

CLOs—Update on Asset Risk Structure

Sept. 29, 2026

Stephen Smith, Chairperson of the C-1 Subcommittee

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About the Academy

2



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Post-Tax Factors

3

The Academy-proposed factors have been adopted for 2026

Investment Grade

Rating	Simple Average Raw C-1	Modeled C-1	
		Thickness > 4%	Thickness ≤ 4%
Aaa	0.03%	0.03%	
Aa1	0.28%	0.04%	
Aa2	0.00%	0.04%	
Aa3	0.00%	0.04%	
A1	0.40%	0.14%	
A2	0.11%	0.14%	
A3	0.12%	0.80%	
Baa1	1.58%	1.81%	
Baa2	3.02%	2.70%	
Baa3	5.94%	2.73%	12.52%

Below Investment Grade

Rating	Simple Average Raw C-1	Modeled C-1	
		Thickness > 4%	Thickness ≤ 4%
Ba1	20.70%	12.59%	22.39%
Ba2	27.37%	20.93%	30.72%
Ba3	28.92%	23.28%	33.08%
B1	17.34%	26.04%	35.84%
B2	30.81%	35.20%	44.99%
B3	56.39%	47.32%	57.12%
Caa1	57.60%	48.12%	57.92%
Caa2	66.51%	55.20%	64.99%
Caa3	77.33%	70.82%	80.61%
Residual ¹	33.98%	35.55%	

¹ Under practical expedient accounting

Table of Contents

4

1. CLO Basics
2. U.S. Life Insurers' Exposure
3. CLO Descriptive Data, Shape of Risk
4. Tranche Thickness and Risk
5. Sensitivities
6. Residual Tranches
7. Diversification

1.

CLO Basics

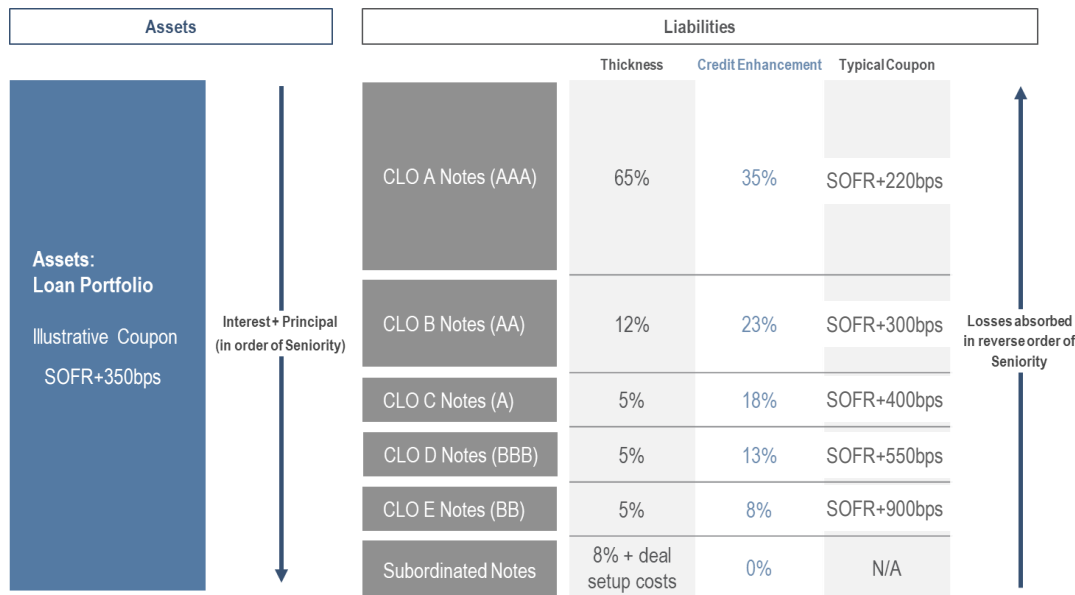
Collateral—Bank Loans

6

- A CLO is a tranching security issued by a Special Purpose Vehicle (SPV) holding a large, diversified portfolio predominantly made up of bank loans.
- Bank loans are typically below investment grade (most are rated BB and B) and issued as senior, secured, floating-rate corporate credit.
- Two main types of collateral: broadly syndicated loans (BSL) and middle market loans (MML)
- A CLO typically contains mostly BSL or mostly MML but not both

Typical Capital Structure at Issue

7

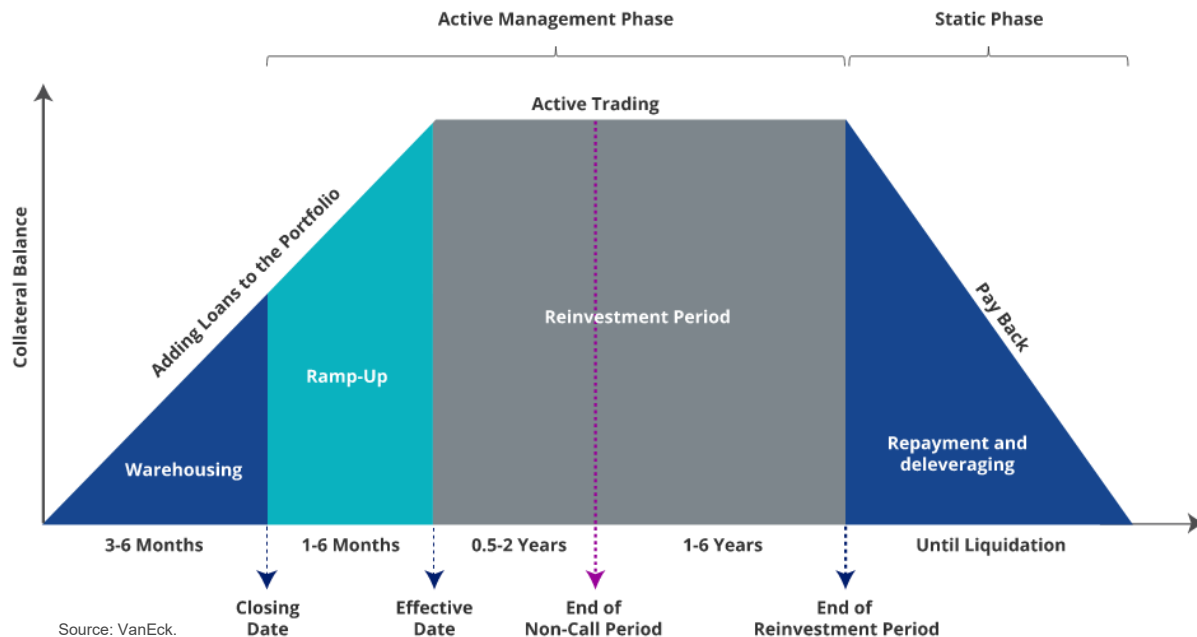


In this hypothetical structure, weighted average coupon on CLO tranches is SOFR+272bps, compared to collateral coupon of SOFR+350bps. Lacking defaults, the excess spread accrues to the subordinated notes (residual tranche), but as defaults occur the excess spread provides credit enhancement in addition to the subordination of principal.

Source: Neuberger. Capital structure and indicative portfolio are presented for illustrative purposes only and may not represent the final capital structure and portfolio of any particular CLO. S+... refers to interest paid as a spread over SOFR.

CLO Lifecycle

8



Source: VanEck.

2.

U.S. Life Insurers' Exposure

Executive Summary

10

1 CLO allocations grow in \$ amounts but plateau as a % of invested assets

- In 2025, Industry CLO holdings reached \$367bn (+7.3% YoY, ~4× the \$85bn held in 2016)
- Out of the total \$367bn of CLO allocations across insurance, life holds 85%, P&C 14% and Health 1%
- CLO allocations as a % of invested assets peaked for P&C and Health in 2022, with 3.5% and 2.7% and have fallen to 2.9% and 1.8%, respectively
- In 2025, Life CLO allocation decreased for the first time in over a decade, falling from 5.2% to 5.1%

2 The number of insurers invested in CLOs is at an all-time high

- In 2025, 75% of life, 57% of P&C and 41% of Health insurers are invested in CLOs—an all-time high for each
- In the Life industry, the top 10 insurers by CLO portfolio market value account for 44% of the CLO allocation

3 Life has more aggressive CLO allocations compared to P&C and Health

- Consistent with the CLO universe—68% of CLO debt balance is AAA-rated—P&C and Health insurers allocating a majority (59%) of CLO debt to AAA; Life insurers are less conservative, allocating only 35% to AAA
- P&C and Health insurers allocate less than 10% of CLOs to middle markets
- Life insurers allocate 23% of CLOs to middle markets and purchase at yields ~50bps above similarly-rated BSL CLOs

4 Adopted C-1 CLO factors for have minimal impact on most Life insurers

- For the Life industry, the NAIC adopted C-1 factors for CLOs that will be effective 2026YE
- Compared to bond factors, the CLO C-1 factors are reduced for A/above CLOs and increased for BBB/below CLOs
- If applied to 2025YE allocations, this change would cause C-1o to increase \$2.1bn industry-wide
This is 0.04% of total invested assets and 0.38% of capital and surplus industry-wide
- However, the median insurer is unaffected by the change; C-1o increase is driven by BB/B CLOs owned by 10% of insurers

Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch, Bloomberg, American Academy of Actuaries.

Methodology to Classify CLOs

11

Data Universe 2025 year-end Schedule D-1 securities for U.S. Life, P&C and Health insurers, preprocessed by S&P Global

1

Match known CLO CUSIPs

Cross-reference each security's CUSIP against Neuberger's CLO CUSIP database, sourced from JPM, Barclays, Kaneraï, PitchBook and manual S&P / Fitch tagging

Source: Neuberger, S&P Global, JPM, Barclays, Kaneraï, PitchBook, Fitch.

2

Match from issuer names and security descriptions

Search for securities labeled "CLO" or "CDO" by the insurer, or containing issuer names from the Neuberger CLO database

3

Infer from insurer-reported asset types

Tag all securities listed by the insurer as a "CLO" if the description has key words associated with middle market, CRE and TruPS CLOs

4

Infer CLO type*

Infer CLO type (if not in database) from description key words (e.g., "BSL," "MML") for all securities tagged as CLOs; ambiguous descriptions are labeled "Unidentified"



Neuberger vs. Insurer Tagging of CLOs

12

Classification of CLO Debt* 2025YE Holdings MV (\$bn)

Life			P&C			Health		
Insurer-reported as CLO			Insurer-reported as CLO			Insurer-reported as CLO		
Tagged as CLO	No	Yes	Tagged as CLO	No	Yes	Tagged as CLO	No	Yes
	No	Yes		No	Yes		No	Yes
No	—	12.6	No	—	1.2	No	—	0.2
Yes	21.7	286.2	Yes	2.9	46.4	Yes	0.3	5.2

Data used in the CLO allocation analysis

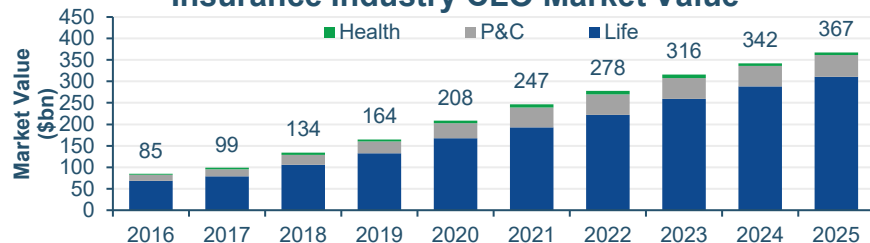
* Insurers only explicitly identify CLOs on *Schedule D1*.

Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch. Asset holdings are as of 2025-12-31. Separate account assets are included for the life industry.

Insurance Industry CLO Market Value and Allocations

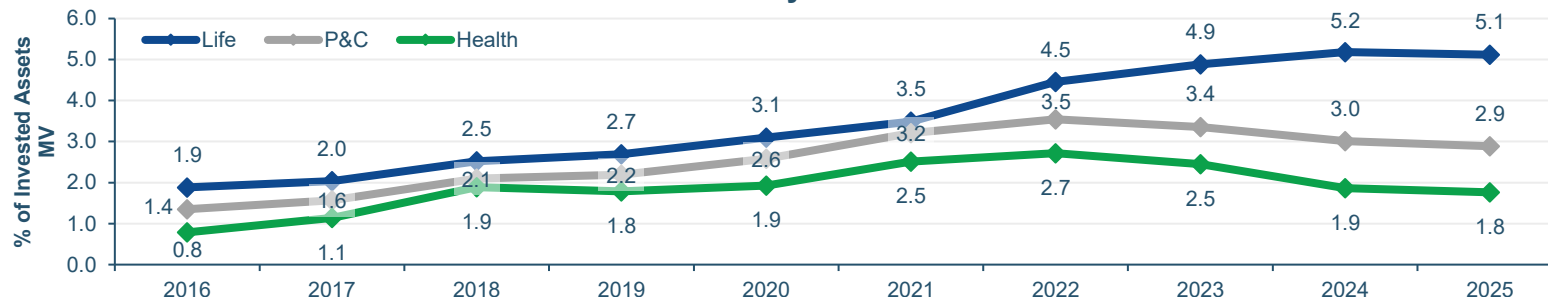
13

Insurance Industry CLO Market Value



- All three industries have increased their CLO allocation over the last decade
- Life insurance CLO allocation peaked in 2024 while P&C and health allocations peaked in 2022
- The life industry accounts for 85% of insurance CLO market value

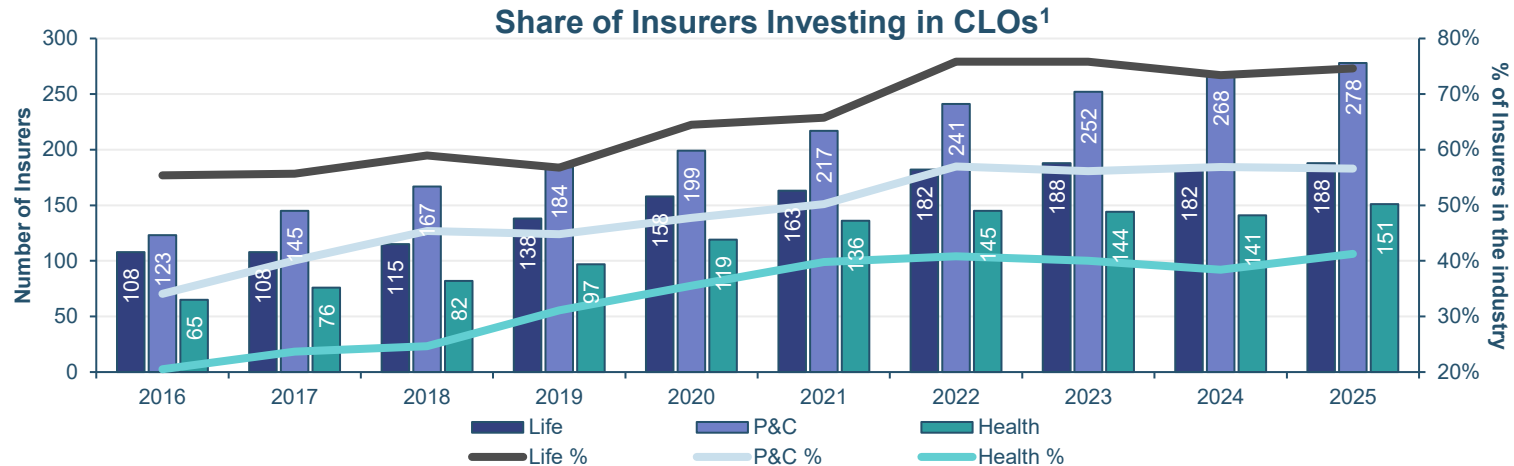
Insurance Industry CLO Allocations



Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch. Asset holdings are as of 2025-12-31. Separate account assets are included for the life industry in years 2018–2025.

