

Global Zombies Companies: Measurements, Determinants and Outcomes

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WHAT IS A ZOMBIE FIRM?

- Insolvent Firm That is Still Functioning over a Relatively Long Time Period
- What Are Appropriate Measures of Zombie Firms?
- For How Long?
- How Are Zombie Firms Supported? And by Whom?

OUR STUDY PROPOSES AND ANALYSES

- What Are The "CONS" (Negatives) of Zombie Firms For An Economy?
- What are the "PROS" (Positives) of Zombie Firms For An Economy?
- How Best to Measure Zombie Firms?
- What Have Been The Trends Of Zombie Firms Over The Last 30 Years Globally And For Specific Countries?
- What Are The Major Determinants of The Percentage of Listed Zombie Firms In An Economy And Across Different Countries Over Time?

Zombie Firms in Europe and Dis-Inflation

Source: V. Acharya, et al, "Zombie Credit and Dis-Inflation from Europe", Journal of Finance, 79(3), June 2024.



OUR SUGGESTED MEASURES OF ZOMBIE FIRMS

- Firms With Cash Flow Interest Expense Coverage ($IC = EBITDA/Interest$) < 1.0 , Based On A 3-Year Moving Average

AND

- Firms With A Clear, Very High Probability of Default, Also Based On A 3-Year Moving Average, Using Z-Scores or Z"-Scores

Z and Z" Score Models

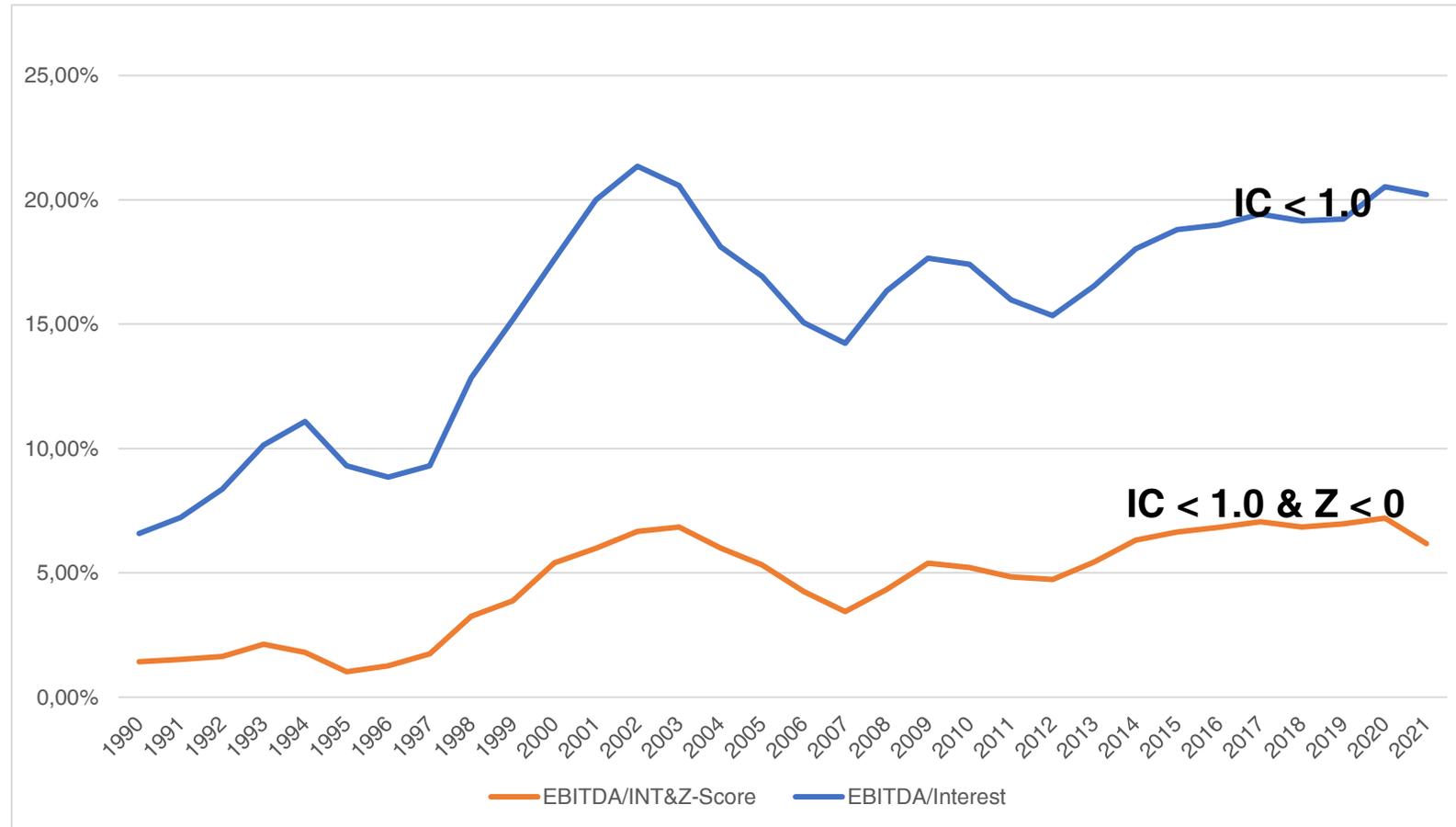
$$Z - \text{Score} = 1.2 \times \frac{\text{Current assets} - \text{Current liabilities}}{\text{Total Assets}} + 1.4 \times \frac{\text{Retained Earnings}}{\text{Total Assets}} \\ + 3.3 \times \frac{\text{EBIT}}{\text{Total Assets}} + 0.6 \times \frac{\text{Market Value of Equity}}{\text{Total Liabilities}} + 1.0 \times \frac{\text{Sales}}{\text{Total Assets}}$$

$$Z'' - \text{Score} = 3.25 + 6.56 \times \frac{\text{Current assets} - \text{Current liabilities}}{\text{Total Assets}} + 3.26 \times \frac{\text{Retained Earnings}}{\text{Total Assets}} \\ + 6.72 \times \frac{\text{EBIT}}{\text{Total Assets}} + 1.05 \times \frac{\text{Book Value of Equity}}{\text{Total Liabilities}}$$

Comparing Interest Coverage Zombie Ratios to the Dual-Filter Approach: Global and USA

