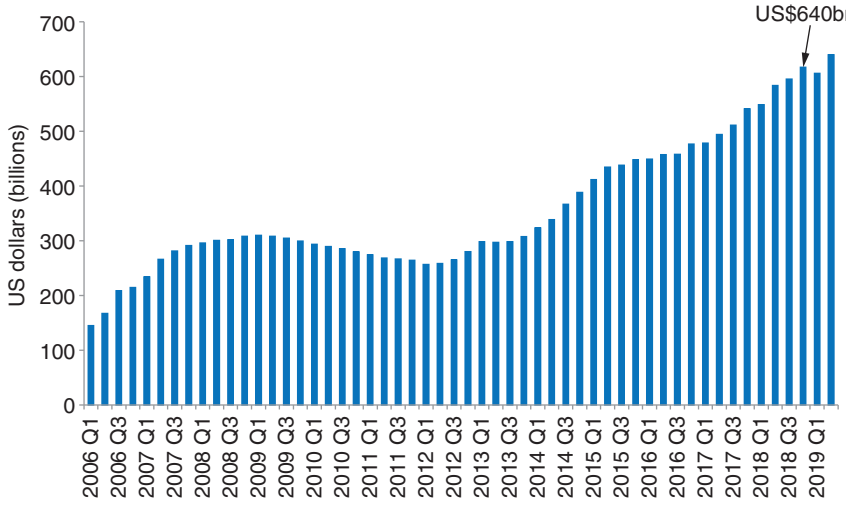
The Z-score models' results, presented in Table 4, suggest overevaluation of about one-third of BBB-rated companies. However, these results are not necessarily indicative of rating inflation, since this represents a single reference-date data point. To provide some evidence of a time series inflationary trend, we compared the BBB class of 2019 with those of 2007, 2013 and 2016. We ran Z- and Z''-score calculations on 108 BBB firms in 2007, 332 in 2013 and 416 in 2016 and compared them with our 2019 sample, discussed earlier, to observe if this overvaluation was a very recent occurrence or one that has persisted for some time. The results of these earlier test years were essentially the same, or even greater than in 2019; ie, between 35% and 45% of the firms received a lower-than-BBB BRE during these periods, depending upon the Z-score test and the period analyzed, and less than 15% received higher than BBB BREs. Our BREs are calibrated based on median Z-scores for each CRA bond rating class over the last thirty years, thereby recognizing changes in median scores over time. We conclude, therefore, that CRAs have been overvaluing a significant number of BBB corporates over the last dozen years, as well as in 2019. Of course, rating agency ratings can differ from point-in-time Z-score BREs, since different criteria are used in the two methods. However, these different methods should not manifest continuous bias of higher versus lower ratings.

On the other hand, there is no evidence of overall rating inflation. What there appears to be is persistent rating overvaluation of investment-grade BBB-rated debt. Clearly, the deterioration in creditworthiness that will cause an investment-grade rating to be downgraded to "junk" is a more dramatic one than just about any other rating migration rating change. The arbitrary and, in some cases, regulatory distinction between investment grade and HY for fixed-income securities is steeped in tradition. For example, the insurance industry has required specific reserve requirements for noninvestment-grade debt in investment-grade portfolios for at least twenty-five years, and the US Securities and Exchange Commission regulates how much speculative grade debt an investment-grade corporate bond mutual fund can own. For some investors (such as exchange-traded funds and some mutual funds), sale of the security upon observing a fallen angel migration is required, potentially causing a free fall in their bond and loan prices. During the stress conditions of the Covid-19 environment, investors who have the flexibility to hold these newly downgraded HY securities may choose to do so if they feel the firms (eg, airlines and energy firms) will likely return to BBB in more normal times. Of course, the downgrade may be a mere first move toward eventual insolvency and default. Altman and Kao (1992) suggest that a downgrade is more likely to be followed by another downgrade (ie, positive autocorrelation) rather than returning to the higher rating. This propensity to observe a downgrade, rather than an upgrade, in subsequent rating changes varied from two to five times greater, depending upon the industrial sector of the firm. Perhaps it is time to update these propensities?

4.2 Collateralized loan obligations

Rating downgrades that always accompany stressed credit cycles could be particularly critical in the Covid-19 economic and credit market crisis period. As noted earlier, CLOs have grown enormously in the United States and now amount to over US$650 billion (see Figure 6) compared with just US$300 billion in 2007 and about US$400 billion in 2014. Increasingly, the leveraged loans that make up the bulk of CLOs are without protective covenants for investors, and are known as "cov-lite" loans (see Griffin *et al* (2019) and Berlin *et al* (2020) for analyses on this increasing trend). Griffin *et al* (2019) shows that loan covenant violations have dropped by 70% in their sample period, due mostly to less restrictive covenants in loan contracts. This should not only reduce the incidence of loan defaults in the short run, but also reduce recovery rates on future defaults of these same companies. Exceptions to these cov-lite loans are when the same firm draws down on existing revolving credit agreements, which almost always retain traditional financial constraints. These derivative CLO instruments are held widely by institutional and mutual fund investment companies, exchange-traded funds and others. CLOs are very sensitive to downgrades,

FIGURE 6 US CLOs outstanding, 2006 Q1–2019 Q2.