Prevalence of CLO Allocations Amongst Insurers

14



- The number of insurers that invest in CLOs increases every year, though the P&C trend has plateaued since 2022
- The percentage of total insurers that invest in CLOs increases over the past decade

Life: from 55% to 75%; P&C: from 34% to 57%; Health: from 21% to 41%

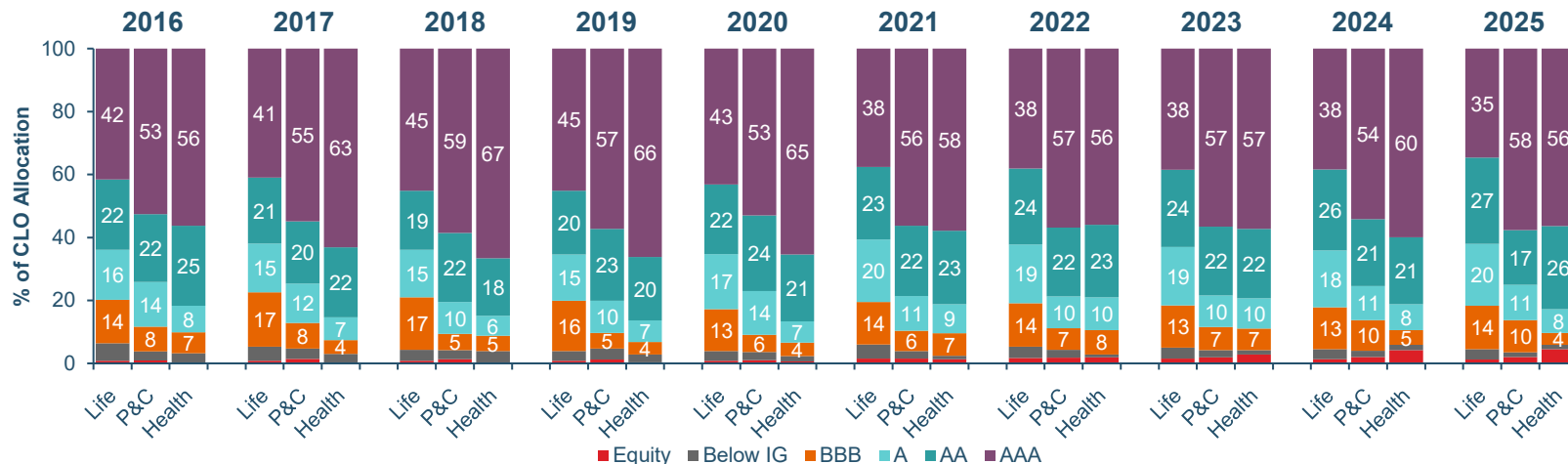
1. Life and P&C companies with total invested assets less than \$100mn are excluded from this analysis. Health companies with total invested assets less than \$20mn are excluded.

Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch. Asset holdings are as of 2025-12-31. Separate account assets are included for the life industry in years 2018–2025.

CLO Ratings Composition

15

CLO Ratings Composition by Industry and Year



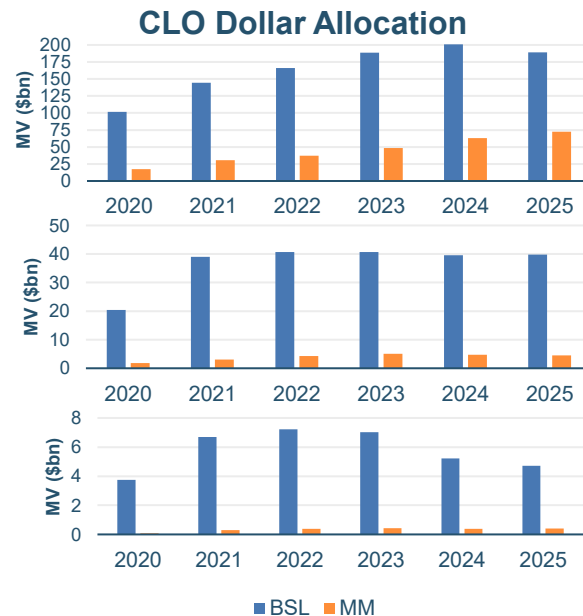
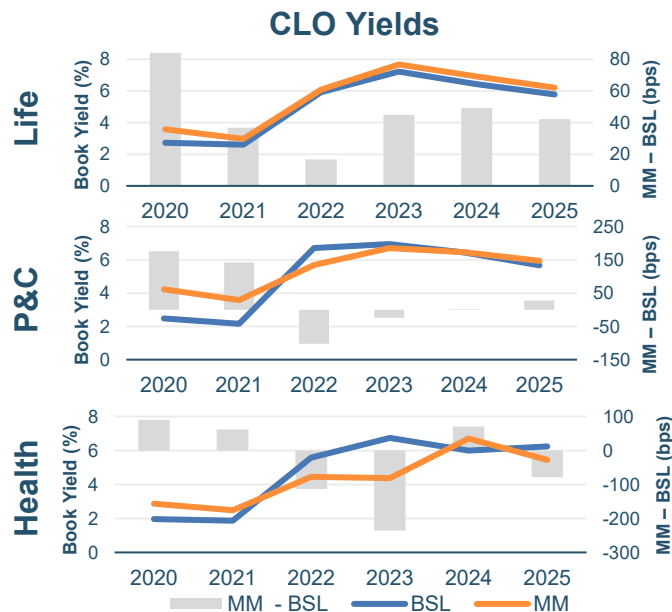
- The life industry continues to skew lower quality than the P&C and health industries, with greater single A and BBB credit
- Since 2021, the P&C and health industries have maintained similar credit quality within CLOs
- Since 2021, allocation to CLO equity has increased but remains small

Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch. Asset holdings are as of 2025-12-31. Separate account assets are included for the life industry in years 2018–2025.

Broadly Syndicated vs. Middle-Market Loans

16

- In the life industry, middle market CLOs (MM) consistently spread above broadly syndicated loan CLOs (BSL)
- All three industries allocate more to BSL, with a BSL:MM ratio of 2.6 for Life, 8.9 for P&C and 11.8 for Health



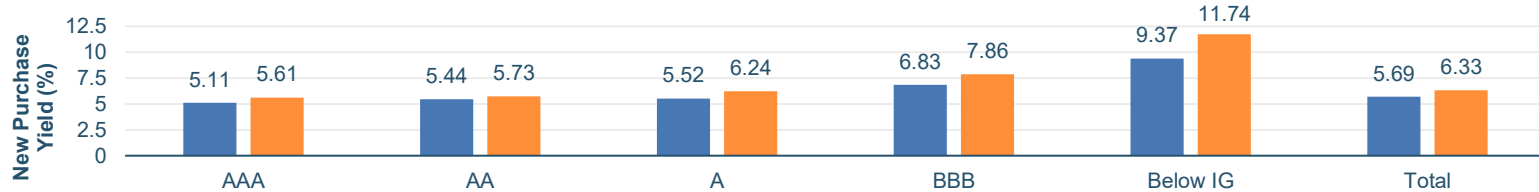
Source: Neuberger, S&P Global, JPM, Barclays, Kanera, PitchBook, Fitch. Asset holdings are as of 2025-12-31. Separate account assets are included for the life industry in years 2018-2025.

CLO 2025 New Purchase Yields

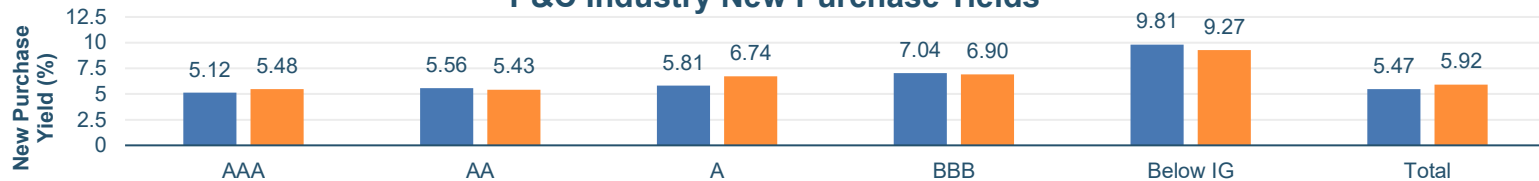
17

- Across credit ratings, CLOs purchased in 2025 had yields ranging from 5% to 10%
- Middle market CLOs average a premium of ~50bps over similarly rated BSL CLOs

Life Industry New Purchase Yields



P&C Industry New Purchase Yields



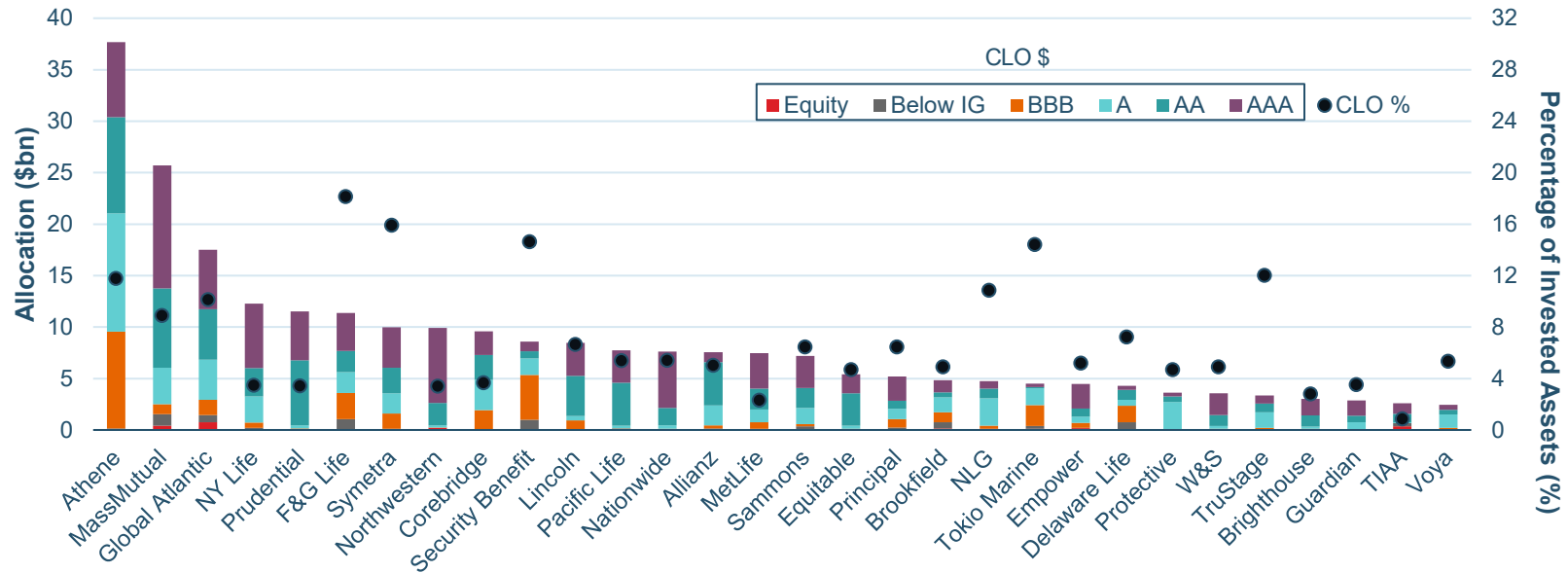
¹New purchase yield represents the incremental book yield attributed to net purchased securities in a given year. Net purchased book value is estimated from the YoY change in book value. Data is reported on Schedule D1. Residual tranche assets are excluded.

Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch. Asset holdings are as of 2025-12-31. Separate account assets are included for the life industry in years 2018–2025.