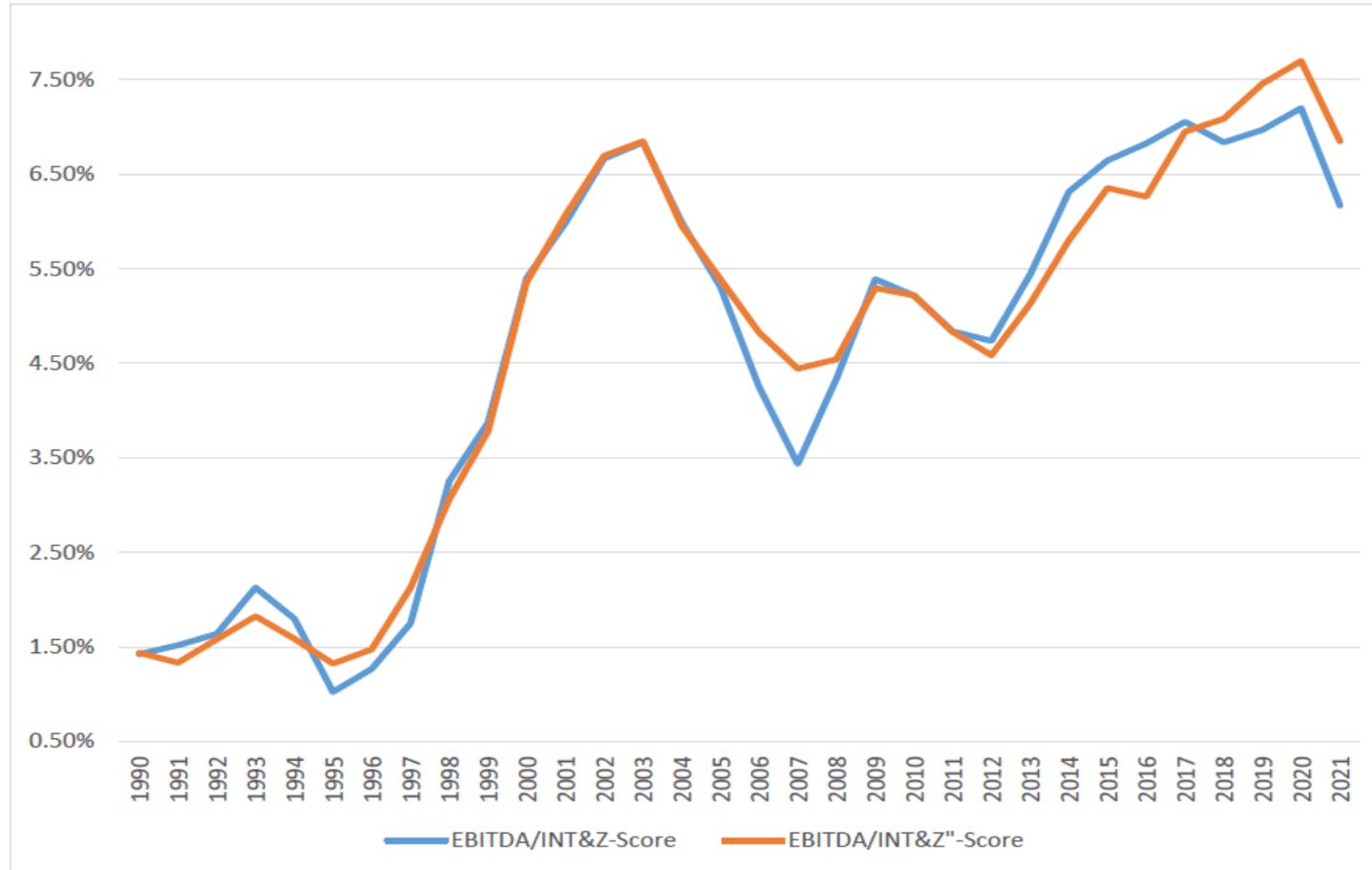
year	Global Listed Public Firms Means					USA Listed Public Firms Means		
	EBITDA/ Interest	Z-Score	Z"-Score	EBITDA/ INT& Z-Score	EBITDA/ INT & Z"-Score	EBITDA/ Interest	EBITDA/ INT & Z-Score	EBITDA/ INT & Z"-Score
1990	6.58%	1.61%	1.65%	1.42%	1.44%	23.38%	5.53%	7.60%
1991	7.23%	1.69%	1.61%	1.52%	1.33%	22.83%	5.04%	7.04%
1992	8.37%	1.78%	1.81%	1.64%	1.58%	21.48%	3.64%	6.07%
1993	10.14%	2.29%	2.09%	2.13%	1.82%	21.47%	3.15%	5.59%
1994	11.09%	2.08%	2.02%	1.80%	1.59%	20.88%	3.53%	5.99%
1995	9.31%	1.49%	1.78%	1.02%	1.32%	20.87%	3.21%	6.07%
1996	8.85%	1.50%	1.76%	1.27%	1.47%	22.76%	3.43%	6.53%
1997	9.31%	1.94%	2.44%	1.75%	2.13%	23.96%	4.33%	7.44%
1998	12.84%	3.76%	3.60%	3.25%	3.06%	22.76%	4.70%	7.28%
1999	15.18%	4.42%	4.60%	3.87%	3.78%	23.82%	4.18%	6.88%
2000	17.60%	6.09%	6.30%	5.40%	5.36%	27.87%	6.07%	8.94%
2001	20.00%	7.05%	7.26%	5.98%	6.07%	26.77%	5.99%	8.97%
2002	21.35%	8.31%	8.33%	6.67%	6.70%	26.28%	8.54%	10.16%
2003	20.57%	8.85%	8.85%	6.84%	6.85%	22.96%	7.16%	9.57%
2004	18.11%	7.95%	8.42%	5.99%	5.96%	20.76%	7.09%	8.60%
2005	16.93%	7.53%	7.85%	5.31%	5.39%	18.62%	6.12%	8.20%
2006	15.06%	6.15%	7.21%	4.25%	4.83%	18.54%	6.01%	8.16%
2007	14.23%	5.01%	6.39%	3.44%	4.44%	20.16%	6.91%	8.61%
2008	16.34%	5.73%	6.56%	4.34%	4.54%	19.57%	7.97%	9.40%
2009	17.66%	6.94%	7.19%	5.39%	5.30%	18.26%	7.37%	8.58%
2010	17.41%	7.06%	7.48%	5.22%	5.22%	15.80%	7.36%	8.34%
2011	15.98%	7.03%	7.24%	4.84%	4.83%	15.51%	6.81%	7.89%
2012	15.34%	7.00%	7.15%	4.74%	4.59%	14.42%	6.57%	7.78%
2013	16.54%	7.80%	7.89%	5.44%	5.13%	15.07%	6.62%	8.11%
2014	18.03%	8.44%	8.50%	6.32%	5.80%	17.55%	7.47%	9.05%
2015	18.81%	9.33%	9.19%	6.65%	6.36%	18.22%	8.92%	9.74%
2016	18.99%	9.46%	9.27%	6.83%	6.26%	18.98%	9.04%	10.31%
2017	19.42%	9.29%	9.65%	7.06%	6.95%	19.19%	9.40%	10.41%
2018	19.15%	9.06%	9.61%	6.84%	7.09%	18.14%	8.23%	9.56%
2019	19.23%	9.19%	9.93%	6.97%	7.46%	17.89%	8.59%	9.82%
2020	20.53%	9.41%	10.05%	7.20%	7.70%	18.90%	7.41%	8.77%
2021	20.21%	8.19%	9.33%	6.17%	6.85%	20.29%	6.48%	8.17%
Average	16.25%	6.54%	6.88%	4.95%	5.02%	20.44%	6.34%	8.24%

