

COVID-19 and the Credit Cycle

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WHERE WERE WE BEFORE COVID-19, AND SINCE

Before Covid-19

- Benign Credit Cycle Continues
- Were We Vulnerable To A Downturn?
- Global & U.S. Corporate Debt Build Up: A Debt Bubble?
- The Triple-B Rating Growth Phenomena: Fallen Angels?
- Zombies In Our Economy

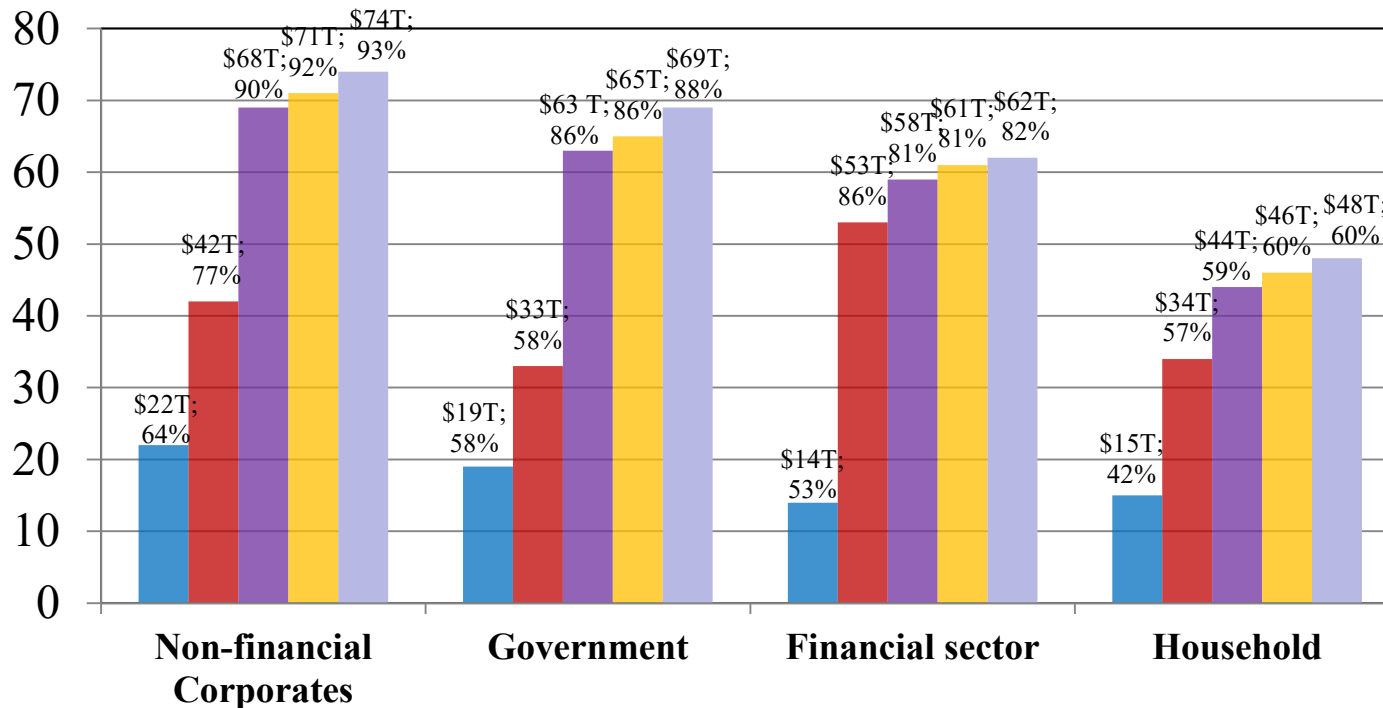
After Covid-19

- March 2020! The Benign Cycle Ends & The Recession Begins
- Fed & Congressional Actions
- The Great Market Rebound & The Real Economy
- Unintended Consequences? Debt Bubble?
- Defaults & Bankruptcies In 2020 And Beyond
- Recovery Rates In 2020

Global Sectoral Indebtedness Before COVID-19

\$ Trillion and % GDP

■ 1997 ■ 2007 ■ 2017 ■ 2018 ■ 2019

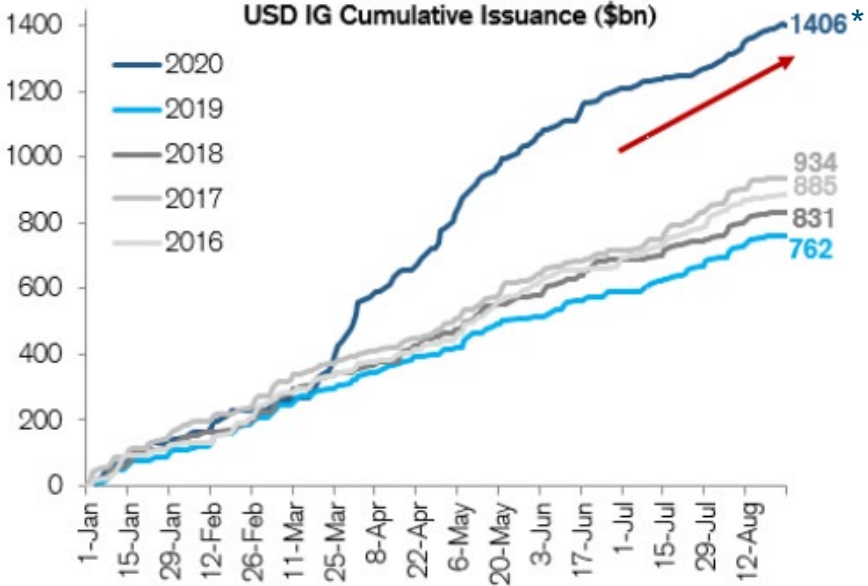


Year	% of GDP	Total \$ Amt. (\$ T)
1997	217%	70
2007	278%	162
2017	317%	233
2018	319%	243
2019	322%	253

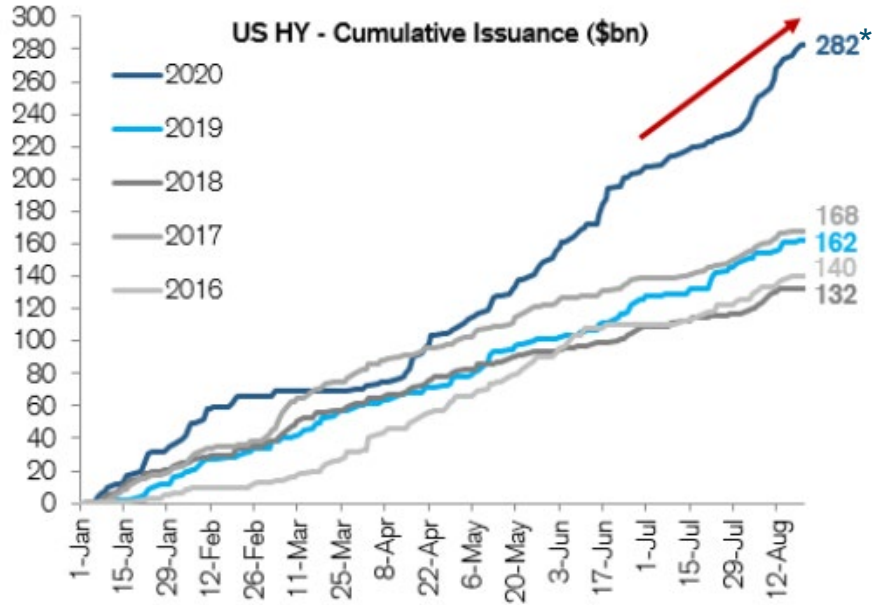
Sources: Chart from *Independent UK* using IIF, BIS, IMF and Haver data for 1997 and 2007. Data for 2017, 2018 and 2019 from “Global Debt Monitor”, Institute of International Finance, January 15, 2019 and January 13, 2020.