■ BSL ■ MM

Life Insurers with Greatest \$ Allocation to CLOs¹

18

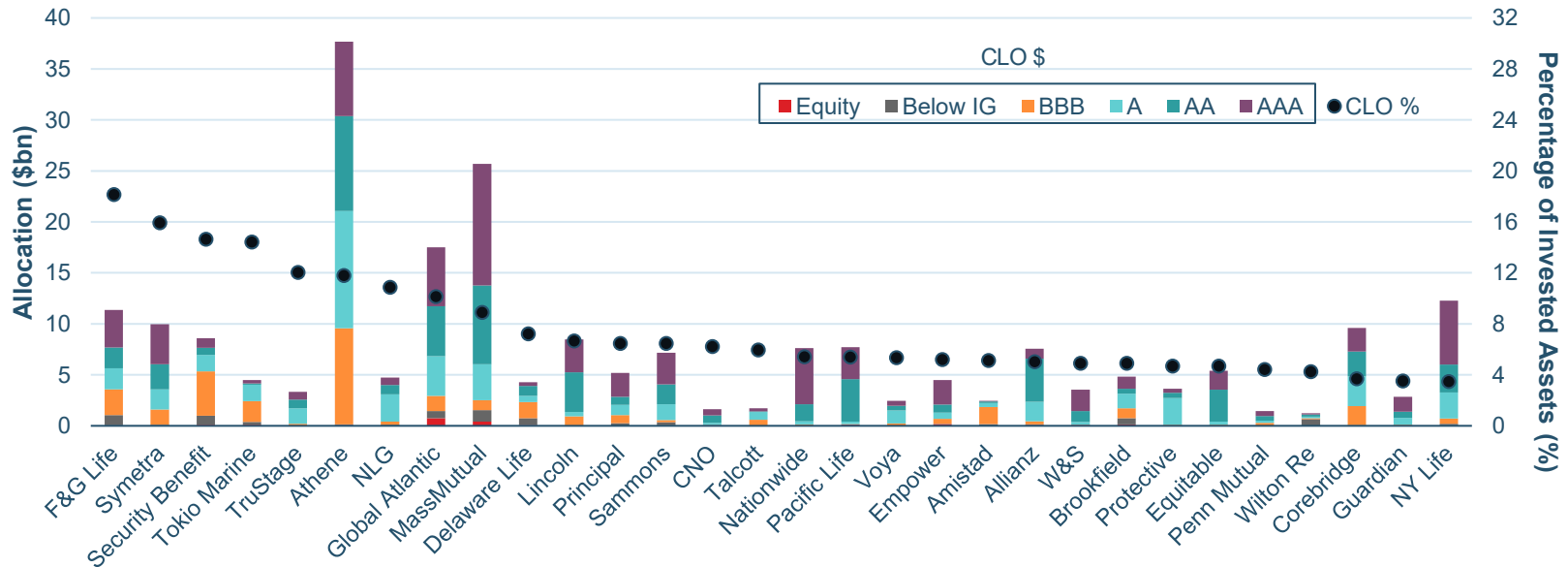


¹Top 50 largest life insurers are analyzed and sorted based on their allocation to CLO as percentage of GA. The top 30 are shown in the chart.

Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch. Asset holdings are as of 2025-12-31. Separate account assets are included for the life industry in years 2018–2025.

Life Insurers with Greatest \$ Allocation to CLOs¹

19



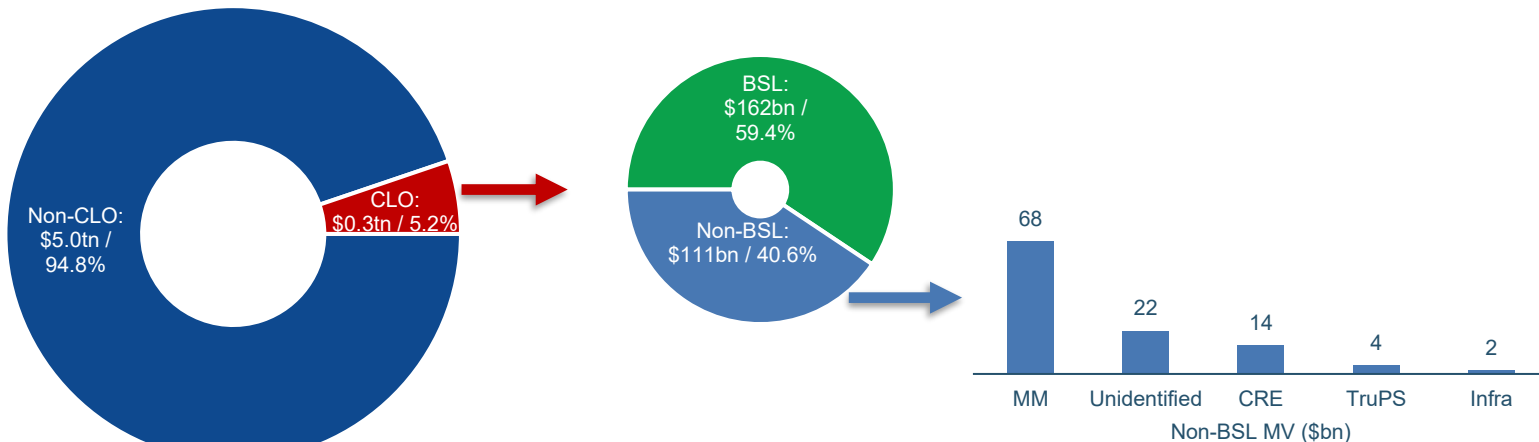
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Life Industry CLO Allocations

20

- As of 2025 year-end reporting, CLOs constitute 5.2% of the life industry's general account asset MV
- Roughly 60% of CLOs owned by life insurers are BSL CLOs
- The majority of non-BSLs are MM CLOs

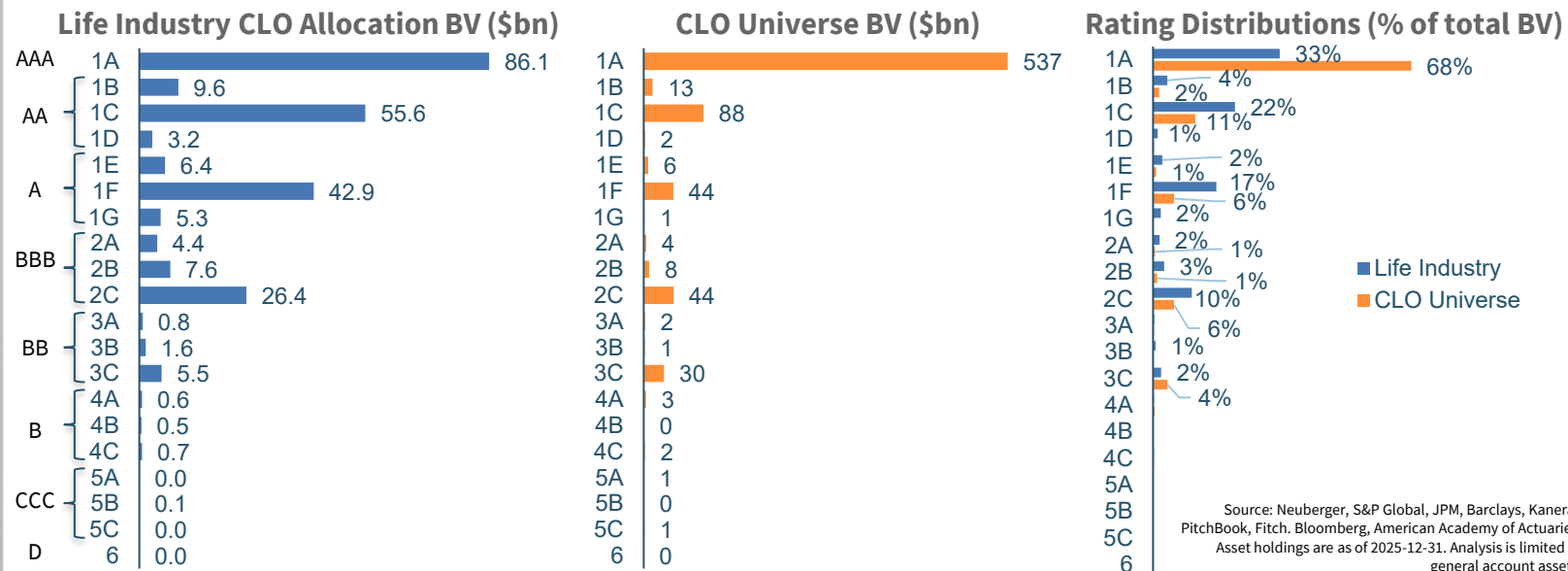


Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch, Bloomberg, American Academy of Actuaries. Asset holdings are as of 2025-12-31. Analysis is limited to general account assets.

Comparison of Life Industry vs. CLO Universe by Rating

21

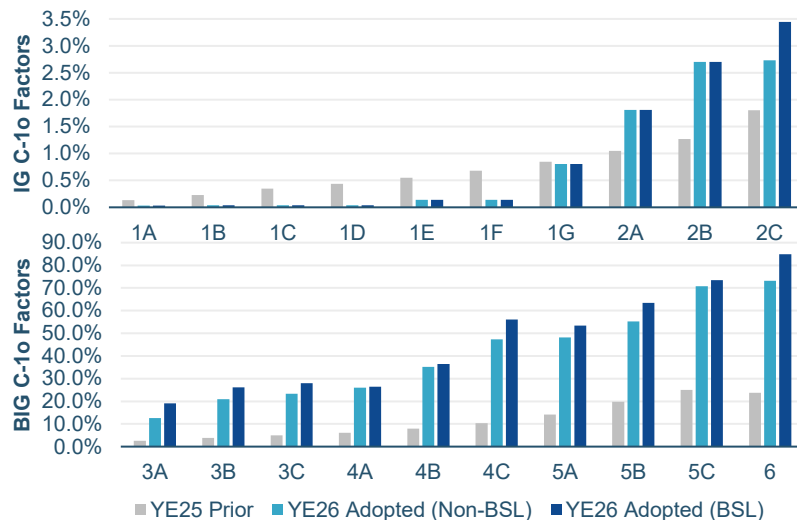
Relative to the full CLO universe, life insurance portfolios are more concentrated in AA, A and BBB CLOs



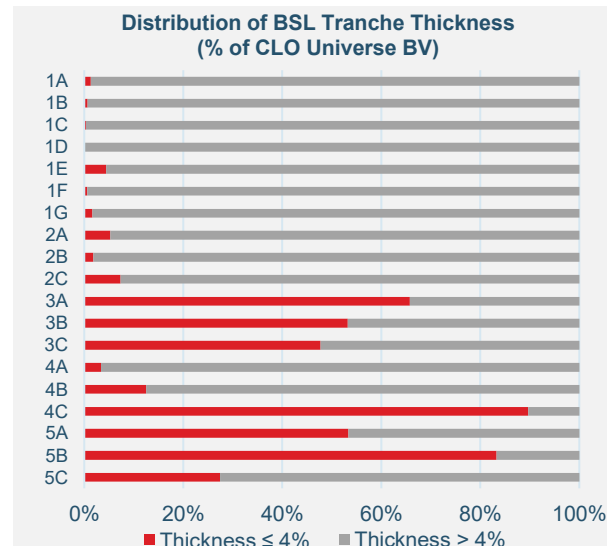
YE26 Adopted CLO C-1o Factors

22

- Non-BSL CLOs are **exempt** from the “thin tranche” surcharge (applied to 2C/below tranches with thickness $\leq 4\%$)
- BSL C-1o YE26 adopted factors are estimated using the CLO universe distribution of tranche thickness

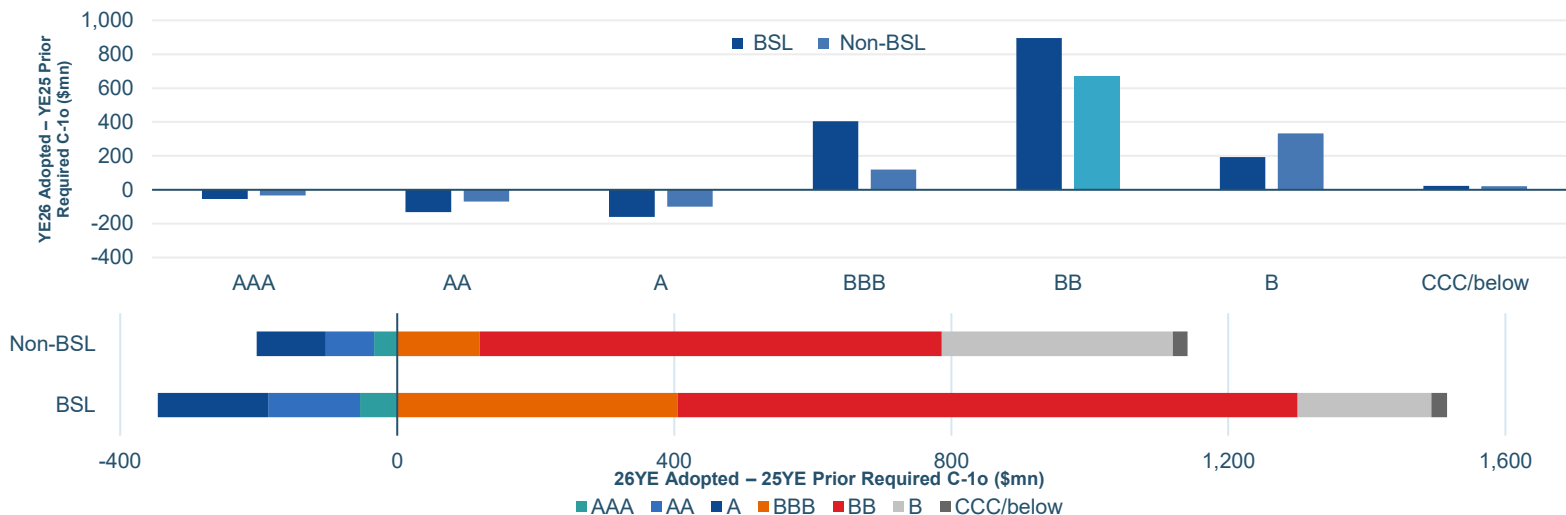


Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch, Bloomberg, American Academy of Actuaries.