Zombie Ratios Using the Traditional Interest Coverage Ratio (EBITDA/Interest) Compared To the Z Score Metric: Aggregate for the 20 Largest Countries: 1990-2021

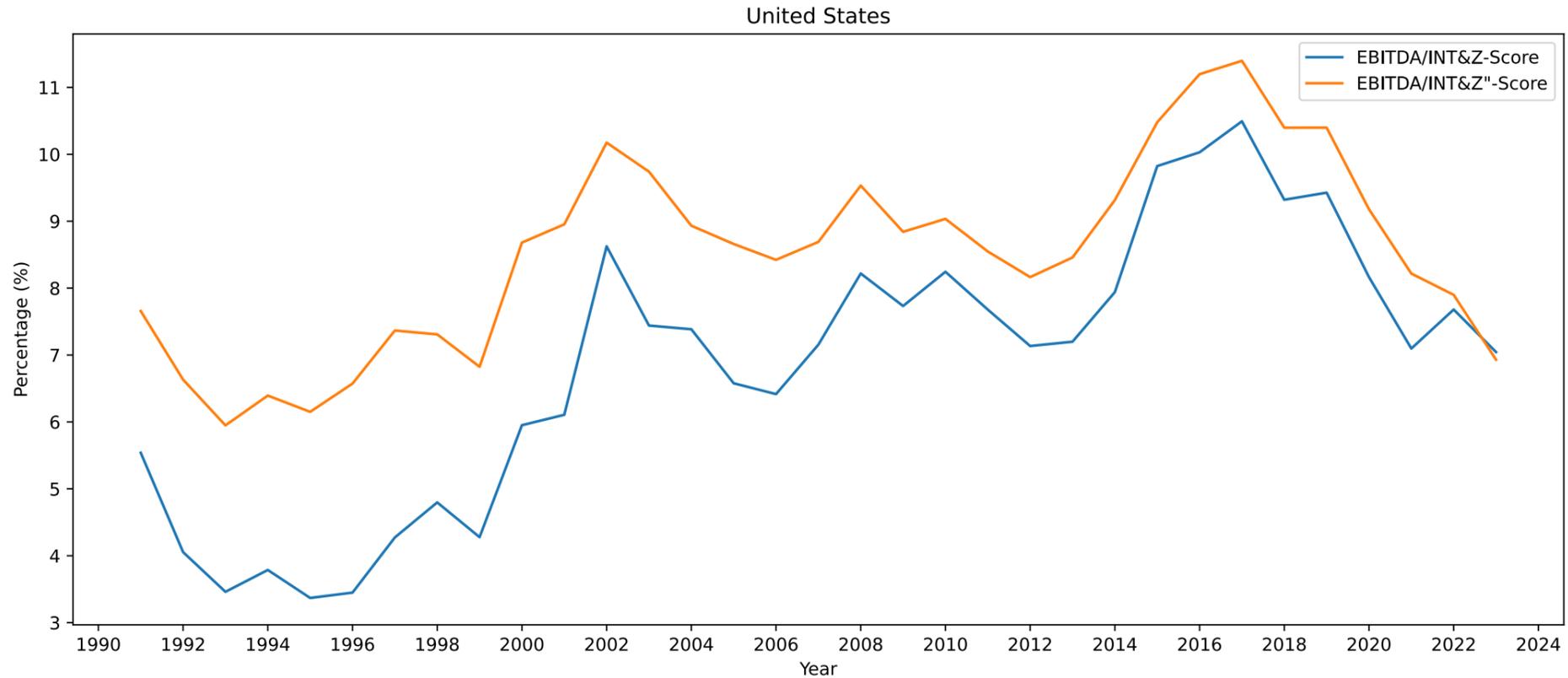


FRACTION OF ZOMBIE FIRMS — GLOBAL EVIDENCE

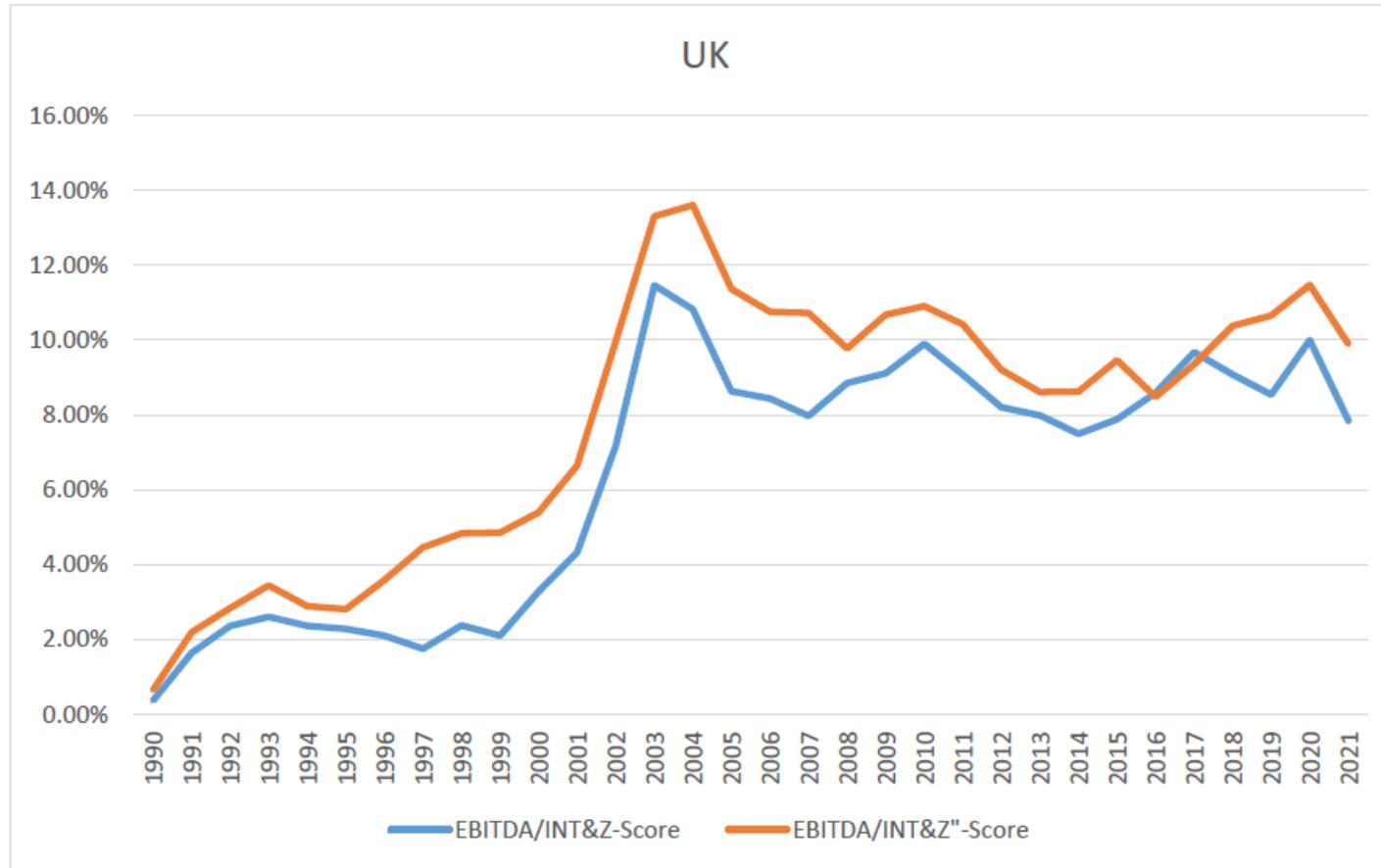
The figure shows the average fraction of zombie firms of the 20 largest GDP countries in the