Supply Surge Despite Economic Deterioration

Investment Grade Issuance



High Yield Issuance

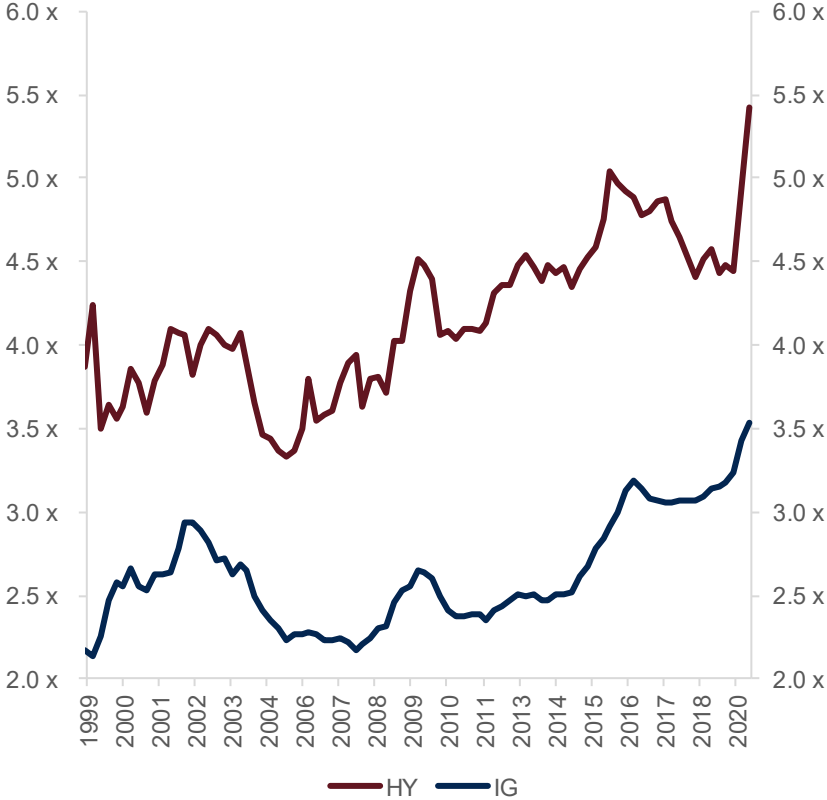


*Considerably higher at 9/30/20

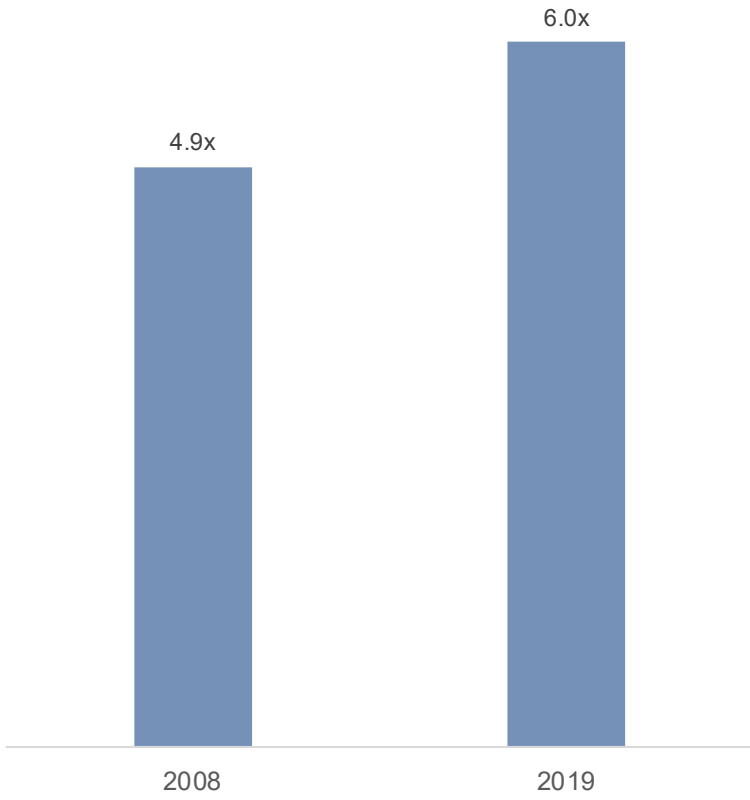
Source: Credit Suisse

Elevated Corporate Debt Leveraged Levels Before COVID-19

Corporate Leverage Levels (Debt / EBITDA)

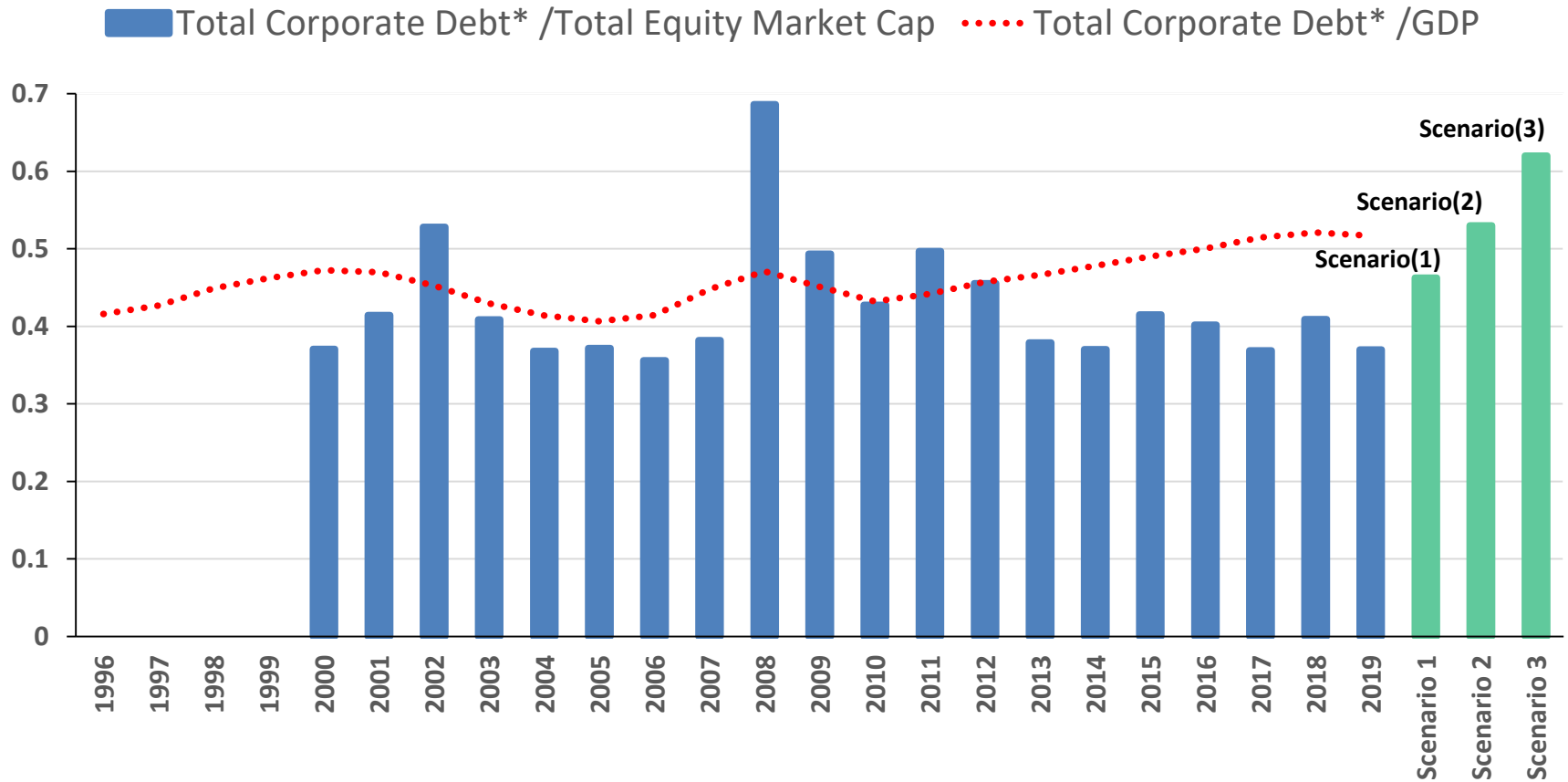


LBO Leverage Levels (Debt / EBITDA)