Life Industry Impact of Adopted CLO C-1 Factors by Rating ²³

Assuming year-end 2025 allocations, YE26 adopted C-1 factors would reduce C-1o capital requirements by \$549mn for A/above and increase C-1o by \$2.6bn for BBB/below



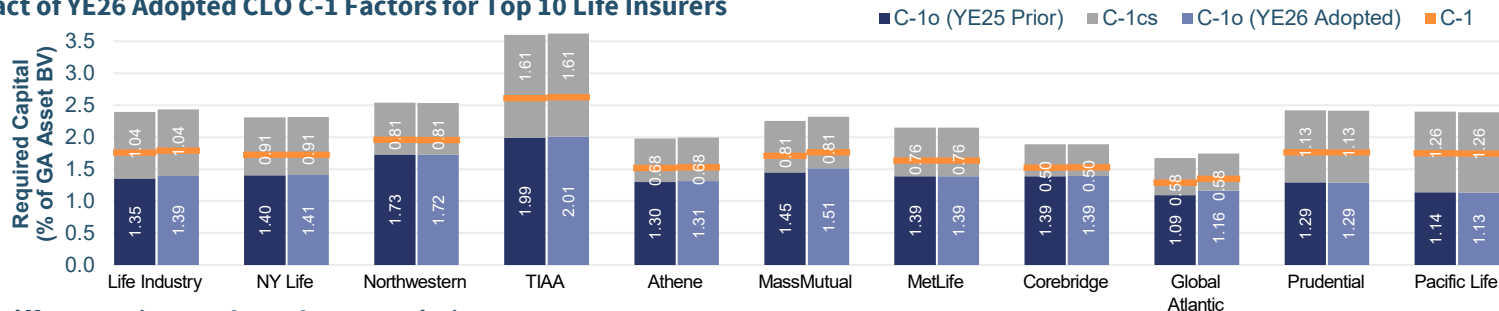
Factors are applied to securities identified as CLOs by Neuberger based on insurer-reported rating designations on *Schedule D1*. Neuberger assumes that insurers own “thin” and “thick” tranche CLOs at the same proportion as the CLO universe. Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch, Bloomberg, American Academy of Actuaries. Asset holdings are as of 2025-12-31. Analysis is limited to general account assets.

Impact of YE26 Adopted CLO C-1 Factors on 10 Largest Life Insurers

24

Based on Neuberger estimation¹, YE26 adopted factors would increase C-1 by only 1.60% for the aggregated life industry

Impact of YE26 Adopted CLO C-1 Factors for Top 10 Life Insurers



C-1o Differences (YE26 Adopted – YE25 Prior)

Absolute	0.04	0.01	-0.00	0.02	0.01	0.06	-0.00	0.00	0.07	-0.00	-0.01
Percentage (% of YE25 Prior)	2.86	0.36	-0.27	1.01	1.12	4.40	-0.01	0.28	6.25	-0.27	-0.70

C-1 Differences (YE26 Adopted – YE25 Prior)

Absolute	0.03	0.00	-0.00	0.02	0.01	0.06	-0.00	0.00	0.06	-0.00	-0.01
Percentage (% of YE25 Prior)	1.81	0.25	-0.22	0.61	0.88	3.38	-0.01	0.25	4.91	-0.15	-0.31

¹ C-1o and C-1cs are estimated from asset holdings reported in annual statutory filings. C-1 is *not* reported publicly. Factors are applied to securities identified as CLOs by Neuberger based on insurer-reported rating designations on Schedule D1. Neuberger assumes that insurers own “thin” and “thick” tranche CLOs at the same proportion as the CLO universe.

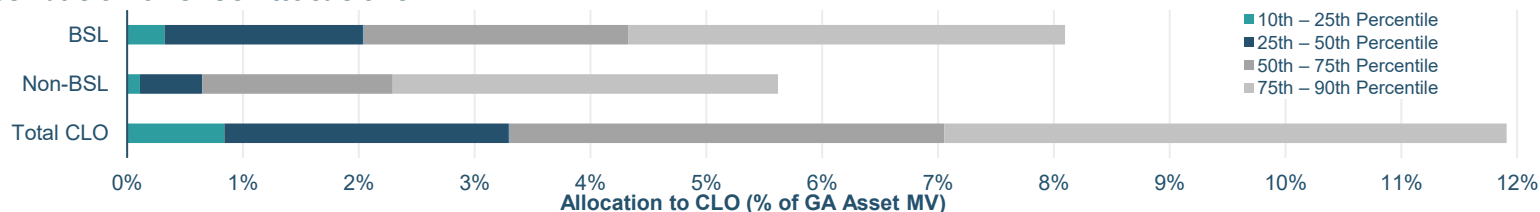
Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch, Bloomberg, American Academy of Actuaries. Asset holdings are as of 2025-12-31. Analysis is limited to general account assets.

Distribution of CLO Allocations and Required C-1o

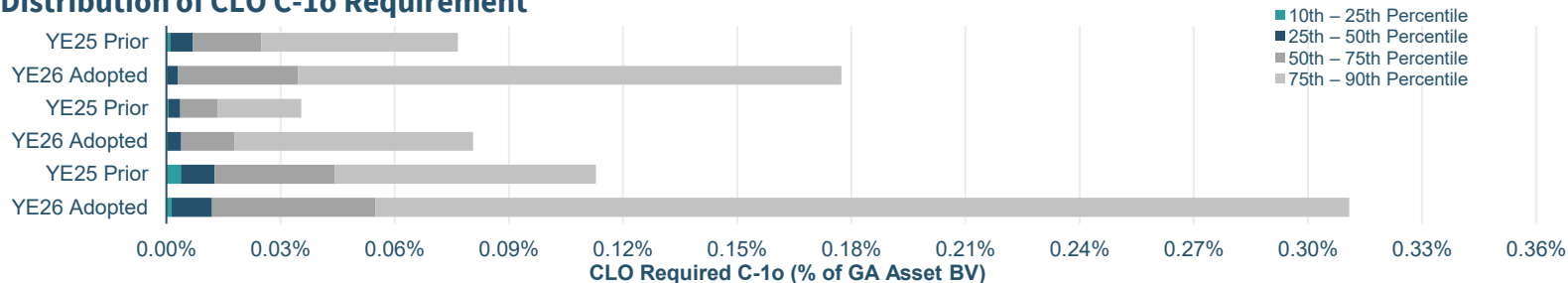
25

The median insurer allocates **3.3% of GA** to CLOs with a YE25 prior C-1o factor of **0.013%** and YE26 adopted C-1o factor of **0.012%**

Distribution of CLOs Allocations



Distribution of CLO C-1o Requirement



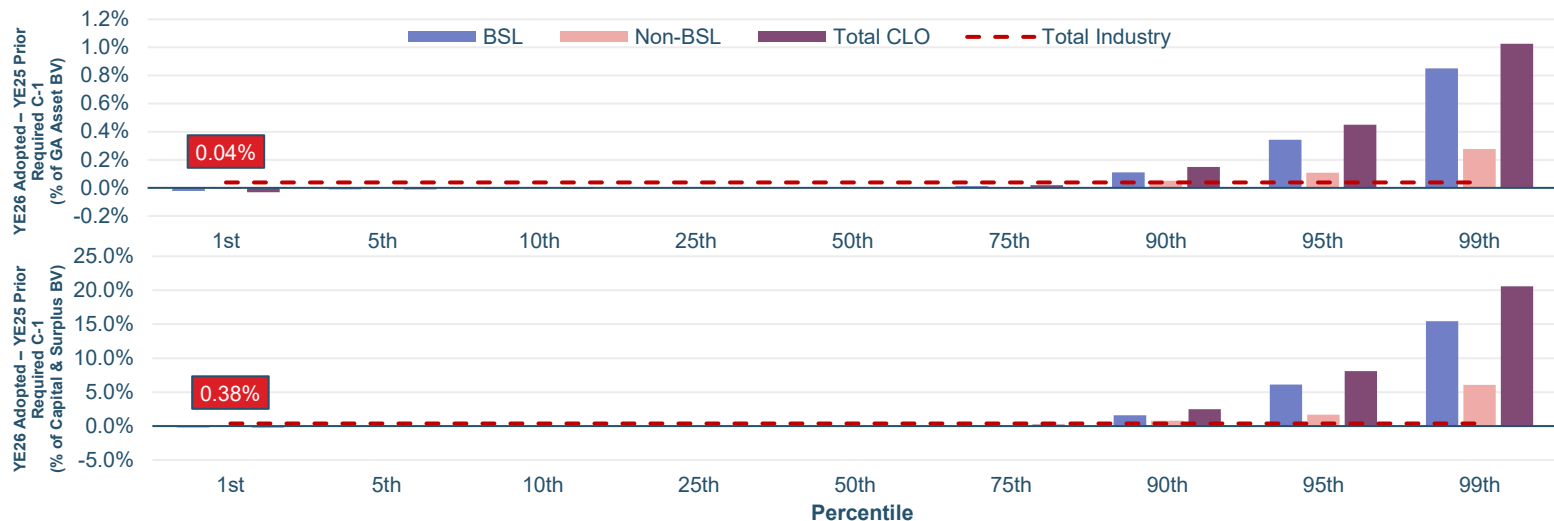
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Distribution of Impact of YE26 Adopted CLO C-1 Factors

26

For $\frac{3}{4}$ of insurers, YE26 adopted CLO C-1 factors would increase C-1o by **less than 0.25%** of capital and surplus

Impact of YE26 Adopted C-1 Factors on Required C-1o for 2025YE Allocations



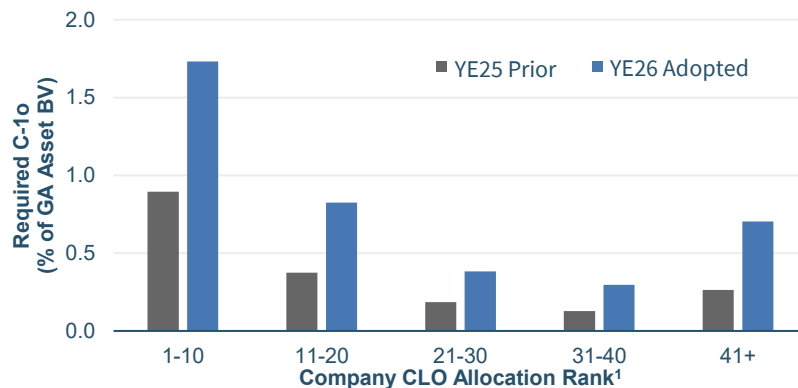
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Impact of YE16 Adopted CLO C-1 Factors by CLO Portfolio Size

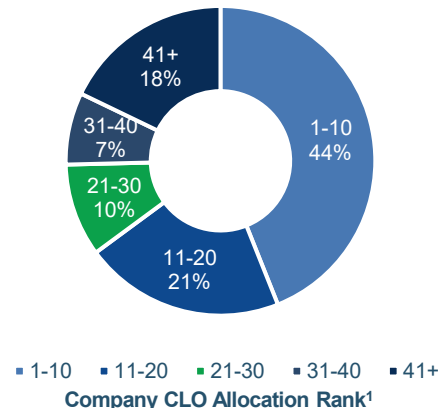
27

While nearly half of the industry's YE26 adopted required C-1o comes from the 10 largest CLO portfolios, the YE26 adopted factors would increase CLO C-1o by roughly ~2x across all CLO portfolio sizes

CLO Required C-1o for 2025Y Allocations, by CLO Portfolio Size¹



Distribution of YE26 Adopted CLO Required C-1



¹“1-10” denotes the aggregation of the top 10 largest insurers by CLO market value, “11-20” denotes the aggregation of the next 10 largest insurers, etc.

Factors are applied to securities identified as CLOs by Neuberger based on insurer-reported rating designations on *Schedule D1*. Neuberger assumes that insurers own “thin” and “thick” tranche CLOs at the same proportion as the CLO universe. Source: Neuberger, S&P Global, JPM, Barclays, Kanerai, PitchBook, Fitch, Bloomberg, American Academy of Actuaries. Asset holdings are as of 2025-12-31. Analysis is limited to general account assets.

Life Insurance Industry CLO Holdings

28

The life insurance industry holds concentrated CLO portfolios, with half of the companies holding fewer than 40 unique CLO deals

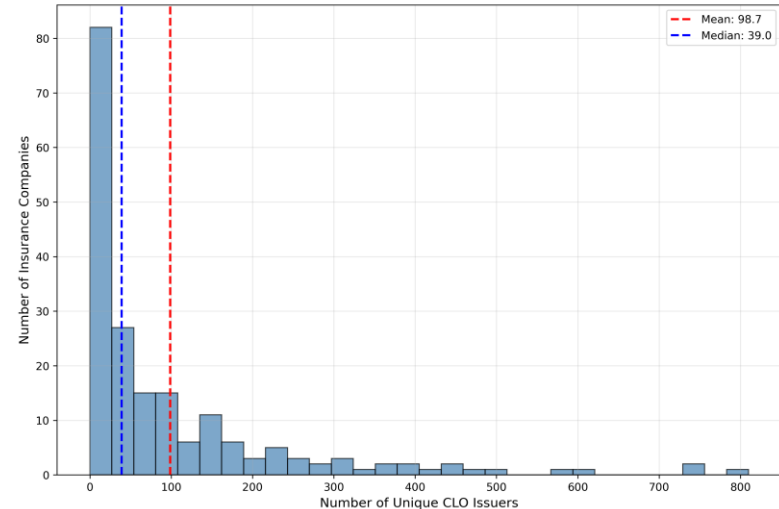
Key Statistics

Total CLO Holdings:	27,930
Unique CLO Deals:	3,307
Median CLO holdings per co.:	51
Median unique CLO deals per co.:	39
Standard deviation:	145.8
Range:	1 to 810 issuers
Q1 (25 th percentile):	7 unique CLO deals
Q3 (75 th percentile):	134 unique CLO deals

Distribution by Issuer Count

Unique CLO deals count range	# of Companies
1-10	57
11-25	24
26-50	27
51-100	27
101-200	28
201-500	25
501+	5

Distribution of CLO Deal Holdings Counts by Life Insurance Companies
(193 companies at group holdings level)

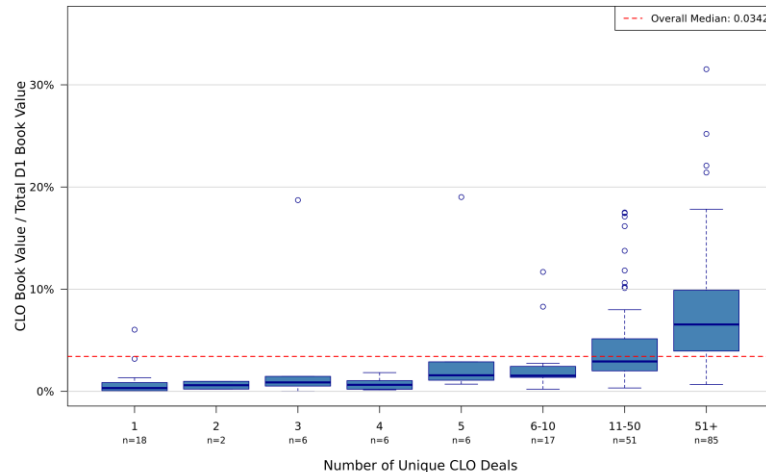


Life Insurance Industry CLO Holdings

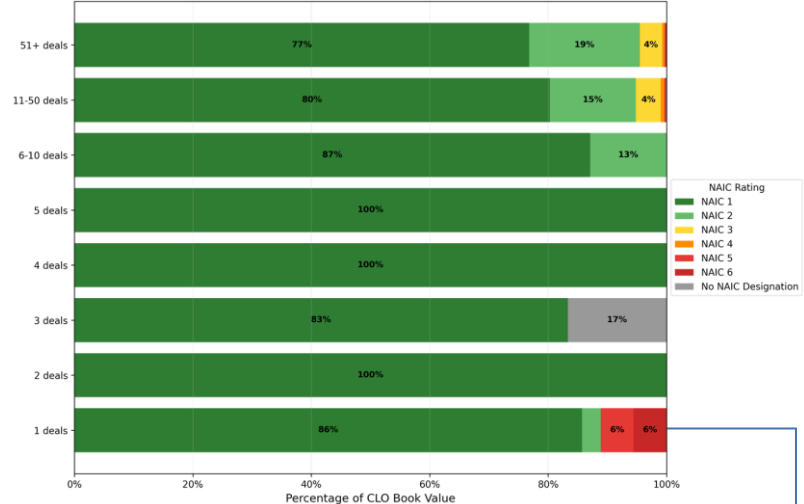
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Life insurers with fewer unique CLO deals generally allocate to higher quality tranches and have a smaller proportion of D1 assets allocated to CLOs

CLO Book Value Ratio by Deal Diversification



CLO Rating Distribution by Number of Unique Deals



There are only 2 companies that hold 1 CLO below-investment grade debt tranche. The total BV of these CLO debt holdings represent less than 0.1% of total general account invested assets.