world from 1990 to 2021. A zombie firm is defined as a firm with a three-year moving average interest coverage ratio that is less than one and has either three-year average Z-score or Z''-score that is less than zero.



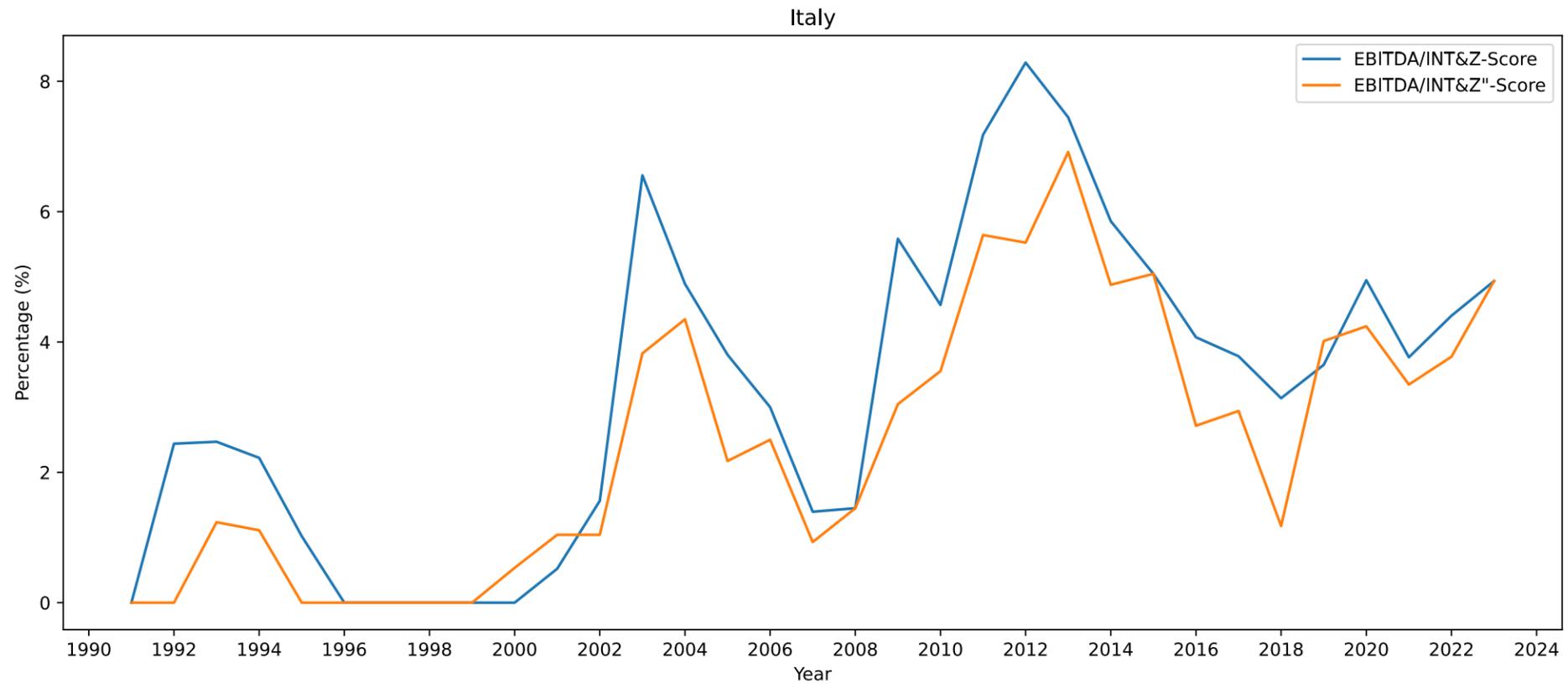
Ratio of Zombie Companies Based on Interest Coverage Ratio <1.0 and Z-Score <0.0 Dual Filter Approach: U.S.A. 1990 - 2023