Sources: 2006–18 Securities Industry and Financial Markets Association (SIFMA) data from Liu and Schmidt-Eisenlohr (2019, Figure 1); 2019 Q1 from SIFMA data; and 2019 Q2 from Bank of America.

especially to CCC and to defaults of the portfolio-collateral companies. Indeed, it is common for overcollateralization triggers to be invoked if CCC leveraged loans in CLOs increase to a certain percentage, eg, 7.5%. Perhaps equally as important, CLOs are constrained to purchase new issues once the 7.5% threshold has been violated. In addition, the CLO manager is required to take a "haircut" on the CCC debt above the 7.5% threshold, which itself causes problems in the compliance of the overcollateralization test. Indeed, any cash and new interest coming into the CLO must be used first to pay off the most senior tranche of the CLO until the overcollateralization ratio comes back into compliance. The triggering of these constraints therefore restricts the CLO's ability to invest in new loans. The increased risk profile of the CLO will be more severe than originally proposed to the market, resulting in likely price declines and potential redemptions of the senior tranches and losses to the junior and equity tranches, if not all tranches.

As of May 7, 2020, roughly 15% of US CLOs (182 in all) were failing the overcollateralization test, but only 1% were failing the senior tranche test (Preston *et al* 2020). This compares favorably to the peak of the GFC, when 56% failed the overcollateralization test and 11% the senior test. Almost all of these 2020 "failures" occurred after the realization of the Covid-19 crisis. Over half of the new overcollateralization test failures were already past their reinvestment period of new loans

in their pools and about 20% had reinvestment periods ending after 2022. The latter, therefore, are the most constrained, going forward.

4.3 "Zombie" firms

The concept of "zombie" firms is well established (see Acharya *et al* 2019a,b; Cohen *et al* 2017; Banerjee and Hofmann 2018). Although the definition of these "walking dead" firms is itself a controversial issue, all attempts connote firms that are kept alive somewhat artificially or dependent on a specific credit environment. For example, firms may be granted loans by banks, which themselves may be having capital problems, for the sole purpose of not wanting to write off marginal customers. Or, firms who would have serious liquidity and interest rate constraints to raise capital in a normal credit environment may be able do so in a low interest rate, cov-lite, "risk-on" environment, such as we found ourselves in at year-end 2019.

The BIS studies by Cohen *et al* (2017) and Banerjee and Hofmann (2018) define "zombies" as firms whose interest coverage ratios are less than 1.0. To evaluate this definition, we may observe that the median CCC-rated firm in the United States and Europe has an interest coverage ratio less than 1.0.[4] As of 2020, this would include almost US$100 billion of CCC bonds outstanding today and perhaps a similar amount of leveraged loan companies, especially since many CLO portfolio firms have been downgraded in the Covid-19 crisis environment. Banerjee and Hofmann (2018) estimated that as much as 16% of all US listed corporations had this financial profile in 2017 compared with only 2% in the 1990s. This percentage will certainly increase in 2020. Acharya *et al* (2019a) follow Caballero *et al* (2008) and Giannetti and Simonov (2013) in including firms receiving loans at below-market interest rates, ie, if the firm's interest rate expense is below that paid by the most creditworthy firms in the economy. Acharya *et al* (2019a,b) analyze zombie European firms in non-GIIPS countries.[5] Many of these companies had received loans from banks that had a stake in the company from prior loans. Acharya *et al* estimated that roughly 8% of loans in their sample were zombie loans.

We propose a different method for identifying zombies in the United States by selecting those firms with existing low credit ratings that we estimate have very high probabilities of default within two years. Starting out with a relatively large sample of firms whose senior unsecured bond rating from S&P Global was B− or below at year-end 2019, we ran Z- and Z''-score tests to assess which had a BRE of D = default classification, ie, scores below zero (0.0).[6] We found data on ninety-nine firms rated B− or below as of year-end 2019 (sixty-seven were B− and

[4] See, for example, https://www.spglobal.com.

[5] GIIPS denotes Greece, Italy, Ireland, Portugal and Spain.

[6] See Altman *et al* (2019) for more details on the mapping of bond rating equivalents.

TABLE 6 Financial profile of low-rated bonds and their Z-score and Z''-score default predictions, December 2019.