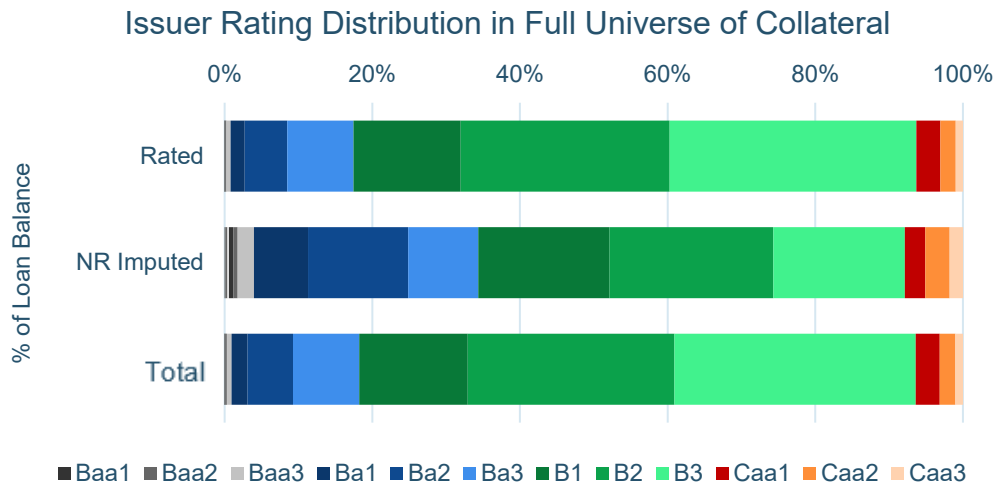
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CLO Descriptive Data, Shape of Risk

Issuer Rating Distribution in Collateral

31

- Issuer rating is used for default modeling, which is the worse between S&P and Moody's.
- When issuers were not rated (5% of loan balance), issuer rating is approximated using average rating, rounded down to the nearest notch.

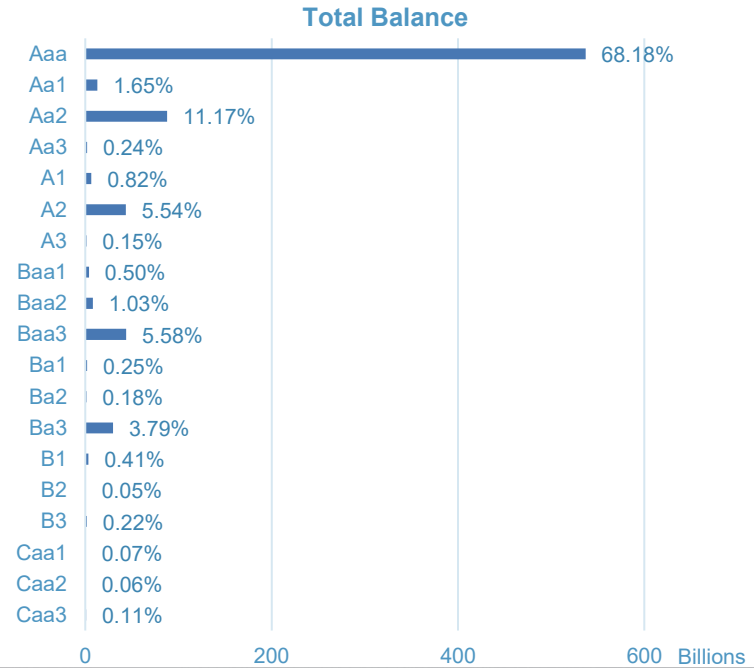


*Issuer rating shown. When comparing issuer and loan rating, S&P ratings are the same for 98% of the balance. Moody's ratings are the same for 57% and within 1 notch for 94% of the loan balance.

Dataset Summary

32

Rating	Count	Total Balance	Average Balance
Aaa	3,701	536,990,530,454	145,093,361
Aa1	297	12,977,362,056	43,694,822
Aa2	1,879	87,971,730,271	46,818,377
Aa3	68	1,892,554,504	27,831,684
A1	246	6,464,462,500	26,278,303
A2	1,642	43,609,160,095	26,558,563
A3	41	1,161,995,000	28,341,341
Baa1	168	3,962,136,650	23,584,147
Baa2	356	8,114,555,000	22,793,694
Baa3	1,980	43,986,588,439	22,215,449
Ba1	118	1,940,755,600	16,447,081
Ba2	79	1,412,324,566	17,877,526
Ba3	1,642	29,832,733,348	18,168,534
B1	154	3,261,262,126	21,177,027
B2	26	422,194,200	16,238,238
B3	330	1,729,679,579	5,241,453
Caa1	50	570,093,651	11,401,873
Caa2	51	479,412,947	9,400,254
Caa3	58	860,837,767	14,842,030



Value-at-Risk, by Rating and Percentile

33

Rating	CTE90	VAR_70	VAR_90	VAR_91	VAR_92	VAR_93	VAR_94	VAR_95	VAR_96	VAR_97	VAR_98	VAR_98.5	VAR_99	VAR_99.25	VAR_99.5	VAR_99.75	VAR_99.9	VAR_99.95	VAR_99.99
Aaa	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
Aa1	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
Aa2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A1	0.4%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%	4.7%	0.6%	4.3%
A2	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.5%	6.2%	0.8%	9.2%
A3	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.8%	0.0%	0.6%	1.8%	1.5%	1.7%	2.1%
Baa1	1.6%	0.0%	0.3%	1.3%	0.0%	0.0%	0.1%	0.0%	0.6%	0.2%	0.9%	0.5%	3.6%	4.9%	1.4%	19.1%	34.3%	21.6%	42.9%
Baa2	3.0%	0.2%	1.2%	3.5%	0.3%	0.2%	0.4%	0.3%	2.2%	0.8%	3.6%	1.4%	7.1%	13.0%	2.7%	24.2%	46.2%	28.9%	50.8%
Baa3	5.9%	0.2%	3.8%	10.3%	0.1%	0.1%	1.3%	0.1%	7.3%	2.6%	7.5%	4.0%	15.7%	21.6%	6.0%	35.0%	50.9%	45.3%	63.0%
Ba1	20.7%	4.1%	18.1%	33.6%	1.0%	0.5%	14.8%	1.4%	28.9%	20.7%	29.6%	23.9%	47.6%	55.2%	34.2%	59.6%	63.7%	68.1%	70.4%
Ba2	27.4%	8.8%	28.4%	33.2%	3.3%	2.5%	24.9%	8.9%	40.0%	28.8%	42.8%	37.4%	52.0%	55.7%	50.7%	59.5%	59.1%	68.1%	66.0%
Ba3	28.9%	8.4%	33.0%	27.6%	6.3%	7.0%	26.0%	12.0%	33.5%	33.6%	43.1%	41.2%	56.6%	63.4%	56.1%	71.5%	70.5%	77.6%	78.2%
B1	17.3%	3.7%	11.3%	4.9%	10.8%	16.4%	12.3%	20.6%	8.9%	22.6%	20.1%	20.3%	28.0%	26.6%	44.9%	49.4%	45.4%	63.6%	61.0%
B2	30.8%	17.6%	28.5%	18.7%	20.8%	26.3%	30.2%	30.8%	23.4%	38.1%	35.8%	35.2%	44.7%	39.3%	52.7%	56.0%	54.3%	64.3%	66.7%
B3	56.4%	34.9%	61.2%	54.0%	31.5%	37.9%	61.8%	38.3%	64.3%	67.1%	70.8%	70.9%	79.0%	76.8%	77.3%	77.2%	72.3%	80.4%	80.6%
Caa1	57.6%	9.4%	43.8%	30.9%	58.6%	67.1%	58.2%	62.5%	45.7%	60.0%	64.1%	60.6%	74.2%	70.2%	75.9%	76.3%	62.8%	77.6%	78.3%
Caa2	66.5%	19.5%	50.0%	41.6%	68.8%	75.6%	67.4%	74.3%	56.3%	64.7%	74.1%	70.7%	80.0%	77.3%	80.2%	82.3%	65.8%	80.3%	81.6%
Caa3	77.3%	55.2%	67.6%	67.0%	81.9%	80.4%	78.3%	81.0%	73.7%	76.5%	78.1%	78.3%	82.3%	82.2%	83.7%	83.9%	74.9%	85.3%	86.1%

Value-at-Risk, by Rating and Percentile—Thickness > 4%

34

Rating	CTE90	VAR_70	VAR_90	VAR_91	VAR_92	VAR_93	VAR_94	VAR_95	VAR_96	VAR_97	VAR_98	VAR_98.5	VAR_99	VAR_99.25	VAR_99.5	VAR_99.75	VAR_99.9	VAR_99.95	VAR_99.99
Aaa	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A1	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	3.9%	0.3%	4.2%
A2	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.4%	5.8%	0.7%	8.9%
A3	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.8%	0.0%	0.6%	1.9%	1.5%	1.8%	1.8%
Baa1	1.3%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.5%	0.3%	2.5%	3.7%	1.3%	18.0%	33.5%	19.0%	40.8%
Baa2	2.7%	0.0%	1.0%	3.1%	0.0%	0.0%	0.1%	0.0%	1.9%	0.6%	3.5%	1.3%	6.6%	12.4%	2.5%	22.9%	45.3%	27.7%	49.7%
Baa3	2.3%	0.0%	0.6%	1.8%	0.0%	0.0%	0.2%	0.0%	1.8%	0.4%	1.7%	1.1%	5.5%	10.6%	2.6%	22.4%	42.2%	35.2%	56.6%
Ba1	3.4%	0.0%	2.6%	2.0%	0.0%	0.0%	2.9%	1.1%	2.6%	1.4%	6.0%	8.2%	4.7%	11.0%	7.4%	19.1%	20.6%	27.2%	29.4%
Ba2	8.8%	1.7%	9.2%	3.0%	3.0%	2.4%	5.3%	8.3%	7.5%	9.3%	13.8%	14.8%	15.0%	17.9%	27.8%	28.8%	28.1%	42.4%	39.3%
Ba3	19.9%	2.4%	22.0%	6.7%	6.4%	7.1%	16.9%	12.7%	15.5%	23.7%	27.6%	32.6%	38.3%	46.1%	51.3%	63.7%	62.0%	72.0%	73.0%
B1	13.7%	0.2%	6.7%	0.7%	8.6%	15.1%	8.6%	17.5%	3.9%	18.2%	15.0%	15.6%	23.5%	21.8%	41.2%	46.3%	42.1%	61.5%	58.7%
B2	12.7%	1.9%	4.9%	0.6%	9.1%	14.8%	8.1%	15.2%	2.6%	17.3%	14.7%	11.5%	25.1%	16.2%	37.0%	43.1%	43.2%	54.1%	58.3%
B3	31.1%	9.8%	18.3%	14.1%	34.9%	37.8%	29.3%	41.7%	22.4%	21.3%	36.0%	34.7%	45.0%	32.2%	51.0%	57.5%	50.1%	56.5%	60.7%
Caa1	35.5%	8.6%	21.5%	22.6%	39.0%	43.2%	30.7%	37.7%	25.4%	35.2%	36.4%	35.5%	48.7%	47.9%	57.3%	57.7%	43.0%	63.0%	64.2%
Caa2	39.1%	22.0%	24.3%	34.8%	44.0%	50.4%	29.4%	44.8%	32.4%	32.9%	41.9%	33.8%	44.1%	42.8%	44.6%	56.6%	39.6%	49.5%	57.1%
Caa3	74.6%	58.6%	64.9%	67.9%	77.6%	76.4%	76.4%	77.7%	73.5%	73.0%	75.3%	74.5%	76.8%	76.5%	79.9%	80.0%	73.4%	81.7%	83.3%