Ratio of Zombie Companies Based on Interest Coverage Ratio <1.0 and Z-Score <0.0 Dual Filter Approach: UK 1990 - 2021



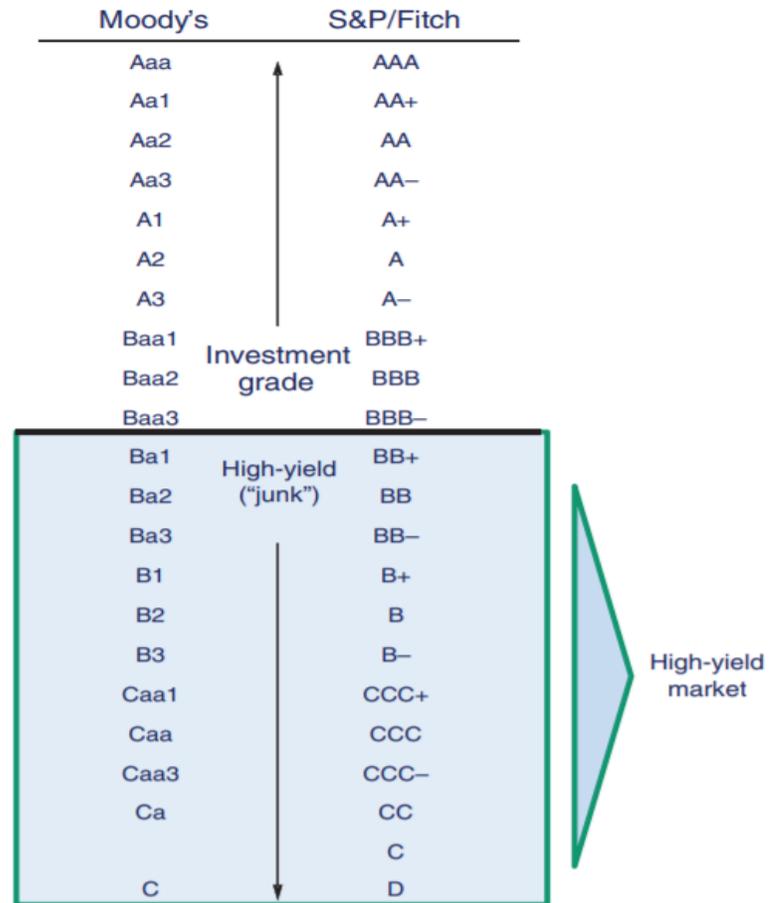
Ratio of Zombie Companies Based on Interest Coverage Ratio <1.0 and Z-Score <0.0 Dual Filter Approach: Italy 1991 - 2023



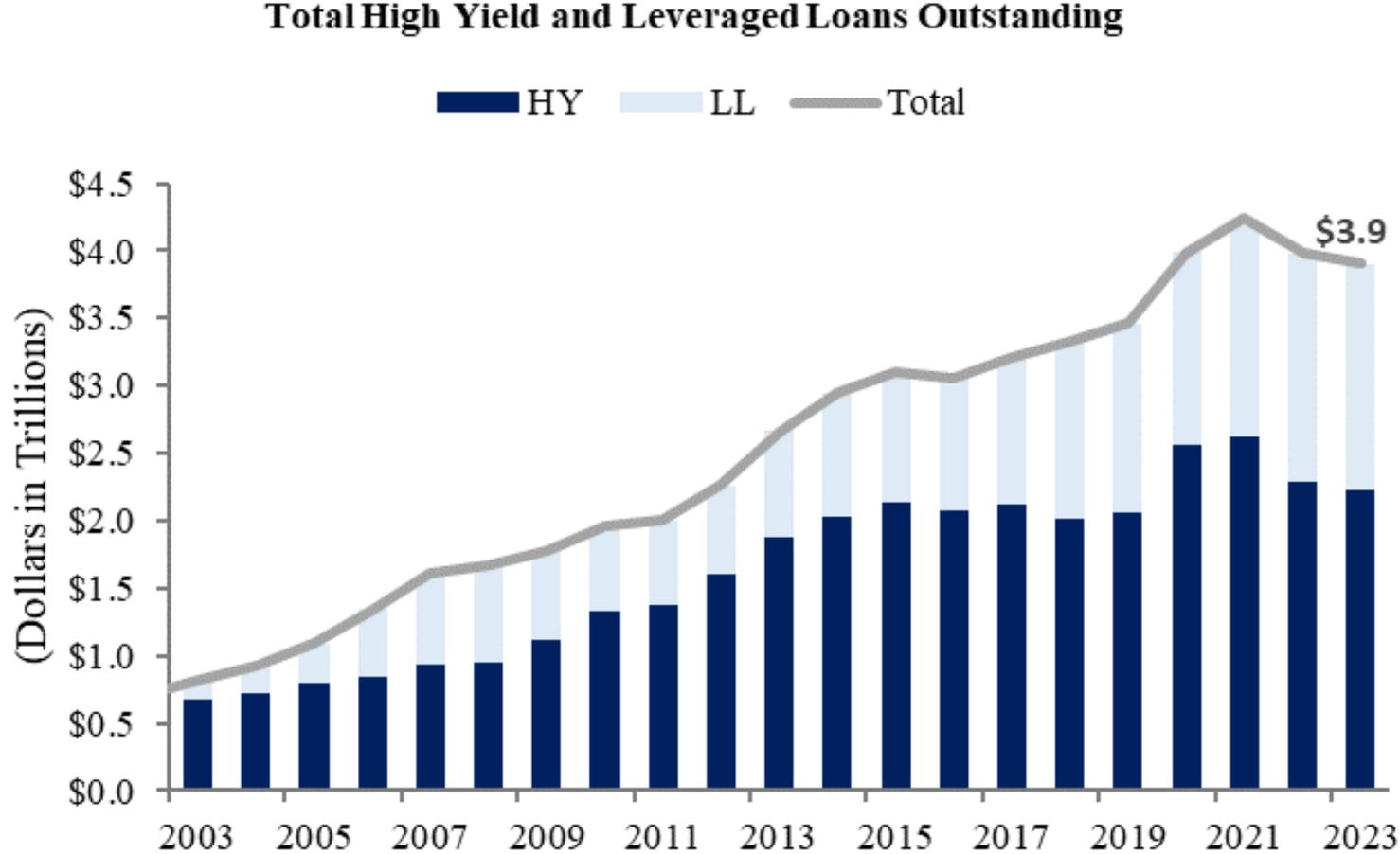
DETERMINANTS OF ZOMBIE FIRM RATIOS OF LISTED COMPANIES – BASED ON CROSS SECTIONAL & TIME SERIES REGRESSIONS Results Are Controlled for GDP Growth