(a) Z-score default prediction

S&P rating	Sample size	Z-score	Rating with BRE of D (%)	EBIT/Interest BRE of D				EBITDA/Interest BRE of D			
				<1.0	1.0–1.5	1.5–2.0	>2.0	<1.0	1.0–1.5	1.5–2.0	>2.0
B−	59	12	20.3	10	—	1	1	4	2	1	5
CCC+	21	7	33.3	6	—	1	—	3	1	1	2
CCC	9	3	33.3	2	1	—	—	2	1	—	—
CCC−	8	4	50.0	3	—	1	—	2	1	—	1
Total	97	26	26.8	21	1	3	1	11	5	2	8

(b) Z''-score default prediction

S&P rating	Sample size	Z-score	Rating with BRE of D (%)	EBIT/Interest BRE of D				EBITDA/Interest BRE of D			
				<1.0	1.0–1.5	1.5–2.0	>2.0	<1.0	1.0–1.5	1.5–2.0	>2.0
B−	67	8	11.9	6	—	—	2	3	2	1	2
CCC+	23	3	13.0	3	—	—	—	2	—	1	—
CCC	9	1	11.1	1	—	—	—	1	—	—	—
CCC−	9	4	44.4	3	—	1	—	3	—	—	1
Total	108	16	14.8	13	—	1	2	9	2	2	3

EBIT, earnings before interest and taxes. EBITDA, earnings before interest, tax, depreciation and amortization. *Sources:* author data, NYU Salomon Center.

forty-two CCCs) to which we could apply the Z-score model and 108 firms that had sufficient data to apply the Z''-score model. Of these, 26.8% had an implied BRE of D using the Z-score model and 15.8% had an implied BRE of D using the Z''-score approach (see Table 6). All of the Z-score D firms also had D-scores with the Z'' test. Incidentally, twenty-one of the twenty-six B−, CCC and CC firms that we predicted to default had interest coverage ratios below 1.0 (the BIS test) and eleven had earnings before interest, tax, depreciation and amortization (a cashflow proxy) coverage ratios below 1.0, a more stringent test. Our sample of about 100 firms is around 40% of the entire population of HY low-quality firms in the Bank of America ICE High Yield index, since many of the remaining firms are owned by private equity firms and do not provide financial data publicly.

Another interpretation of our tests is that we are measuring default risk, not necessarily zombie firms. Since the market was not expecting default in most of these companies, ie, their bond prices were not below seventy in December 2019, we feel it is legitimate to consider them as zombies. We posit that many of these firms, especially those who will not be able to meet their interest or maturity payments during the Covid-19 pandemic, will now default, due partially to the crowding-out effect from new-entry fallen angels, discussed above, as well as rising interest rates on new financing. Of course, the exact number of these firms is difficult to estimate with precision, but we feel it will be nontrivial. As estimated earlier, about US$15 billion, or 1% of the HY bond market, and perhaps a similar amount of leveraged loans, will fall into this crowded-out default category.

5 CONCLUSION

No doubt the situation we find ourselves in today is unprecedented in terms of the speed of recent asset price declines, subsequent rapid rebound after government credit and job market supports, and the expected impact and forecast of corporate defaults. These rapid fire dynamics make the future extremely difficult to predict. As such, we may not have reliable models to capture these dynamics based on historical, modern credit market experience. Despite these uncertainties, our best estimate at this point in time is a default rate on the HY bond and leveraged loan markets for the next twelve months of between 8.6% and 9.0%, or about US$130–135 billion in each of these leveraged finance markets. With respect to Chapter 11 corporate bankruptcy reorganization filings, in 2020 we expect a record annual number of mega-bankruptcies over US$1 billion in liabilities, which could, along with smaller firm filings, challenge the bankruptcy court system. Our forecast for filings with more than US$100 million in liabilities is second only to 2009. These large bankruptcies do not capture the impact of Covid-19 on small and medium-sized enterprises, a topic which is beyond the scope of this paper.

A related issue is the enormous growth and downgrade potential of the BBB-rated investment-grade corporate bond category. This group could produce as much as US$500–625 billion of new HY bonds, ie, "fallen angels," over the next two years. Thus, the likelihood that many of these low-quality credits will be able to fund themselves during the credit downturn is low, thereby increasing defaults. We call this the "crowding-out effect". Additional evidence is provided to assess the criticism that we are observing ratings inflation, especially in the massive BBB-rating sector. Our analysis suggests no evidence of ratings inflation, but we do find evidence of persistent rating overvaluation in the BBB-rating sector over the last dozen years. Finally, we present some evidence of the existence of "zombie companies," and we posit that many of these firms will be among those that will default during the Covid-19 crisis period. We hope that our analysis has provided some guidance on these important issues.

DECLARATION OF INTEREST

The author reports no conflicts of interest. The author alone is responsible for the content and writing of the paper.

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