Sources: Bloomberg Intelligence, S&P LCD

U.S. Total Non-Financial Corporate Debt as a Proportion of GDP and Market Cap of Equity



Scenario assumptions (1,2,3) – Equity Market Cap lower by 20%,30%,40%

* Debt and Equity do not include financial firms; Market Cap includes NYSE and NASDAQ companies

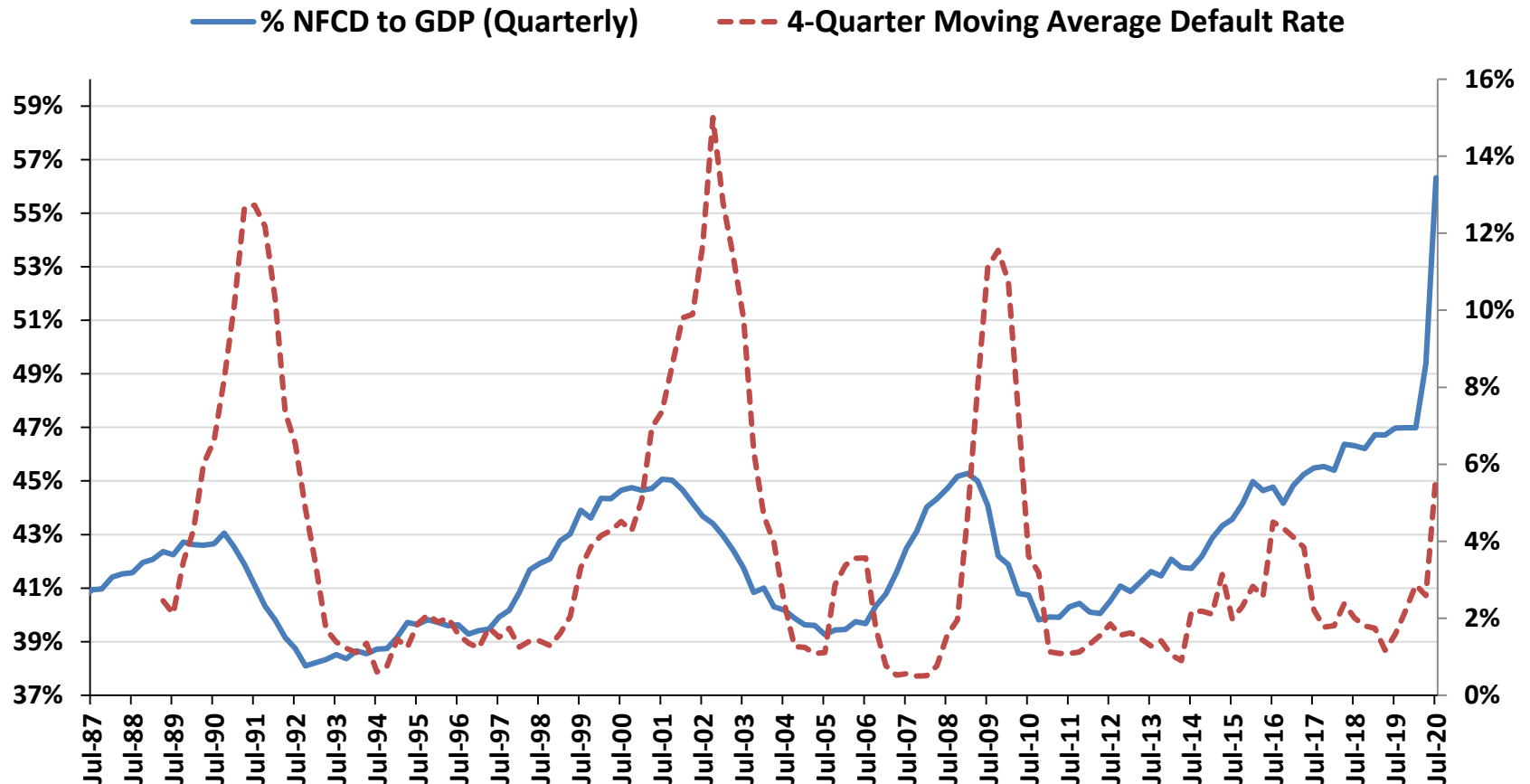
Sources: Bank of America, FRED, World Federation of Exchanges, Volatility & Risk Institute, NYU Stern

How To Tell Where Are We in the Credit Cycle (Five Factors)

	<u>Historic Avg</u>
• Default Rates - Current and Forecast (HY Bonds)	• 3.3%
• Recovery Rates - Loss Given Default (LGD)	• 45%
• Required Returns (Risk Premia)	• 5.3%
• Distress Ratios (% of HY > 10% over RF Rate)	• 10%
• Liquidity - New Issues of Risky Debt	• n/a

U.S. Non-financial Corporate Debt (Credit Market Instruments) to GDP: Comparison to 4-Quarter Moving Average Default Rate

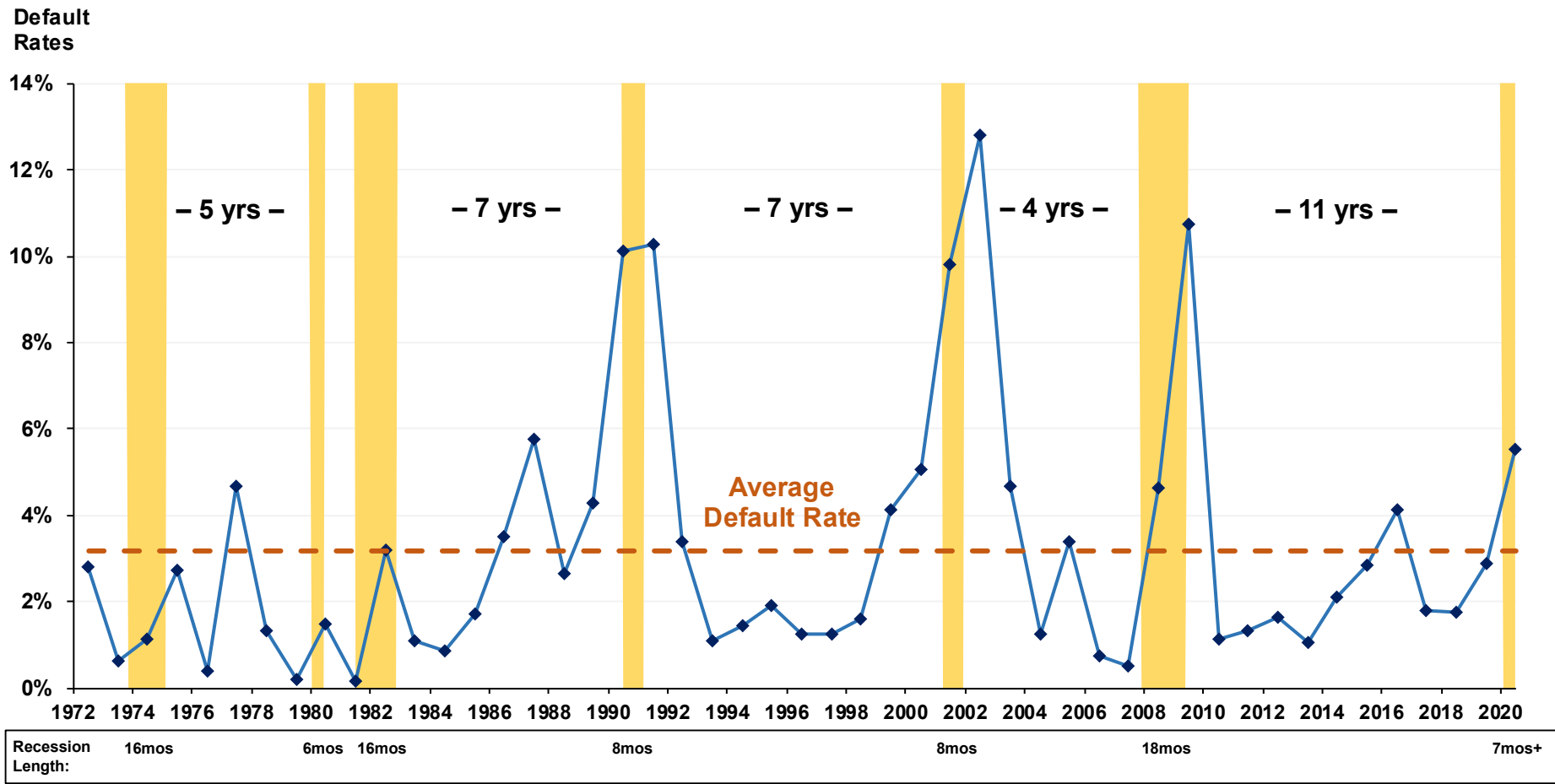
January 1, 1987 – July 01, 2020



Sources: FRED, Federal Reserve Bank of St. Louis and KBRA/Altman High-Yield Default Rate data.