Determinant Variable.	Impact (Association)
• Cyclicity	(-) - (Negative)
• Firm Size.	(+) - (Positive)
• Sovereign rating (IV grade)	(-) - (Negative)
• Financing Channels (Debt Issuance)	(+) - (Positive)
• Creditor Rights & Debt Enforcement	(-) - (Negative)
• Bankruptcy Code Reforms Over Time	(-) - (Negative)

Major Agencies Bond Rating Categories

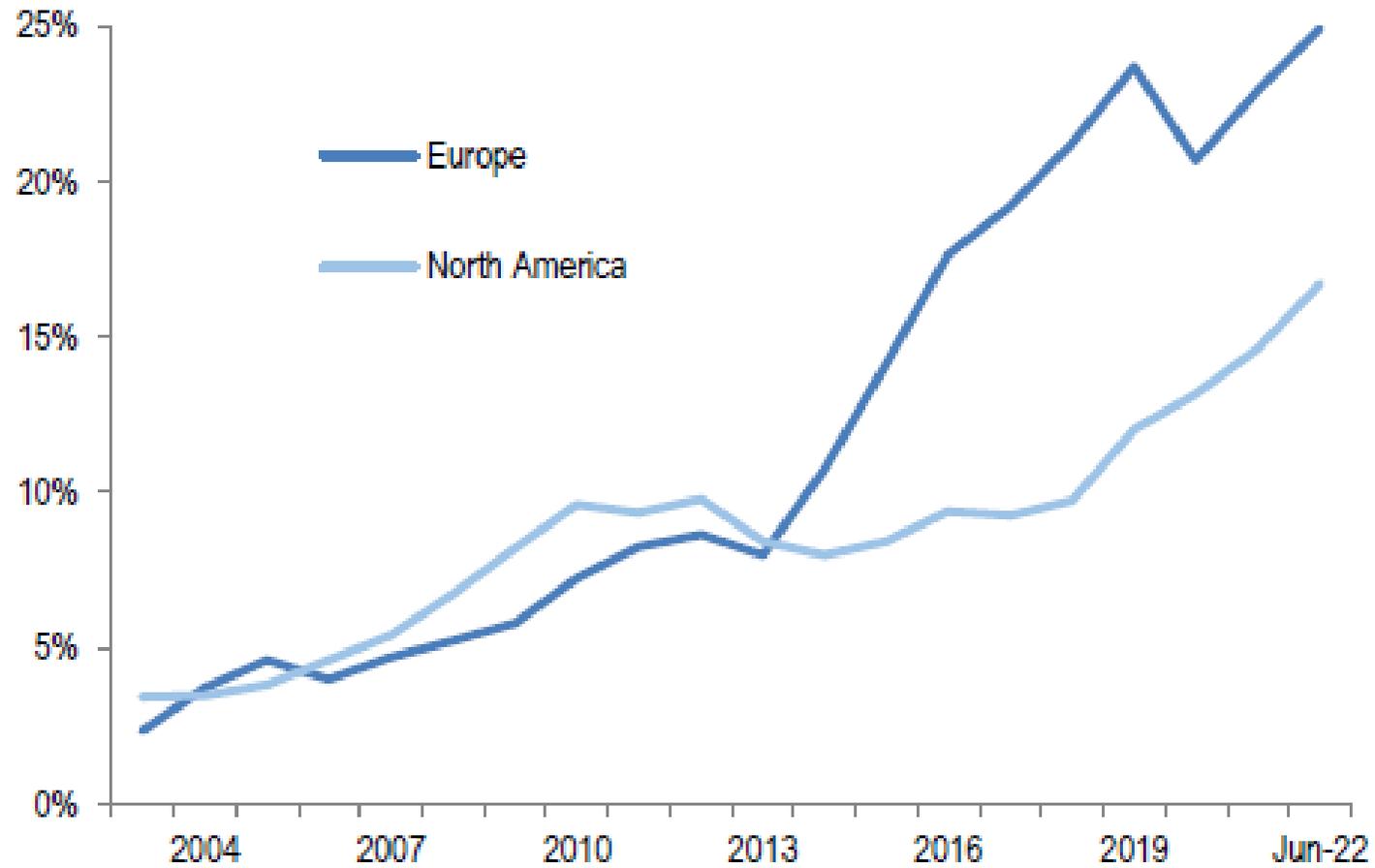


Total High Yield and Leveraged Loans Outstanding



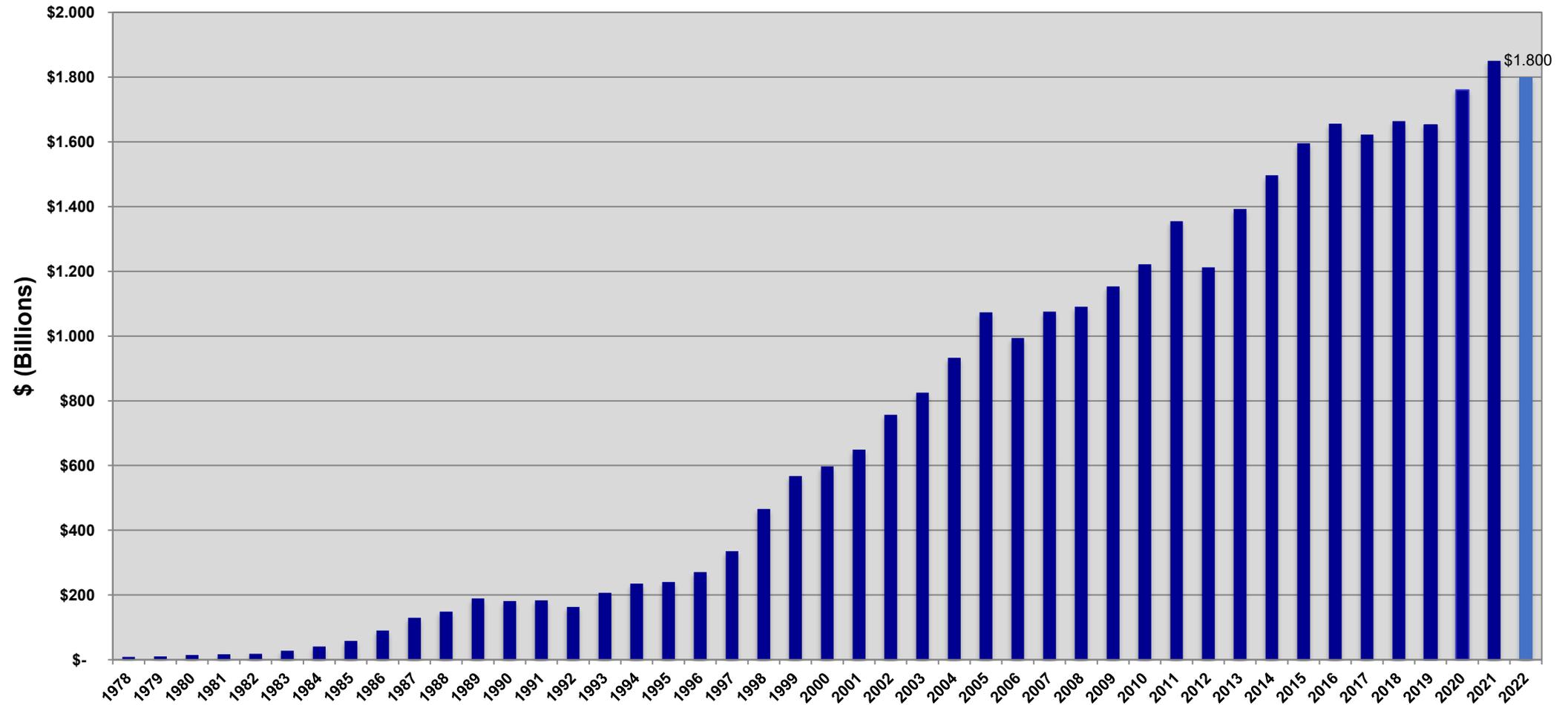
Source: Bank of Americal Merrill Lynch (HY), LCD (LL), Silver Point Capital (Graph)

Private Credit as a Share of Leveraged Finance



Source: J.P. Morgan, Preqin Ltd.

Size of the US High-Yield Bond Market: 1978 – 2022



Source: NYU Salomon Center estimates using Credit Suisse, S&P, Citi and BofA data

U.S. Non-Finance firms Z-Score by S&P Bond Rating: 1992–2022

Rating	2022 (No.)	2019- 2020 (No.)	2015- 2017 (No.)	2011- 2013 (No.)	2004- 2010	1996- 2001	1992- 1995
AAA/AA	6.32 (20)	4.74 (14)	4.20 (14)	4.13 (15)	4.18	6.20*	4.80*
A	4.33 (99)	4.03 (67)	3.85 (55)	4.00 (64)	3.71	4.22	3.87
BBB	3.63 (315)	2.87 (222)	3.10 (137)	3.01 (131)	3.26	3.74	2.75
BB	3.13 (324)	2.29 (270)	2.45 (173)	2.69 (119)	2.48	2.81	2.25
B	1.80 (242)	1.22 (203)	1.65 (94)	1.66 (80)	1.74	1.80	1.87
CCC/CC	0.43 (34)	0.47 (23)	0.73 (4)	0.23 (3)	0.46	0.33	0.40
D	-0.24 (14)	-0.76 (54),# -0.42 (59)^	-0.10 (16)	0.01 (33)	-0.04	-0.20	0.05

*AAA Only.

Sources: S&P CapitalIQ, *Compustat* Database, mainly S&P 500 firms, compilation by NYU Salomon Center, Stern School of Business.
-0.87 is mean and -0.50 is the median Z scores for the rating category D (2020 only).

CORPORATE DEBT MARKET DEVELOPMENT IMPACT ON ZOMBIE RATIOS

(Based on New Issuance of Worldwide and U.S. High Yield Bonds)

- 7.3% of B Rated Firm Bonds Qualified As Zombies Over Time
- 28.0% of CCC/CC Rated Firm Bonds Qualified As Zombies