Value-at-Risk, by Rating and Percentile—Thickness $\leq 4\%$

35

Rating	CTE90	VAR_70	VAR_90	VAR_91	VAR_92	VAR_93	VAR_94	VAR_95	VAR_96	VAR_97	VAR_98	VAR_98.5	VAR_99	VAR_99.25	VAR_99.5	VAR_99.75	VAR_99.9	VAR_99.95	VAR_99.99
Aaa	0.1%	0.0%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Aa1	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%
Aa2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A1	5.1%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	15.8%	5.0%	5.2%
A2	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	31.3%	1.8%	27.0%
A3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.8%
Baa1	4.6%	0.0%	3.2%	7.2%	0.1%	0.0%	1.1%	0.0%	3.8%	2.4%	4.6%	2.2%	14.0%	16.1%	2.9%	30.1%	41.6%	46.3%	62.8%
Baa2	10.5%	6.1%	6.3%	14.5%	6.1%	6.1%	6.1%	6.1%	11.2%	6.1%	6.1%	6.1%	19.1%	28.0%	7.3%	54.7%	68.5%	58.0%	78.8%
Baa3	16.3%	0.7%	13.1%	34.6%	0.2%	0.2%	4.5%	0.3%	23.3%	8.9%	24.1%	12.4%	45.0%	53.0%	15.7%	71.1%	75.9%	74.4%	81.4%
Ba1	26.1%	5.4%	23.0%	43.4%	1.3%	0.6%	18.4%	1.5%	37.1%	26.7%	37.0%	28.8%	60.9%	68.9%	42.5%	72.2%	77.1%	80.8%	83.2%
Ba2	38.1%	12.9%	39.6%	50.8%	3.4%	2.5%	36.3%	9.2%	58.9%	40.1%	59.6%	50.6%	73.4%	77.7%	64.0%	77.3%	77.0%	83.1%	81.5%
Ba3	35.6%	12.9%	41.1%	43.1%	6.1%	6.9%	32.7%	11.4%	46.8%	40.9%	54.5%	47.5%	70.2%	76.2%	59.7%	77.3%	76.8%	81.7%	81.9%
B1	54.0%	38.5%	57.6%	47.0%	33.3%	29.6%	49.1%	52.2%	59.7%	66.7%	71.1%	67.3%	73.3%	74.2%	81.5%	80.8%	77.6%	83.8%	83.5%
B2	65.0%	47.2%	73.2%	52.8%	42.8%	48.0%	72.1%	60.3%	62.6%	77.4%	75.8%	80.0%	81.9%	83.0%	82.2%	80.6%	75.5%	83.5%	82.8%
B3	57.3%	35.8%	62.8%	55.5%	31.4%	37.9%	63.0%	38.1%	65.9%	68.8%	72.1%	72.3%	80.3%	78.5%	78.3%	77.9%	73.1%	81.3%	81.4%
Caa1	67.1%	9.7%	53.4%	34.4%	67.0%	77.4%	70.0%	73.2%	54.4%	70.6%	76.0%	71.4%	85.1%	79.7%	83.9%	84.3%	71.3%	83.9%	84.3%
Caa2	70.2%	19.2%	53.4%	42.5%	72.2%	78.9%	72.5%	78.3%	59.5%	69.0%	78.4%	75.6%	84.8%	81.9%	85.0%	85.8%	69.2%	84.4%	84.8%
Caa3	81.5%	50.1%	71.6%	65.7%	88.3%	86.4%	81.2%	86.0%	74.1%	81.8%	82.4%	84.0%	90.5%	91.1%	89.5%	89.9%	77.2%	90.6%	90.3%
Caa3	77.3%	55.2%	67.6%	67.0%	81.9%	80.4%	78.3%	81.0%	73.7%	76.5%	78.1%	78.3%	82.3%	82.2%	83.7%	83.9%	74.9%	85.3%	86.1%

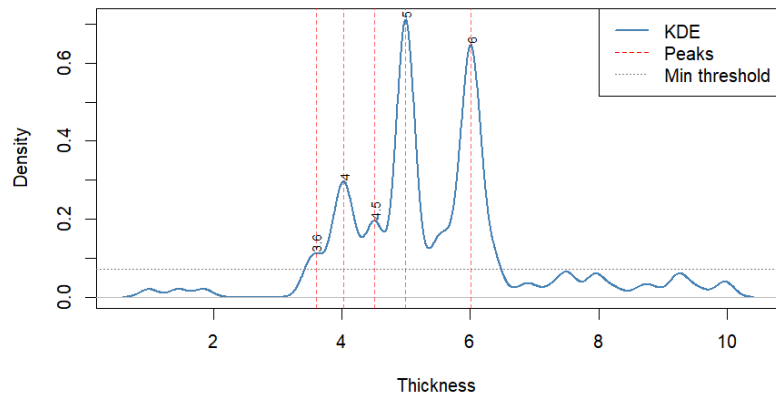
4.

Tranche Thickness and Risk

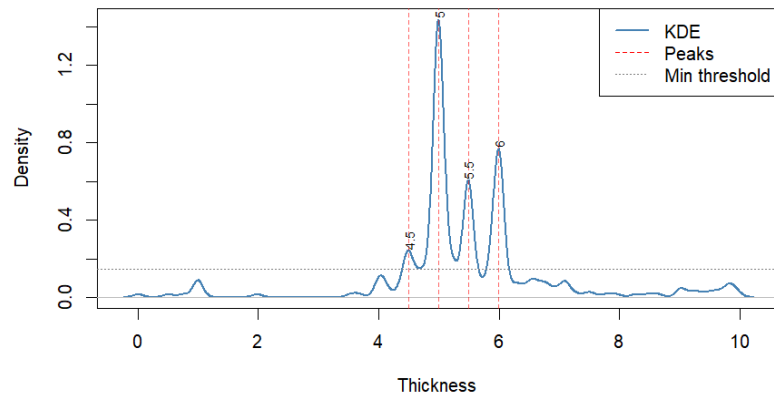
Kernel Density Estimation—Baa1/Baa2

37

Thickness Peaks — Baa1

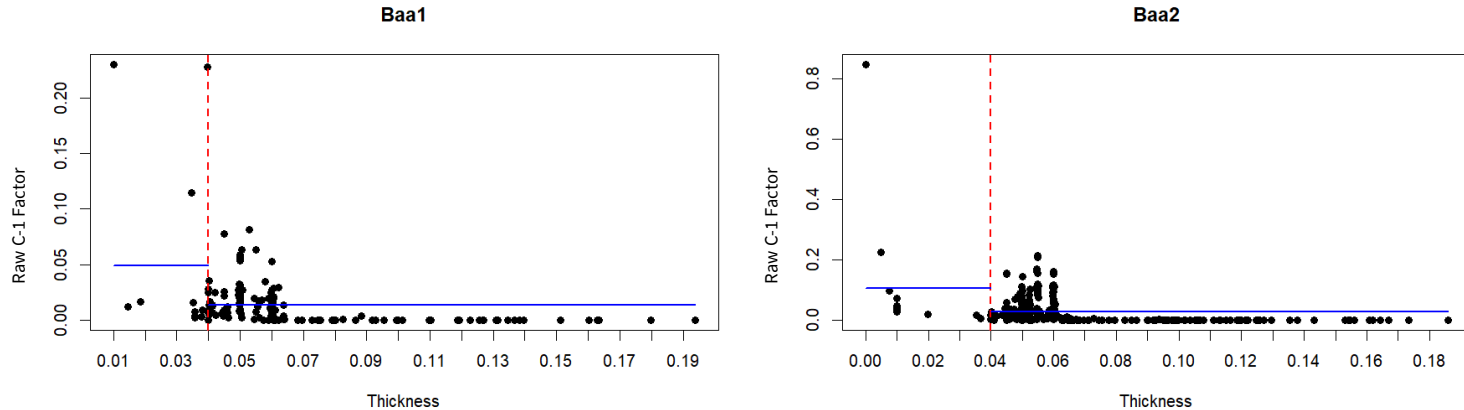


Thickness Peaks — Baa2



Tranche Thickness 4% Cut-Off Baa1/Baa2

38



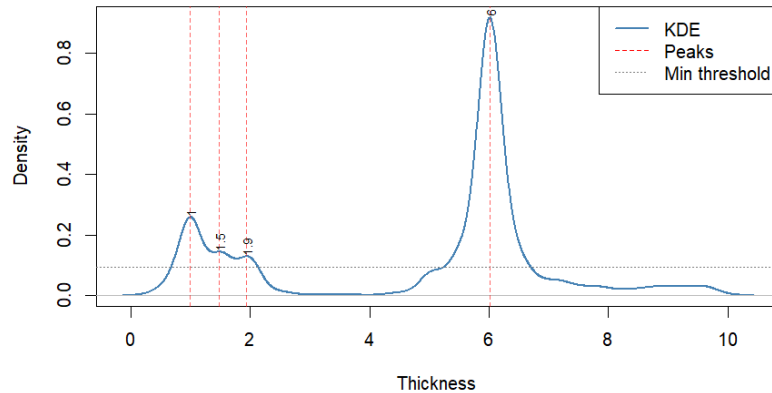
The scatterplots above show the relationship between tranche thickness and raw C-1 factor within a single rating bucket. Each dot represents one CLO debt tranche. The blue horizontal lines show the average raw C-1 factor across the dataset for CLO debt tranches of the given rating and tranche thickness (less than or equal vs. greater than 4%). The difference between the blue lines shows that tranche thickness provides information on tail risk, as represented by the raw C-1 factor, that is not captured by ratings.

Tranche thickness is not included as a comparable attribute in modeled factors for Baa1 and Baa2 due to low sample size in these ratings, even though the pattern can be observed here.

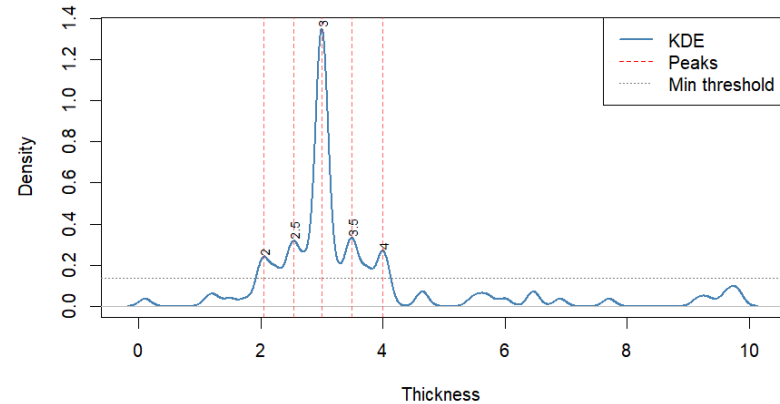
Kernel Density Estimation—Baa3/Ba1

39

Thickness Peaks — Baa3



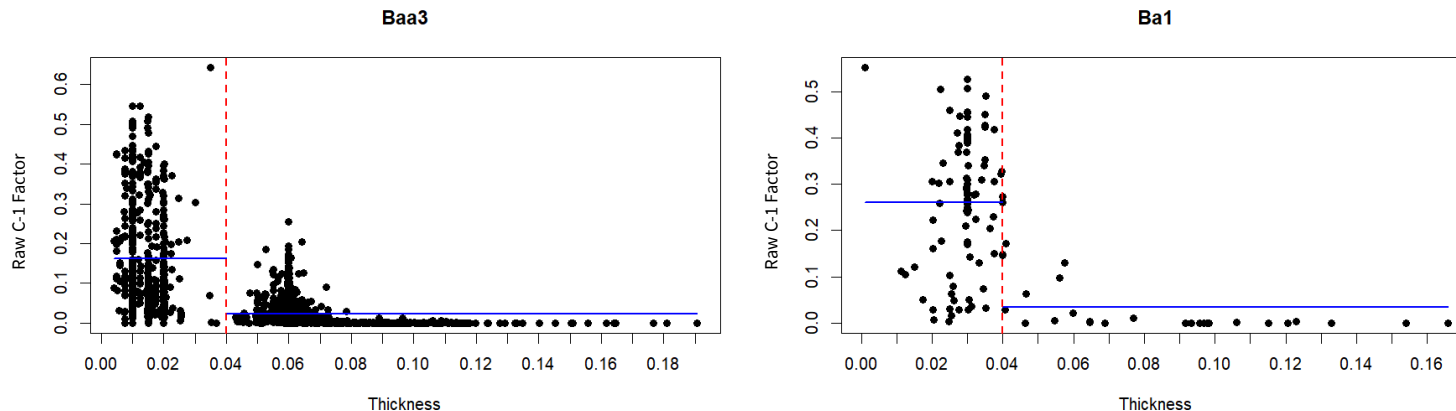
Thickness Peaks — Ba1



Tranche Thickness 4% Cut-Off

Baa3/Ba1

40

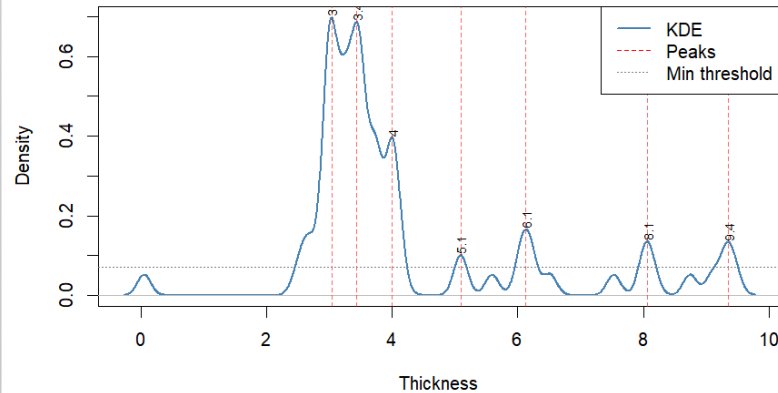


The scatterplots above show the relationship between tranche thickness and raw C-1 factor within a single rating bucket. Each dot represents one CLO debt tranche. The blue horizontal lines show the average raw C-1 factor across the dataset for CLO debt tranches of the given rating and tranche thickness (less than or equal vs. greater than 4%). The difference between the blue lines shows that tranche thickness provides information on tail risk, as represented by the raw C-1 factor, that is not captured by ratings.