Historical Default Rates, Benign Credit Cycles and Recession Periods in the U.S.

High-Yield Bond Market Default Rate (1972 – 8/1/2020)



Note: The highlighted areas show Periods of Recession. Periods of Recession are as follows: 11/73 – 3/75, 1/80 – 7/80, 7/81 – 11/82, 7/90 – 3/91, 4/01 – 12/01, 12/07 – 6/09, 2/20 – present. Benign credit cycles are approximated. All rates are annual.

Source: E. Altman (NYU Salomon Center); National Bureau of Economic Research

Forecasting High Yield Bond Default Rates

- **Mortality Rate Technique**
- **Yield Spread – Risk Premium Technique**
- **Distressed Ratio Technique**

Marginal and Cumulative Mortality Rate Actuarial Approach

$$\mathbf{MMR}_{(r,t)} = \frac{\text{total value of defaulting debt from rating } (r) \text{ in year } (t)}{\text{total value of the population at the start of the year } (t)}$$

MMR = Marginal Mortality Rate

One can measure the cumulative mortality rate (CMR) over a specific time period (1,2,..., T years) by subtracting the product of the surviving populations of each of the previous years from one (1.0), that is,

$$\mathbf{CMR}_{(r,t)} = 1 - \prod_{t=1 \rightarrow N} SR_{(r,t)},$$

$r = \text{AAA} \rightarrow \text{CCC}$

CMR_(r,t) = Cumulative Mortality Rate of (r) in (t),

SR_(r,t) = Survival Rate in (r,t) , 1 - MMR_(r,t)

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%

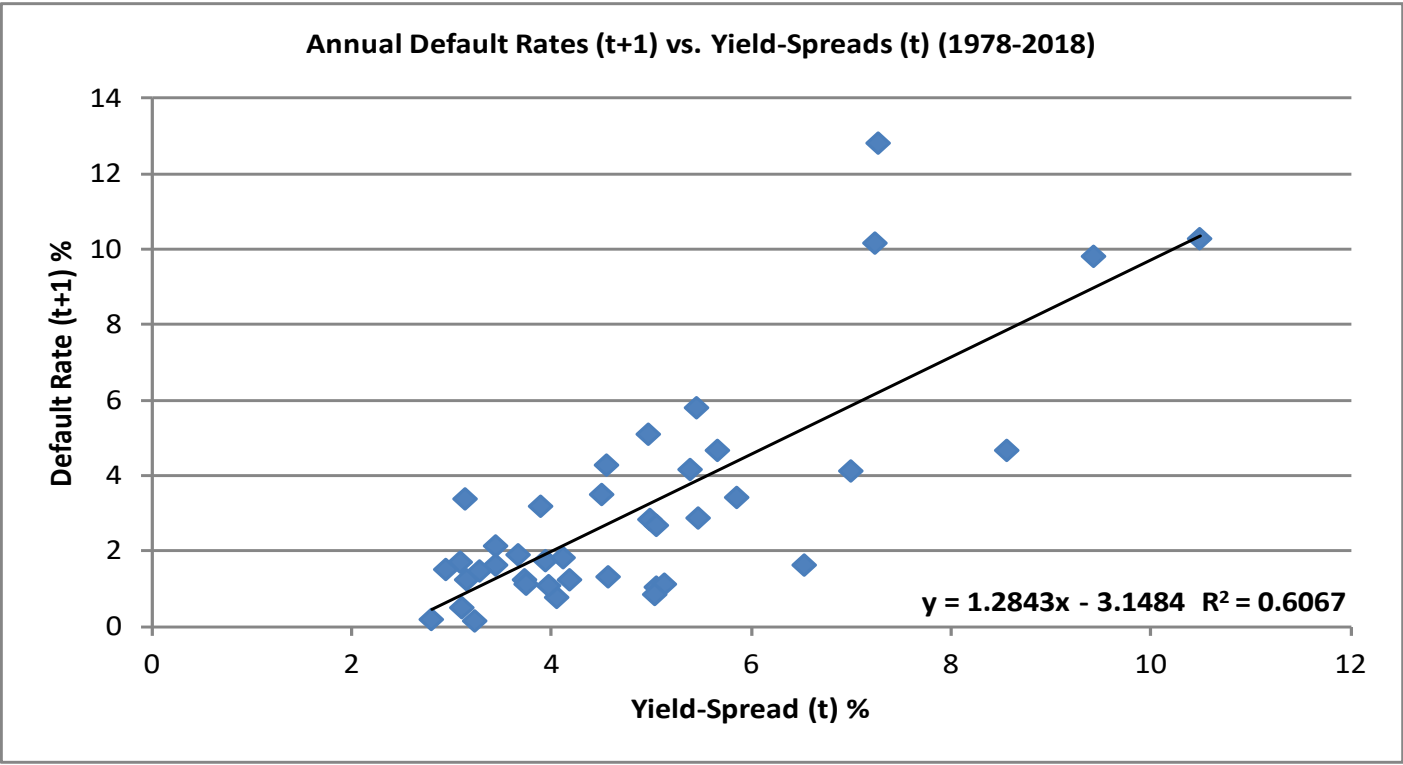
*Rated by S&P at Issuance

Based on 3,578 issues

Source: S&P Global Ratings and Author's Compilation

Updated Market-Based Annual Default Rate Forecast

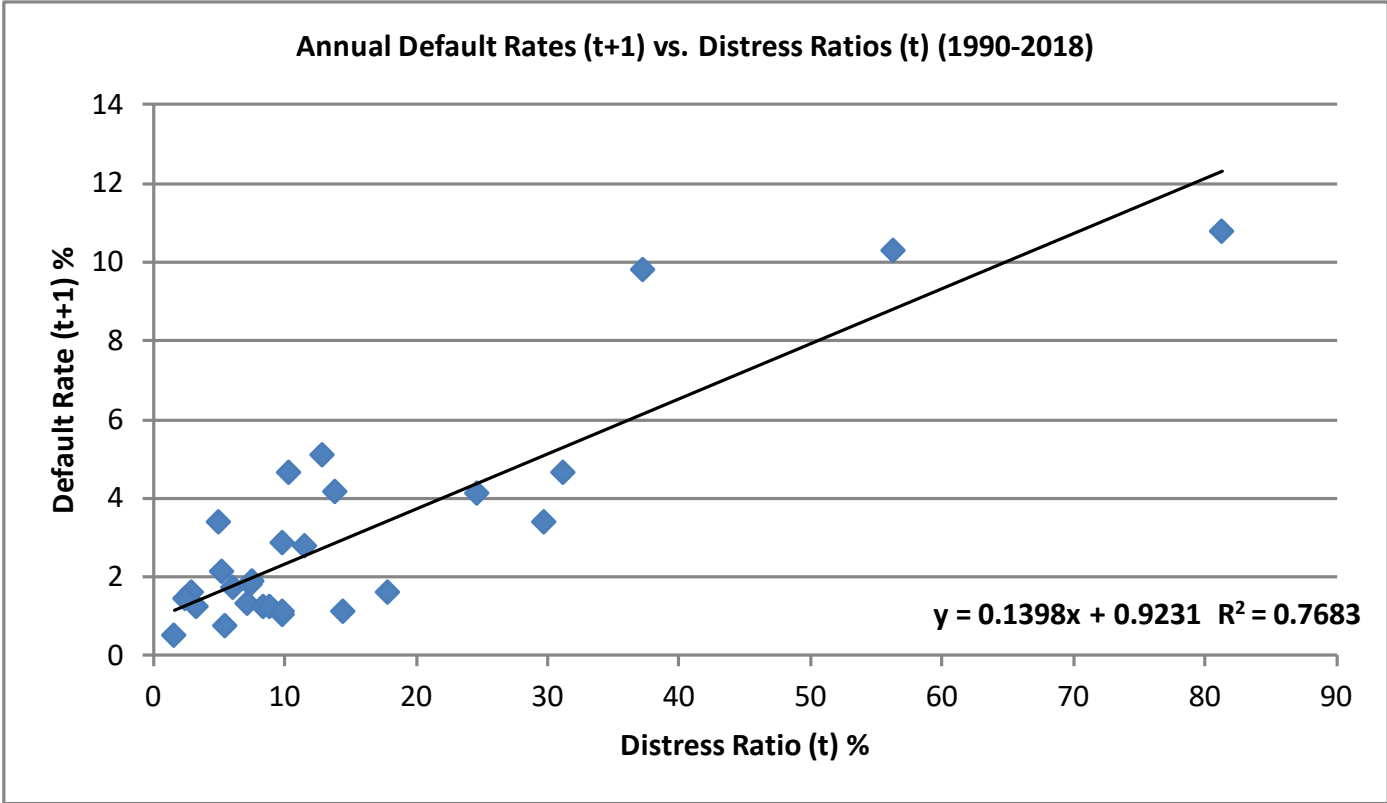
Annual Default Rate (t+1) versus High-Yield Spreads (t)