- The Median EBITDA Interest Coverage Ratio of CCC (S&P) Rated Bonds in 2007-2009 was 1.1 and the Median EBITDA Interest Coverage Ratio of CCC Rated Bonds in 2022 was 0.9; hence about 50% of CCC companies did not cover their interest payments with their cash flows in recent years

IMPACT OF ZOMBIE FIRMS ON THE ECONOMY

(Congestion Regression Results)

A 1% INCREASE in Zombie Ratios In a Sample of Industrial Sectors Lead To LOWER Various Measures of Performance Amongst NON-ZOMBIE Firms In the Same Industrial Sector: Performance Measures Resulted In:

- 1.5% DECREASE in Investment
- 2.5% DECREASE In Employment
- 1.0% DECREASE in Sales Growth

IMPACT OF MAJOR BANKRUPTCY CODE REFORMS ON ZOMBIE RATIOS

(Based On Recent Bankruptcy Code Reforms in 8 Countries)

- Within 3 Years Of A Country's Major Bankruptcy Code Reform, Zombie Ratios DECREASED by 2 Percentage Points Relative To Their Historic Averages (Gradual Decrease over the 3 Years)
- The Sample Countries' Zombie Ratios Were Fairly Constant and Indistinguishable From Other Countries in The Years Prior To The Reforms. Hence, We Conclude That The Reforms Were Not Due To High Zombie Ratios

Post-Zombie Fate: U.S. Zombie Firms: 1990-2021

Post-Zombie Fate	No. of Firms.	% of Total	Avg. Time (Years) After First Identified As Zombie
Bankrupt	505	15.30%	4.7
Delisted	1,397	42.20%	3.7
M&A	1,039	31.40%	5.5
Recovered	365	11.10%	3.9
Total Firms	3,306	100.00%	-----

New Research: Can One Predict the Future of Zombies?

Sources: CRSP, Compustat, Worldscope, Capital IQ, Bankruptcy.Com

Outcomes of Zombie Firms

The table below displays the outcomes of zombie firms, categorized as bankruptcy (Chapter 11 or Chapter 7 filings in the United States), delisted, merger & acquisition, recovered, and unknown. It also reports the average years between when a company became a zombie firm and when it reached one of the outcomes. It is considered that a company is recovered from zombie status if it is no longer identified as a zombie by interest coverage and Z-score or Z''-score.