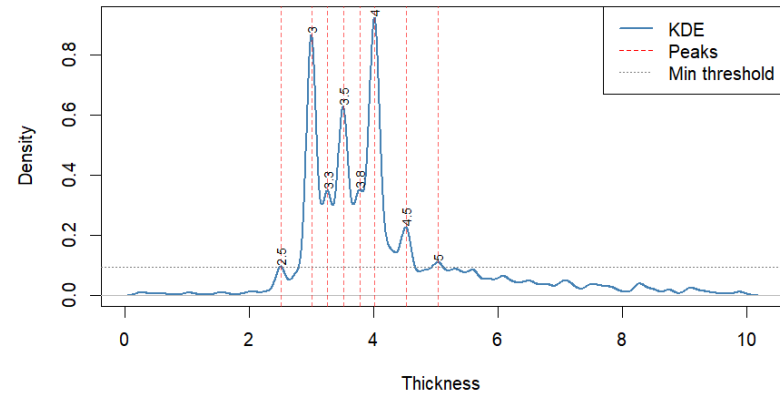
Kernel Density Estimation—Ba2/Ba3

41

Thickness Peaks — Ba2

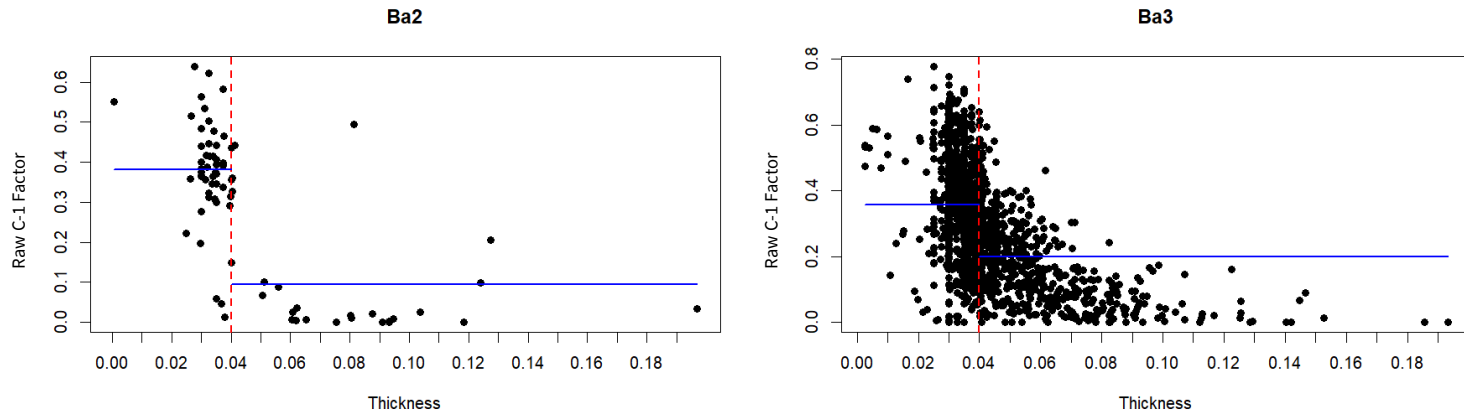


Thickness Peaks — Ba3



Tranche Thickness 4% Cut-Off—Ba2/Ba3

42

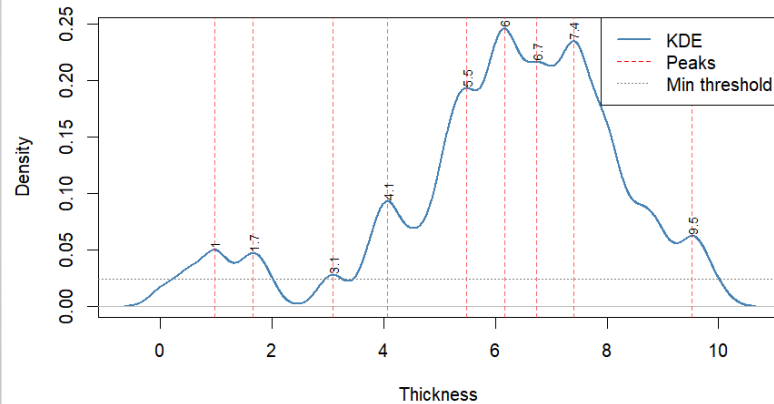


The scatterplots above show the relationship between tranche thickness and raw C-1 factor within a single rating bucket. Each dot represents one CLO debt tranche. The blue horizontal lines show the average raw C-1 factor across the dataset for CLO debt tranches of the given rating and tranche thickness (less than or equal vs. greater than 4%). The difference between the blue lines shows that tranche thickness provides information on tail risk, as represented by the raw C-1 factor, that is not captured by ratings.

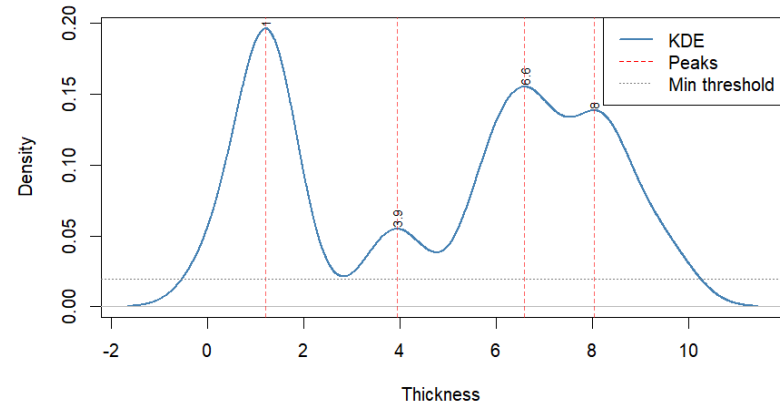
Kernel Density Estimation—B1/B2

43

Thickness Peaks — B1

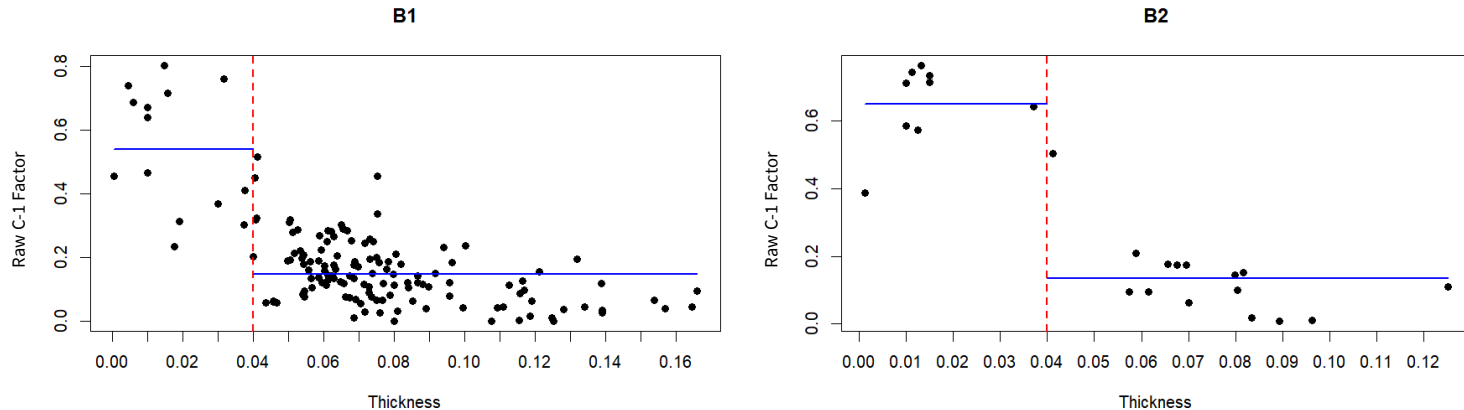


Thickness Peaks — B2



Tranche Thickness 4% Cut-Off—B1/B2

44

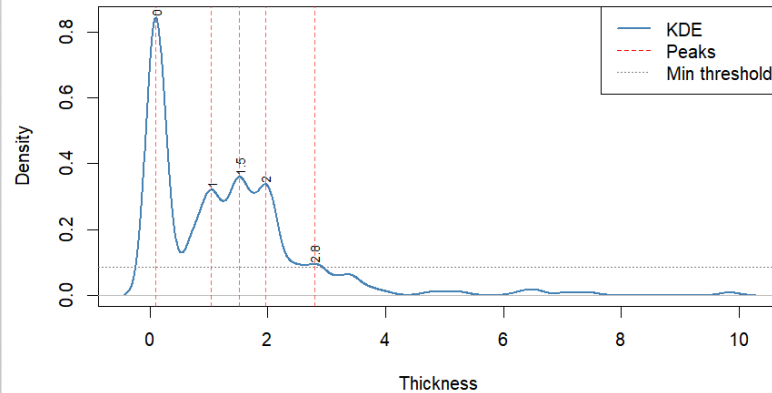


The scatterplots above show the relationship between tranche thickness and raw C-1 factor within a single rating bucket. Each dot represents one CLO debt tranche. The blue horizontal lines show the average raw C-1 factor across the dataset for CLO debt tranches of the given rating and tranche thickness (less than or equal vs. greater than 4%). The difference between the blue lines shows that tranche thickness provides information on tail risk, as represented by the raw C-1 factor, that is not captured by ratings.

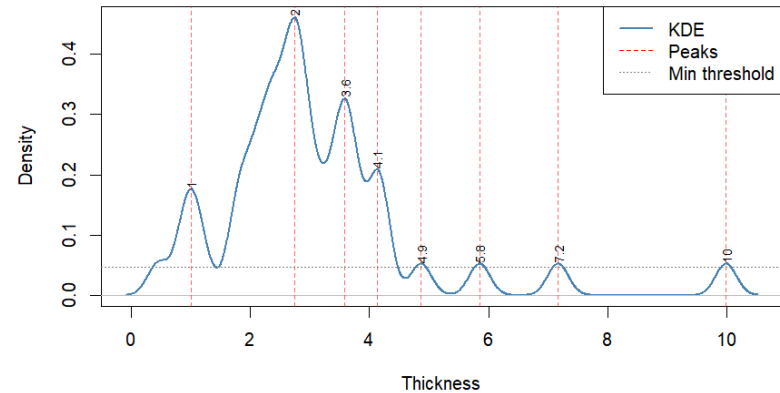
Kernel Density Estimation—B3/Caa1

45

Thickness Peaks — B3

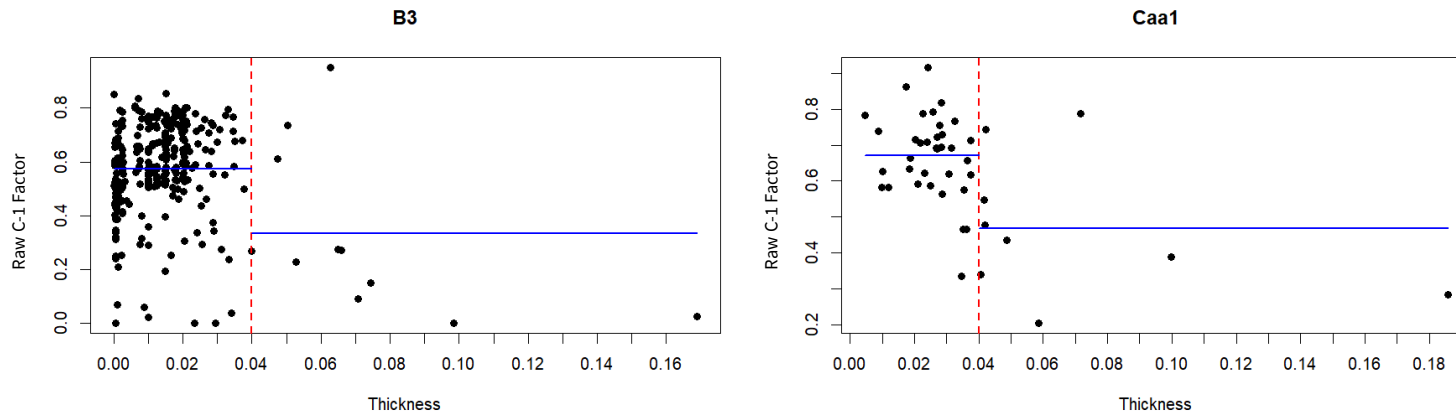


Thickness Peaks — Caa1



Tranche Thickness 4% Cut-Off—B3/Caa1

46

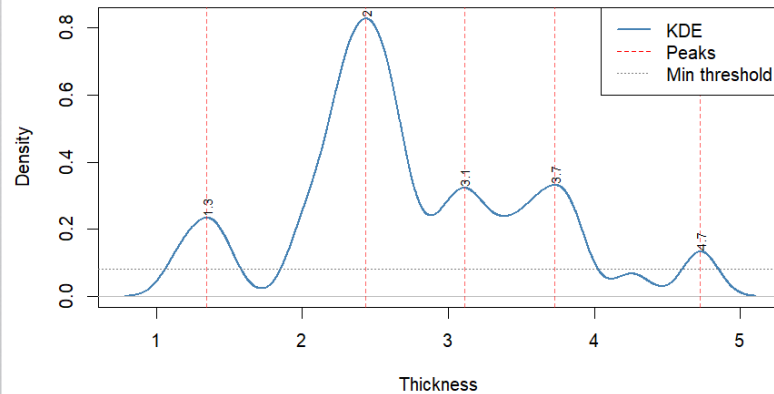


The scatterplots above show the relationship between tranche thickness and raw C-1 factor within a single rating bucket. Each dot represents one CLO debt tranche. The blue horizontal lines show the average raw C-1 factor across the dataset for CLO debt tranches of the given rating and tranche thickness (less than or equal vs. greater than 4%). The difference between the blue lines shows that tranche thickness provides information on tail risk, as represented by the raw C-1 factor, that is not captured by ratings.