Sources: BoAML and authors' compilations

Updated Market-Based Annual Default Rate Forecast

Annual Default Rate (t+1) versus Annual Distressed Ratio (t)



Source: BoAML and authors' compilations

Default Rate Forecasts for U.S. High-Yield Bonds For 2020 and 2021

Forecaster	12 Month Ending 2020 / 2021	Cumulative 2020 & 2021
E. Altman (NYU)	6.5–7.5% (as of 9/30/20*)	-
Bank of America	9.6%	22.0%
Barclays	9–10% (end of 2020)	20.0%
Deutsche Bank	9.5%	-
Goldman Sachs	10.5% (end of 2020)	-
Fitch	5–7%	12–15%
Moody's	11.7% (end of 2020)	21.0%
S&P Global	10–13%	20.0%
KBRA	7.5% (as of 8/15/20)	-

*8-9% as of 4/20

Compilation by E. Altman, NYU

2020 Large Firm Bankruptcy Filings in the U.S. as of October 31, 2020 & Extrapolations*

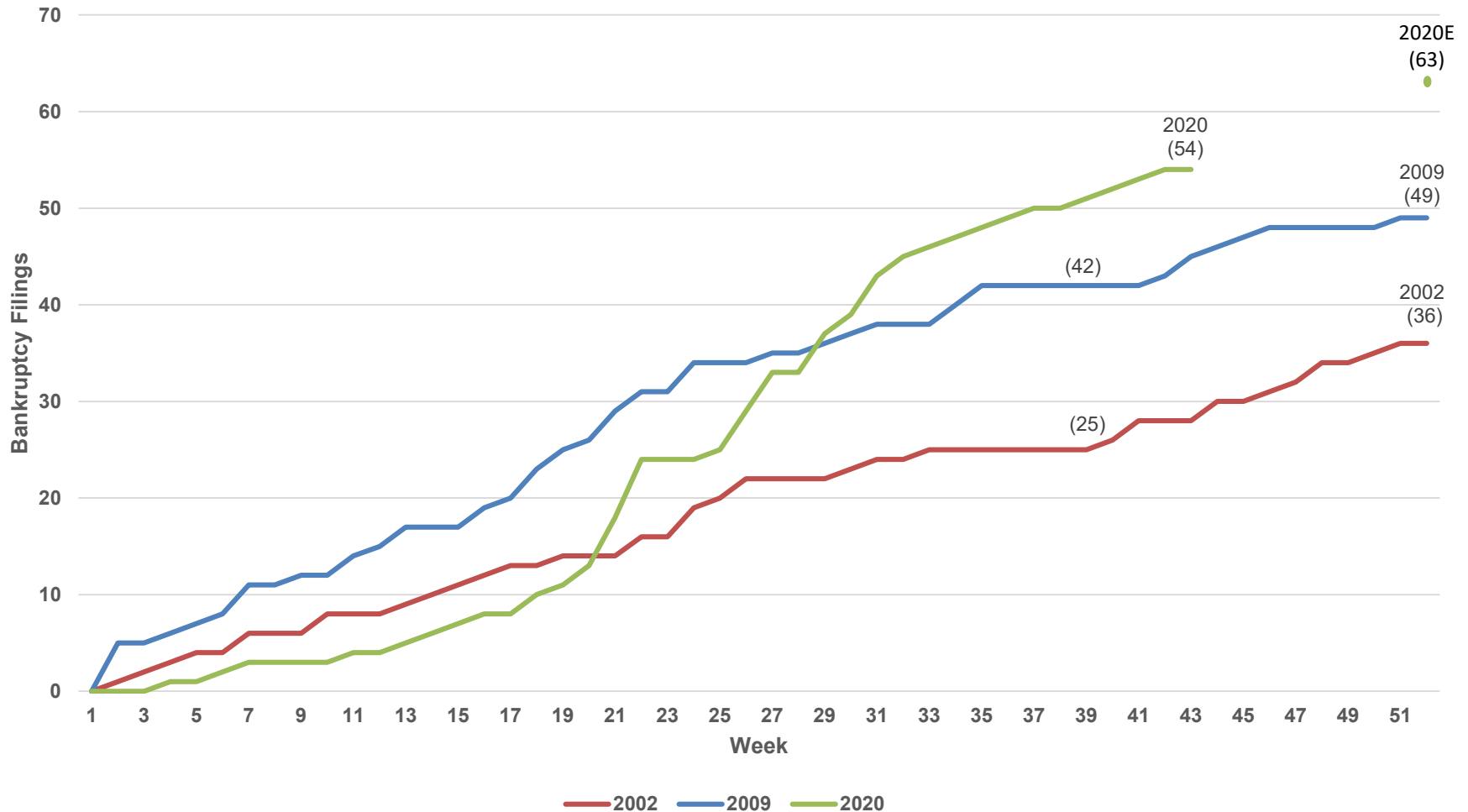
Number of Chapter 11s > \$100 Million	161
Extrapolated Number for 2020	188
Extrapolated Ranking (1989-2020)	(1 st)
Next Highest Year (2009)	153
Historic Yearly Average (1989-2019)	78
Historic Yearly Median (1989-2019)	66

Number of Chapter 11s > \$1 Billion	54
Extrapolated Number for 2020	63
Extrapolated Ranking (1989-2020)	(1 st)
Next Highest Year (2009)	49
Historic Yearly Average (1989-2019)	17
Historic Yearly Median (1989-2019)	20

Source: E. Altman (NYU Stern Salomon Center) and KBRA, using data from New Generation Research, Boston, MA.