		Number of years to outcome							
		N(%)	Mean	StdDev	P10	P25	Median	P75	P90
Zombie firms based on interest coverage and Z-score									
US	Bankruptcy	504(15.26%)	4.71	4.8	1	1	3	6	11
	Delisted	1,397(42.31%)	3.75	4.06	1	1	2	5	8
	Merger & Acquisition	1,036(31.37%)	5.51	5.53	1	1	3	8	14
	Recovered	365(11.05%)	3.94	3.81	1	1	3	5	9
	All	3,302(100.00%)	4.47	4.72	1	1	3	6	11
Non-US	Delisted	1,945(34.68%)	6.38	4.59	2	3	5	9	13
	Merger & Acquisition	647(11.54%)	3.09	3.7	0	1	1	5	8
	Recovered	1,970(35.13%)	3.79	2.99	1	2	3	5	8
	Unknown	1,046(18.65%)	3.35	3.57	0	1	2	5	8
	All	5,608(100.00%)	4.52	4.03	1	1	3	6	10
Zombie firms based on interest coverage and Z''-score									
US	Bankruptcy	546(14.15%)	5.18	5.2	1	1	3	7	12
	Delisted	1,714(44.43%)	4.12	4.5	1	1	3	5	9
	Merger & Acquisition	1,230(31.88%)	5.9	5.88	1	1	4	9	15
	Recovered	368(9.54%)	4.76	4.25	1	2	3	6	11
	All	3,858(100.00%)	4.9	5.11	1	1	3	7	12
Non-US	Delisted	1,938(35.22%)	6.71	4.72	2	3	6	10	13
	Merger & Acquisition	697(12.67%)	3.22	3.72	0	1	1	5	9
	Recovered	1,799(32.69%)	4.08	3.23	1	2	3	5	8
	Unknown	1,069(19.43%)	3.65	3.99	0	1	2	5	9
	All	5,503(100.00%)	4.81	4.25	1	2	3	7	11

ZOMBIE FIRMS AROUND THE WORLD

By Firm Size in 2019

This table reports the fraction of zombie firms by firms size using interest coverage ratio (IC) and Z"-score model. Small firms are those with sales less than or equal to \$50 million, and large firms are those with sales more than \$50 million. Our sample includes all publicly traded firms with nonmissing three-year moving average of EBITDA interest coverage, Z-score, and Z"-score from 1990 to 2020 in 20 countries that have the largest nominal GDP in 2019. Definitions of variables are provided in Table 1.

Nation	2019 GDP Rank	Small-Medium Firms (SMEs)			Large Firms			Fraction of SMEs
		N. Firms	IC	IC & Z"	N. Firms	IC	IC & Z"	
United States	1	315	60.00%	42.54%	1641	9.81%	3.53%	16.10%
China	2	369	34.42%	10.84%	3448	8.79%	0.87%	9.69%
Japan	3	352	17.33%	2.27%	2356	1.95%	0.13%	13.00%
Germany	4	136	39.71%	13.24%	315	7.30%	1.27%	30.16%
India	5	1279	23.46%	9.38%	1117	9.76%	4.30%	53.38%
United Kingdom	6	367	55.59%	24.80%	536	7.84%	0.93%	40.64%
France	7	192	64.06%	28.13%	305	5.25%	0.66%	38.63%
Italy	8	83	22.89%	8.43%	190	6.84%	1.05%	30.40%
Brazil	9	17	64.71%	52.94%	128	14.84%	3.13%	11.72%
Canada	10	1257	60.46%	40.89%	404	17.33%	3.96%	75.68%
Russian Federation	11	19	42.11%	10.53%	126	7.14%	3.17%	13.10%
Korea, Rep	12	632	48.58%	10.28%	1422	10.48%	0.70%	30.77%
Australia	13	969	56.86%	32.92%	350	13.43%	4.00%	73.46%
Spain	14	35	31.43%	11.43%	89	10.11%	0.00%	28.23%
Mexico	15	0	0.00%	0.00%	83	1.20%	0.00%	0.00%
Indonesia	16	166	22.89%	4.22%	304	9.54%	2.63%	35.32%
Netherlands	17	18	50.00%	22.22%	69	10.14%	4.35%	20.69%
Saudi Arabia	18	25	24.00%	0.00%	104	7.69%	0.00%	19.38%
Turkey	19	117	35.04%	8.55%	149	11.41%	3.36%	43.98%
Switzerland	20	23	73.91%	39.13%	145	8.28%	0.69%	13.69%
Average		6371	41.37%	18.64%	13281	8.96%	1.94%	29.90%
Weighted Average			44.52%	22.21%		8.21%	1.63%	

IMPACT OF COVID-19 PANDEMIC ON GLOBAL ZOMBIE RATIOS

- Very Small Impact Overall on Global Zombie Ratios
 - Global Average Change of Zombie Ratio from 2019 to 2020 - + 0.12%
 - 10 Countries Had An Increase of Zombies
 - 8 Countries Had A Decrease of Zombies
 - 2 Countries Had No Change of Zombies
- Reasons For Small Change During the Pandemic?

CONCLUDING REMARKS

- "Zombie firm trends are clearly cyclical with spikes in zombies as economic growth declines."
- We Propose a Two-Step, Dual-Filter Measure for Identifying and Quantifying Zombie Firms on a Global and Country Basis
- The Dual-Filter Approach Involves a 3-Year Moving Average Cash-Flow Interest Coverage Ratio <1.0 AND A High Default Probability Forecast (Z-Scores $< 0/0$)
- We find That The Average Proportion of Publicly Traded Firms from the 20 Largest Global Economies Increased Significantly in The Past 30 Years From 1.5% in 1990 to About 7.0% in 2021. Is this a Trivial Amount, or Not?
- U.S. Zombie Firms Increased from About 6.0% of Listed Companies in 1990 to About 8% in 2021; Countries like Japan, China and Germany Had Considerably Lower Zombie Ratios
- Smaller Firms Are More Likely To Be Zombies than Larger Companies, Impacting Certain Countries More Than Others, eg. Australia and Canada
- Global Zombieism Did not Increase Much During The COVID-19 Pandemic From 2019 to 2020 but Did Decrease in 2021 as the World's Economies Recovered from the Pandemic Recession"
- Our Results Have Important Implications For Policy Makers, Legislators, And Financial Economists

GRAZIE

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