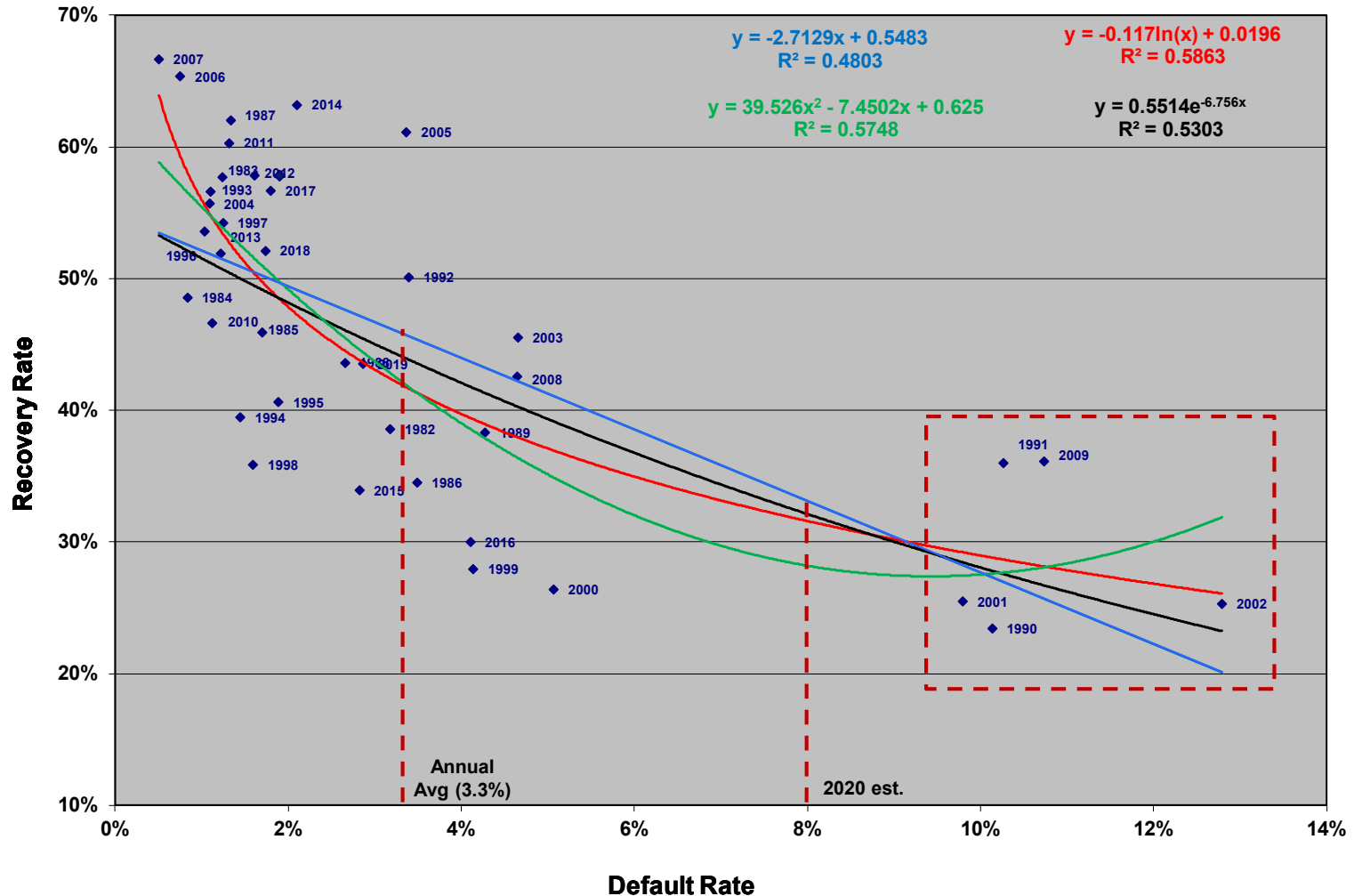
* Includes firms with > \$ 100 million and > \$1 billion in Liabilities

Cumulative Weekly Count of U.S. Companies with \$1B or More in Liabilities Filing for Chapter 11 Bankruptcy (2002, 2009 & 2020)



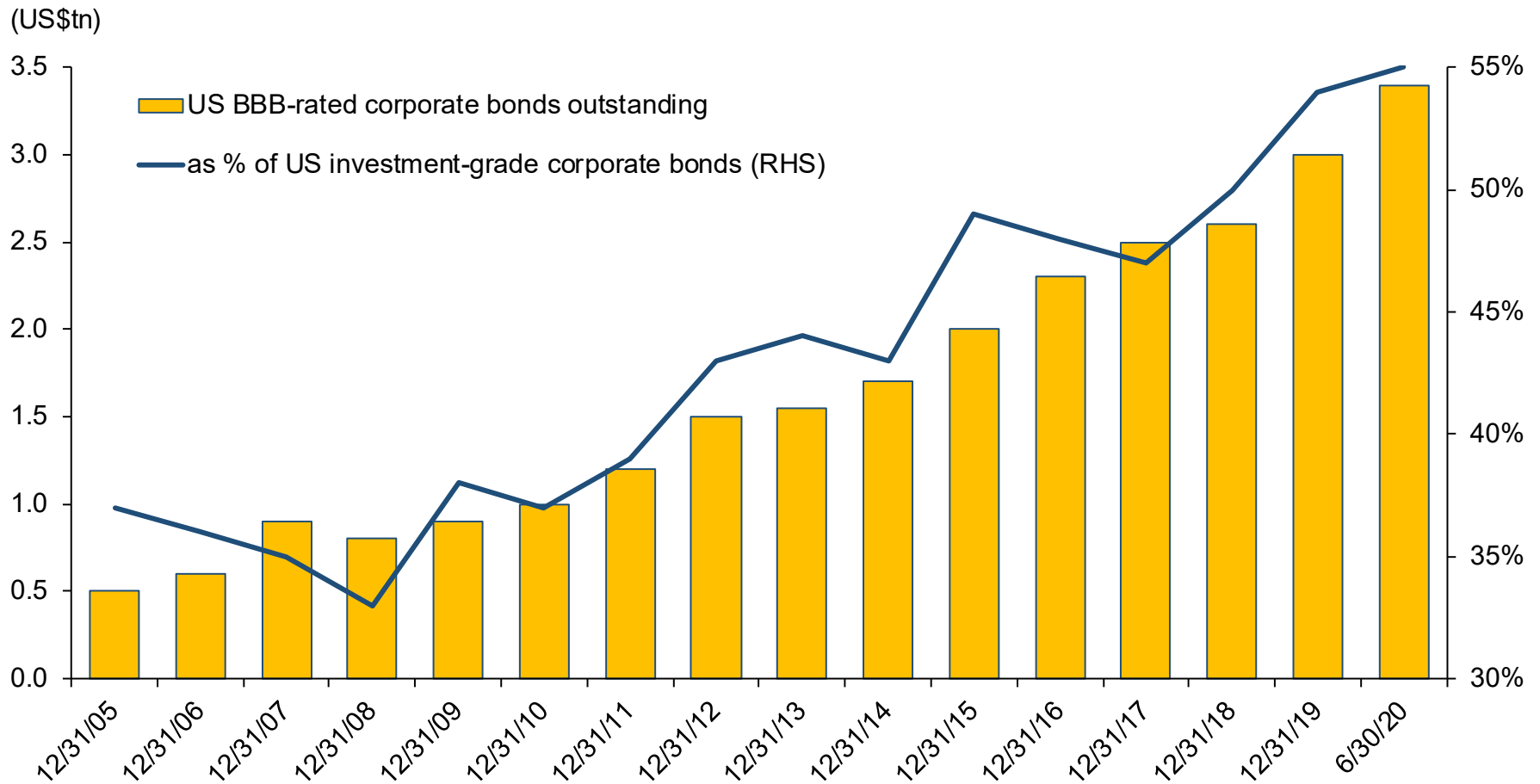
Source: BankruptcyData.com & E. Altman Estimate

Recovery Rate/Default Rate Association: Dollar-Weighted Average Recovery Rates to Dollar-Weighted Average Default Rates, 1982–2019



Source: Updated from E. Altman, et. al., “The Link Between Default and Recovery Rates”, *Journal of Business*, November 2005.

U.S. BBB Rated Bonds Outstanding 2005–6/30/2020



Source: Bloomberg-Barclays U.S. Corporate Investment Grade Index

Note: All yearly numbers are end of year numbers, with the exception of 2020. The data for 2020 is as of 6/30/2020.

Z-Score Component Definitions and Weightings

Variable	Definition	Weighting Factor
X_1	$\frac{\text{Working Capital}}{\text{Total Assets}}$	1.2
X_2	$\frac{\text{Retained Earnings}}{\text{Total Assets}}$	1.4
X_3	$\frac{\text{EBIT}}{\text{Total Assets}}$	3.3
X_4	$\frac{\text{Market Value of Equity}}{\text{Book Value of Total Liabilities}}$	0.6
X_5	$\frac{\text{Sales}}{\text{Total Assets}}$	1.0

Median Z-Score by S&P Bond Rating for U.S. Manufacturing Firms: 1992–2017

Rating	2017 (No.)	2013 (No.)	2004-2010	1996-2001	1992-1995
AAA/AA	4.20 (14)	4.13 (15)	4.18	6.20*	4.80*
A	3.85 (55)	4.00 (64)	3.71	4.22	3.87
BBB	3.10 (137)	3.01 (131)	3.26	3.74	2.75
BB	2.45 (173)	2.69 (119)	2.48	2.81	2.25
B	1.65 (94)	1.66 (80)	1.74	1.80	1.87
CCC/CC	0.73 (4)	0.23 (3)	0.46	0.33	0.40
D	-0.10 (16) ¹	0.01 (33) ²	-0.04	-0.20	0.05

*AAA Only.

¹ From 1/2014-11/2017, ²From 1/2011-12/2013.

Sources: S&P Global Market Intelligence's *Compustat* Database, mainly S&P 500 firms, compilation by NYU Salomon Center, Stern School of Business.

Z'' Score Model for Manufacturers, Non-Manufacturer Industrials; Developed and Emerging Market Credits (1995)

$$Z'' = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

$$X_1 = \frac{\text{Current Assets} - \text{Current Liabilities}}{\text{Total Assets}}$$

$$X_2 = \frac{\text{Retained Earnings}}{\text{Total Assets}}$$

$$X_3 = \frac{\text{EBIT}}{\text{Total Assets}}$$

$$X_4 = \frac{\text{Book Value of Equity}}{\text{Total Liabilities}}$$

US Bond Rating Equivalents Based on Z''-Score Model

$$Z'' = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

Rating	Median 1996 Z''-Score ^a	Median 2006 Z''-Score ^a	Median 2013 Z''-Score ^a	Median 2018-2020 Z''-Score ^a
AAA/AA+	8.15 (8)	7.51 (14)	8.80 (15)	7.90 (15)
AA/AA-	7.16 (33)	7.78 (20)	8.40 (17)	
A+	6.85 (24)	7.76 (26)	8.22 (23)	
A	6.65 (42)	7.53 (61)	6.94 (48)	6.60 (88)
A-	6.40 (38)	7.10 (65)	6.12 (52)	
BBB+	6.25 (38)	6.47 (74)	5.80 (70)	
BBB	5.85 (59)	6.41 (99)	5.75 (127)	5.99 (238)
BBB-	5.65 (52)	6.36 (76)	5.70 (96)	
BB+	5.25 (34)	6.25 (68)	5.65 (71)	
BB	4.95 (25)	6.17 (114)	5.52 (100)	5.30 (276)
BB-	4.75 (65)	5.65 (173)	5.07 (121)	
B+	4.50 (78)	5.05 (164)	4.81 (93)	
B	4.15 (115)	4.29 (139)	4.03 (100)	4.46 (205)
B-	3.75 (95)	3.68 (62)	3.74 (37)	
CCC+	3.20 (23)	2.98 (16)	2.84 (13)	
CCC	2.50 (10)	2.20 (8)	2.57(3)	3.75 (46)
CCC-	1.75 (6)	1.62 (-) ^b	1.72 (-) ^b	
CC/D	0 (14)	0.84 (120)	0.05 (94)	0.99 (88)

^aSample size in parentheses. ^bInterpolated between CCC and CC/D.
Sources: S&P CapitalIQ, Compustat, and Company Filings.

Downgrade Vulnerability of BBB Rated Bonds Based on Z- and Z''-Scores as of 2019

Z-Score Determined Bond Rating Equivalents Of BBB Rated Bonds

From BBB to BB 57/298 (19%)

From BBB to B 45/298 (15%)

Total 102/298 (34%)

Z''-Score Determined Bond Rating Equivalents Of BBB Rated Bonds

From BBB to BB 78/371 (21%)

From BBB to B 56/371 (15%)

Total 134/371 (36%)

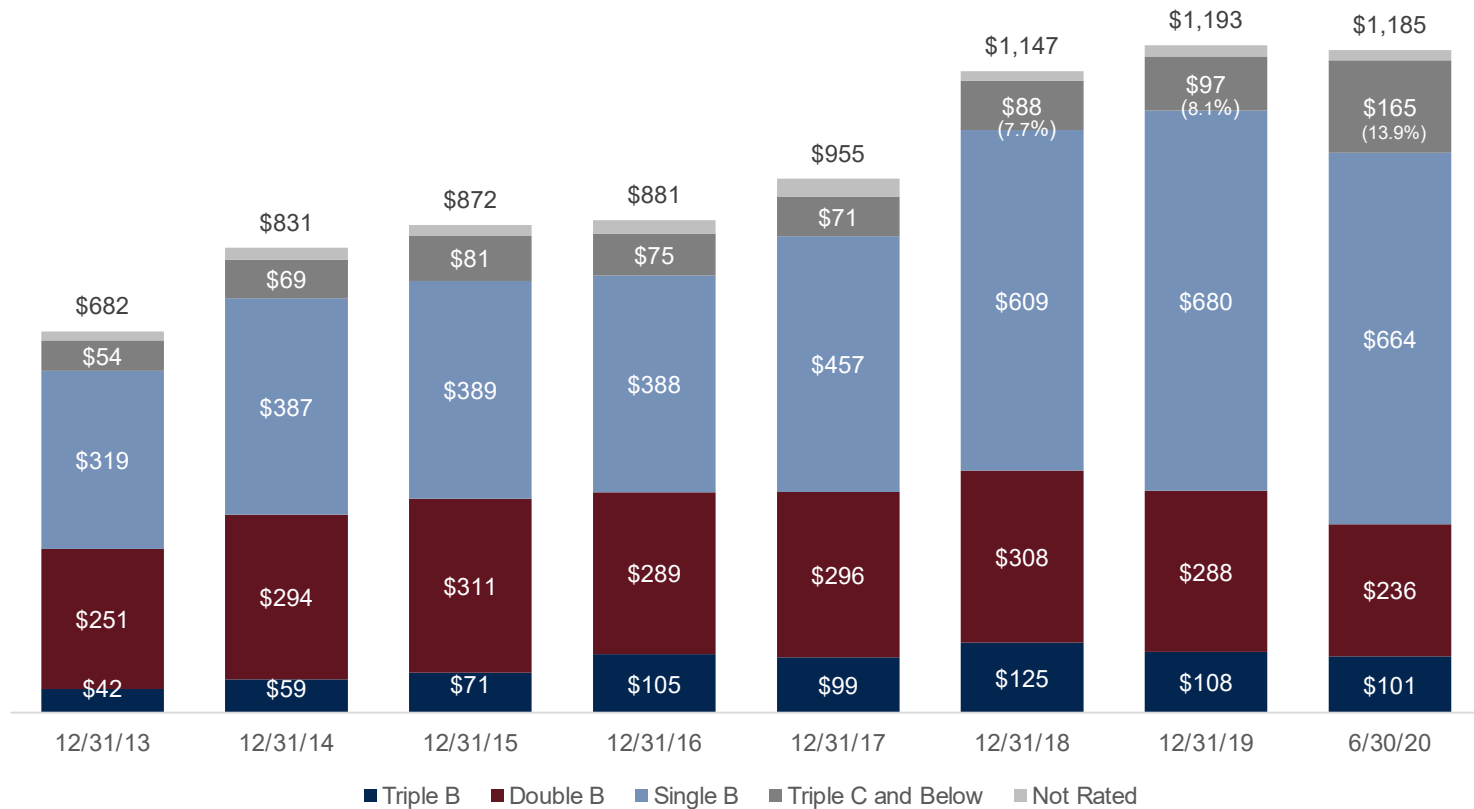
Source: Author's computations from *Capital IQ* data

Fallen Angel Z and Z''-Scores and their Bond Rating Equivalent (BRE): May 2020

General Information				Financial Information				
Issuer Name	Ticker	Industry	Face Downgrade \$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
Rolls Royce	RR.	Capital Goods	\$6,117	12/31/2019	0.46	CCC-	2.67	CCC
Service Properties Trust	SVC	Real Estate	\$5,680	12/31/2019	0.78	CCC	3.99	B

Leveraged Loan Market Has Seen Surge in Lower Rated Issuers

(\$ in billions)

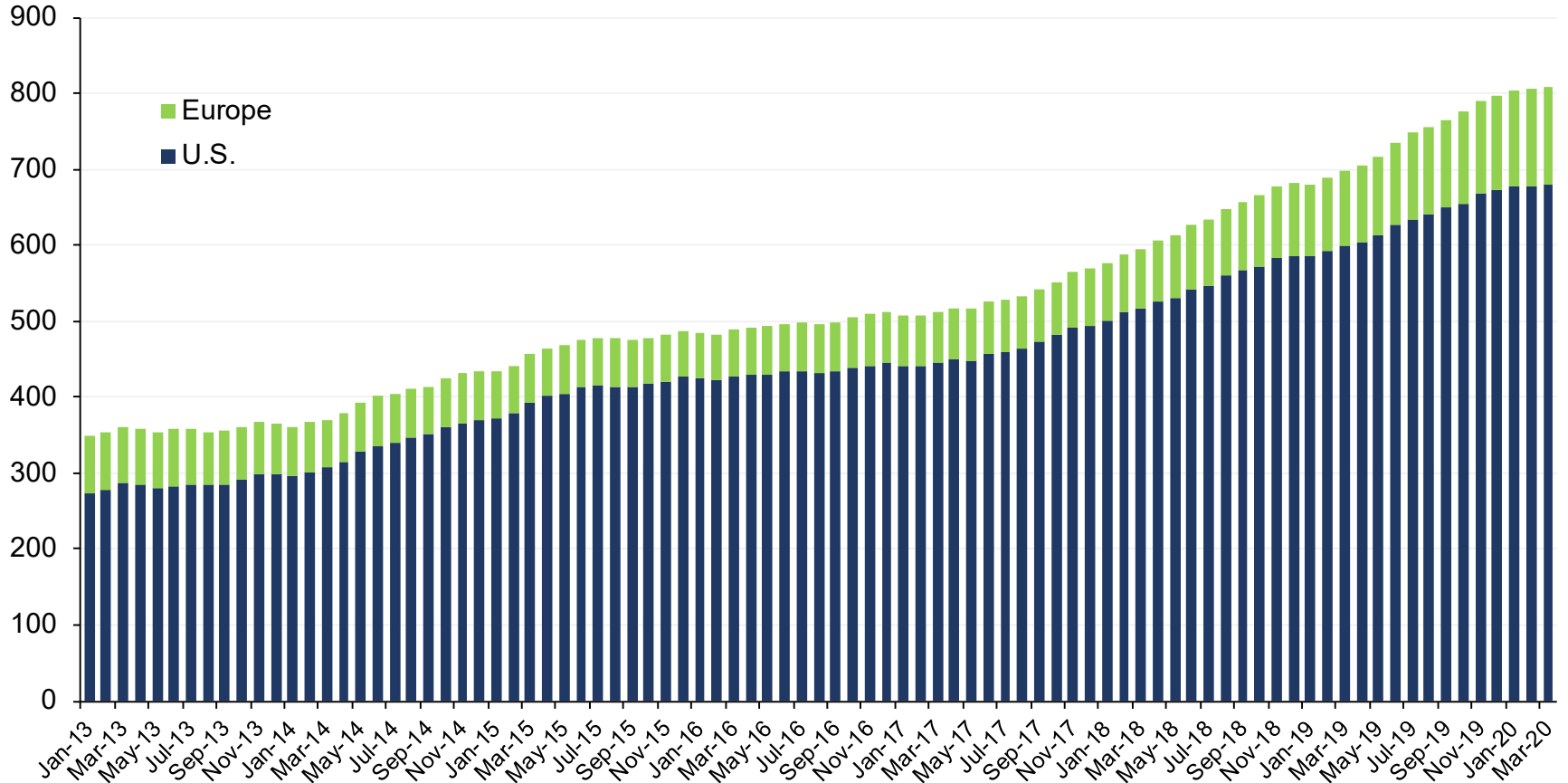


Source: S&P LCD

US and European CLO Assets Under Management

January 2013 – March 2020

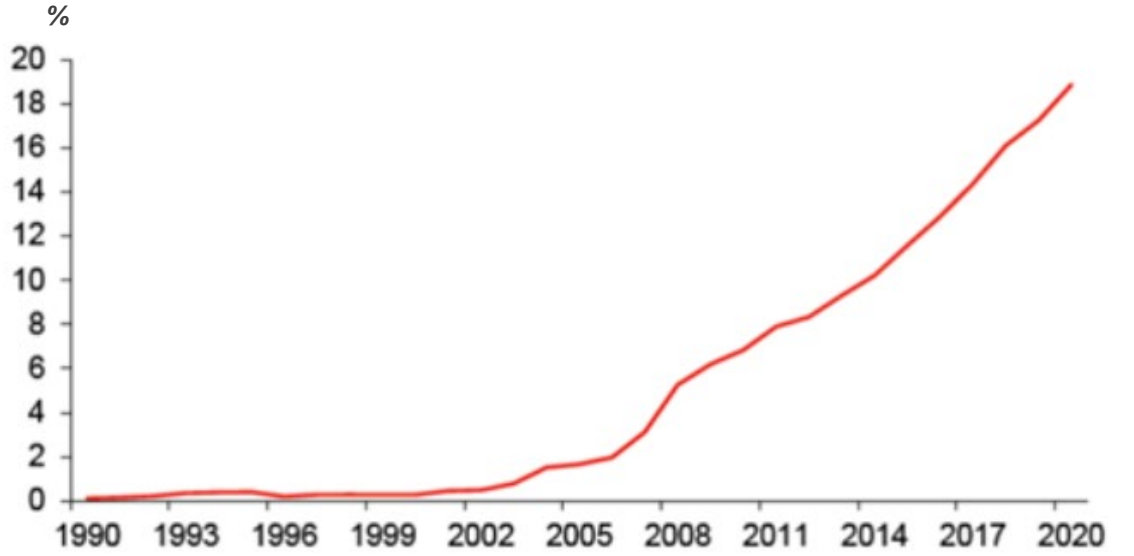
(In Billions
USD or EUR)



Source: Refinitiv LPC Collateral

Note: CLO assets under management for U.S. CLOs are shown in US Dollars and CLO assets under management for European CLOs are shown in Euros.

Share of Zombie Companies in the U.S.



Note: Firm-level data is used to calculate the share of listed firms that are more than ten years old with an interest coverage ratio less than one for three years in a row.

Sources: Datastream, Worldscope, DB Global Research

Financial Profile of Low-Rated Bonds and their Z-Score Default Prediction

Companies Rated B-, CCC+, CCC, Or CCC- and their Z-Score Default Prediction: December 2019											
S&P Rating	Sample Size	Z-Score BRE of D	% 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

Source: E. Altman, NYU Salomon Center

Financial Profile of Low-Rated Bonds and their Z''-Score Default Prediction

Companies Rated B-, CCC+, CCC, or CCC- and their Z''-Score Default Prediction: December 2019											
S&P Rating	Sample Size	Z''-Score BRE Of D	% 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

Source: Author Compilation From Capital IQ Data

Some Recent Observations

- **High-Yield Bond New Issuance During The Pandemic *Exceeding Any Period In History, > \$360 Billion (11/1) – Up 65% vs 2019***
- **Investment Grade New Issuance > \$1.8 Trillion (11/1) – *Up 72% vs 2019***
- **Corporate Bond Market Prices Rebound To Normal During the Pandemic; *Even In A Recession!***
- **Default Rates Still Trending-Up With 2020 Rate Likely To Range From 7-11%**
- **Unprecedented Support From The U.S. Central Bank And Congress**
 - *Successful But With Unintended Consequences?*
- **Large (> \$100 Million) & Mega-Bankruptcies (> \$1 Billion) *All-Time Annual Record***
- **Non-Financial Corporate Debt Rising To Alarming Levels – *Debt Bubble? Silver Lining – Debt Buybacks And New Equity Issues (Selected Companies)***