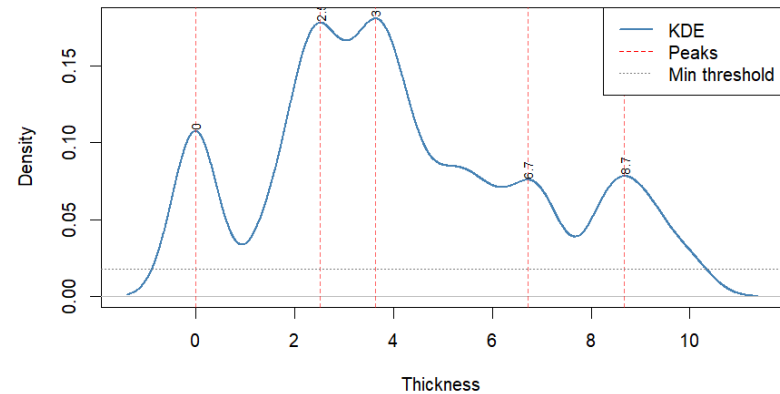
Kernel Density Estimation—Caa2/Caa3

47

Thickness Peaks — Caa2

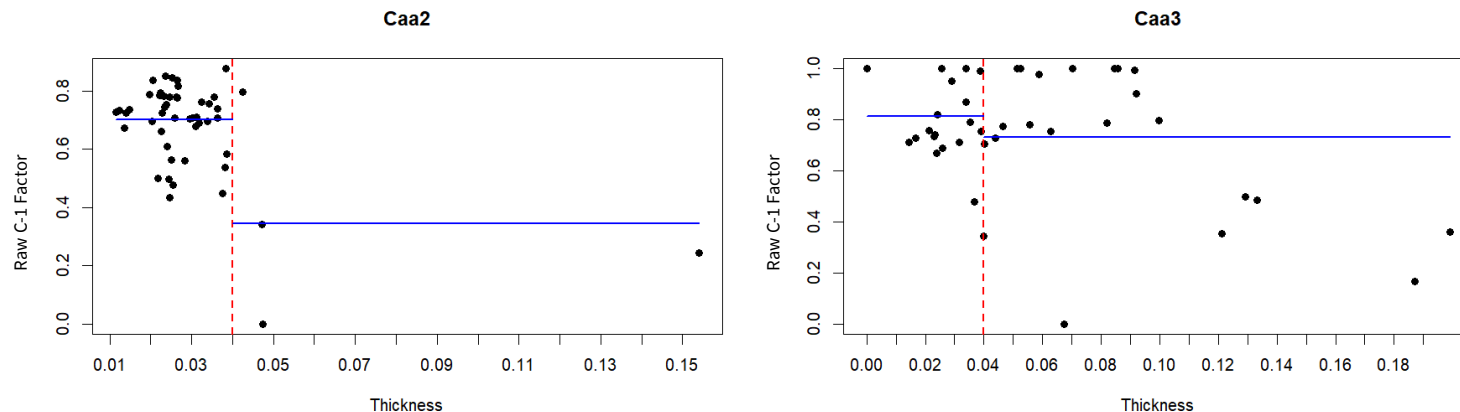


Thickness Peaks — Caa3



Tranche Thickness 4% Cut-Off—Caa2/Caa3

48



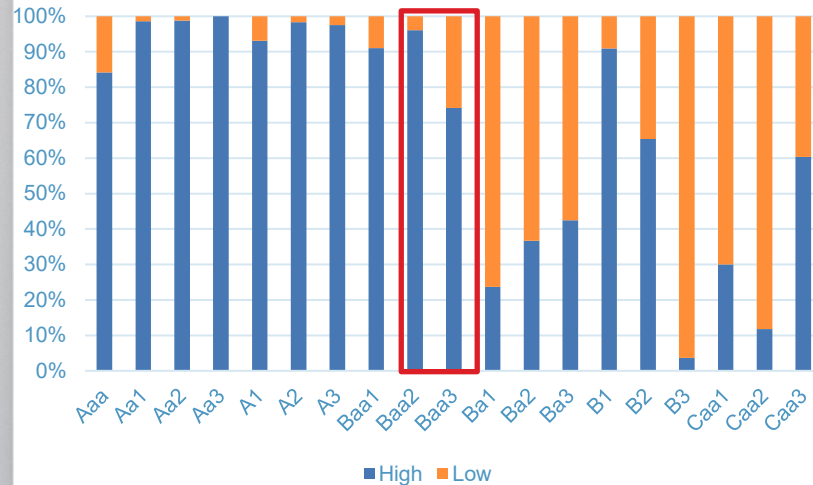
The scatterplots above show the relationship between tranche thickness and raw C-1 factor within a single rating bucket. Each dot represents one CLO debt tranche. The blue horizontal lines show the average raw C-1 factor across the dataset for CLO debt tranches of the given rating and tranche thickness (less than or equal vs. greater than 4%). The difference between the blue lines shows that tranche thickness provides information on tail risk, as represented by the raw C-1 factor, that is not captured by ratings.

Distribution by Tranche Thickness

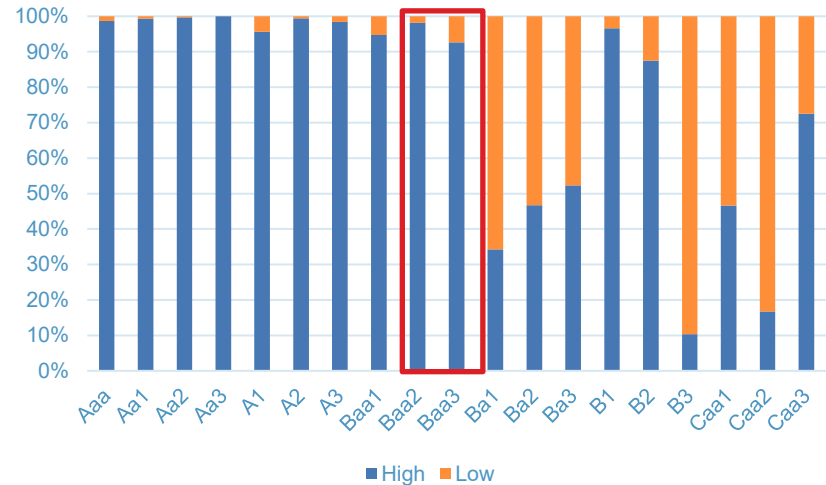
49

Differences between Baa2 and Baa3 tranche thickness are driven by securities with smaller \$ balances. In other words, the intuitive result holds that thin tranches have smaller \$ balances than thick tranches for most ratings.

High vs. Low Thickness (by Frequency)



High vs. Low Thickness (by Balance)



*High vs. low is defined as greater than vs. less than 4%

Distribution by Tranche Thickness

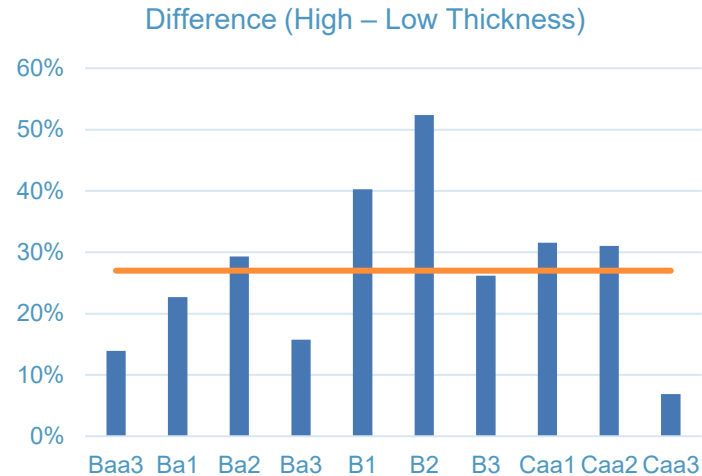
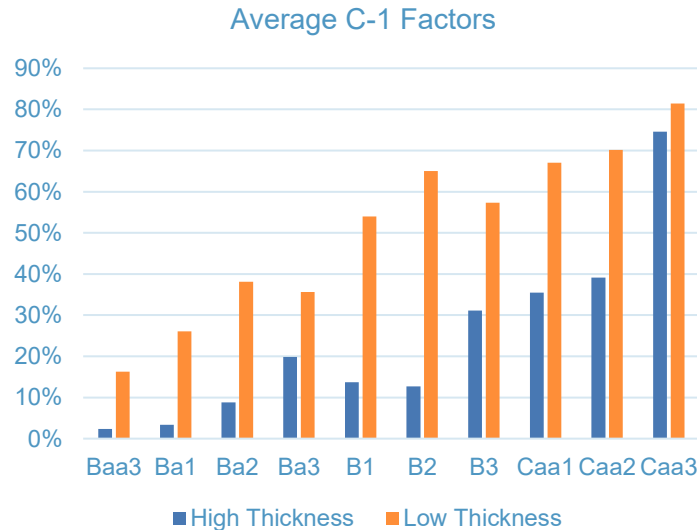
50

	Counts		Balance		Difference (Balance - Counts)	
	High	Low	High	Low	High	Low
Aaa	84%	16%	99%	1%	15%	-15%
Aa1	99%	1%	99%	1%	1%	-1%
Aa2	99%	1%	100%	0%	1%	-1%
Aa3	100%	0%	100%	0%	0%	0%
A1	93%	7%	96%	4%	3%	-3%
A2	98%	2%	99%	1%	1%	-1%
A3	98%	2%	98%	2%	1%	-1%
Baa1	91%	9%	95%	5%	4%	-4%
Baa2	96%	4%	98%	2%	2%	-2%
Baa3	74%	26%	93%	7%	19%	-19%
Ba1	24%	76%	34%	66%	10%	-10%
Ba2	37%	63%	47%	53%	10%	-10%
Ba3	43%	57%	52%	48%	10%	-10%
B1	91%	9%	97%	3%	6%	-6%
B2	65%	35%	88%	12%	22%	-22%
B3	4%	96%	10%	90%	7%	-7%
Caa1	30%	70%	47%	53%	17%	-17%
Caa2	12%	88%	17%	83%	5%	-5%
Caa3	60%	40%	73%	27%	12%	-12%

Raw C-1 Factor Averages by Tranche Thickness

51

Differences between high thickness and low thickness factors do not trend across rating and only have minor improvements to model fit; we use one premium across all ratings to avoid overfitting

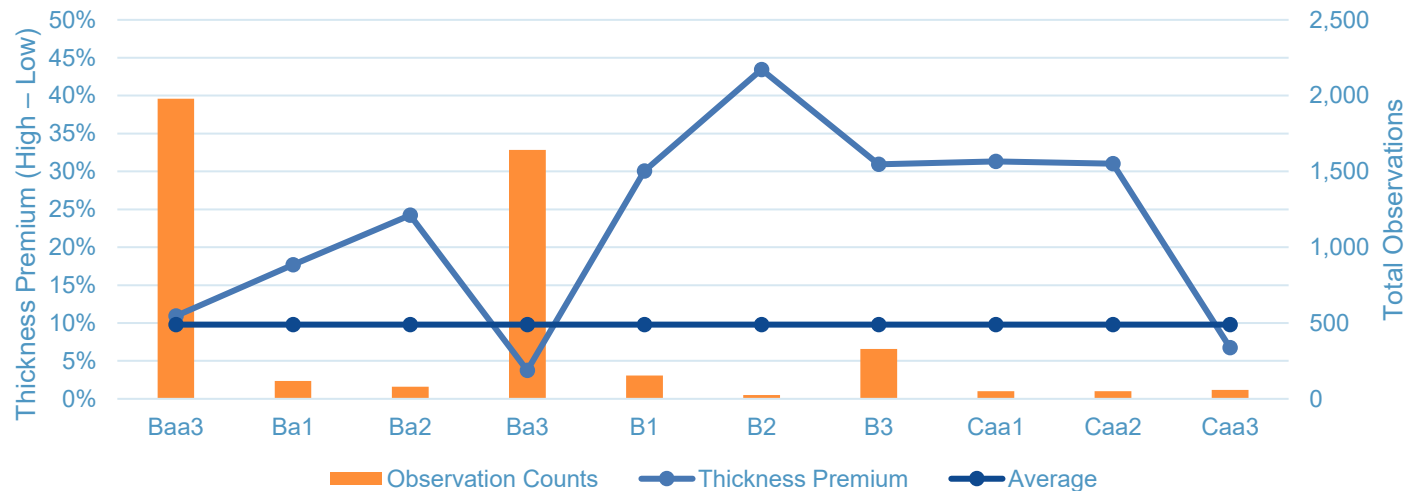


*Applying regression to standardize reinvestment horizon to mean, spiking out 4% thickness for Baa3/below and applying isotonic regression to A2/above

Model* Output Thickness Premiums

52

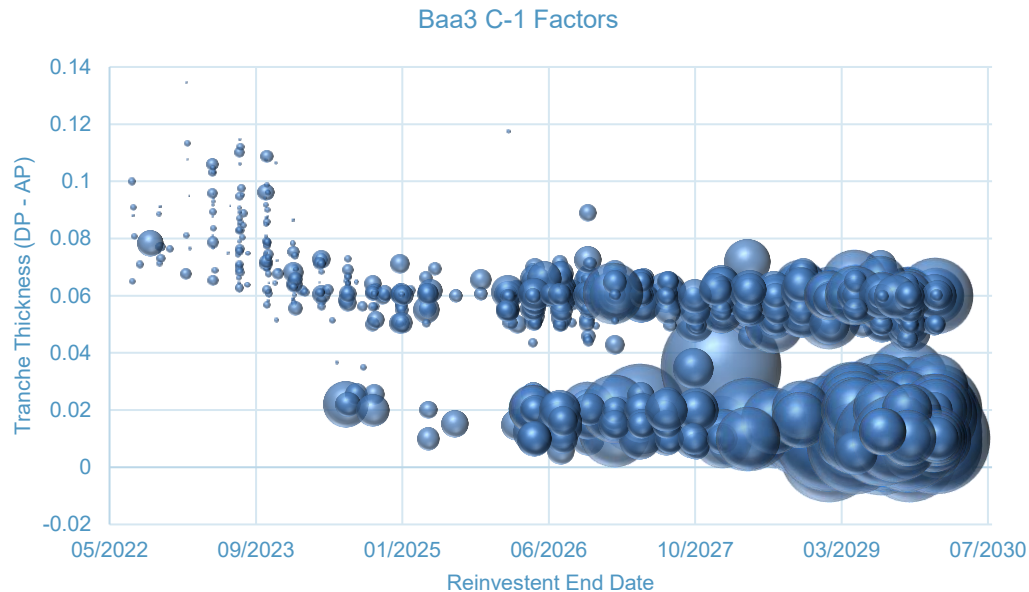
After accounting for reinvestment horizon (see next section) and estimating the thickness premium at each rating, we observe noisy results for B1/below and elect to use a single average across all Baa3/below ratings



Tranche Thickness and Reinvestment Horizon

53

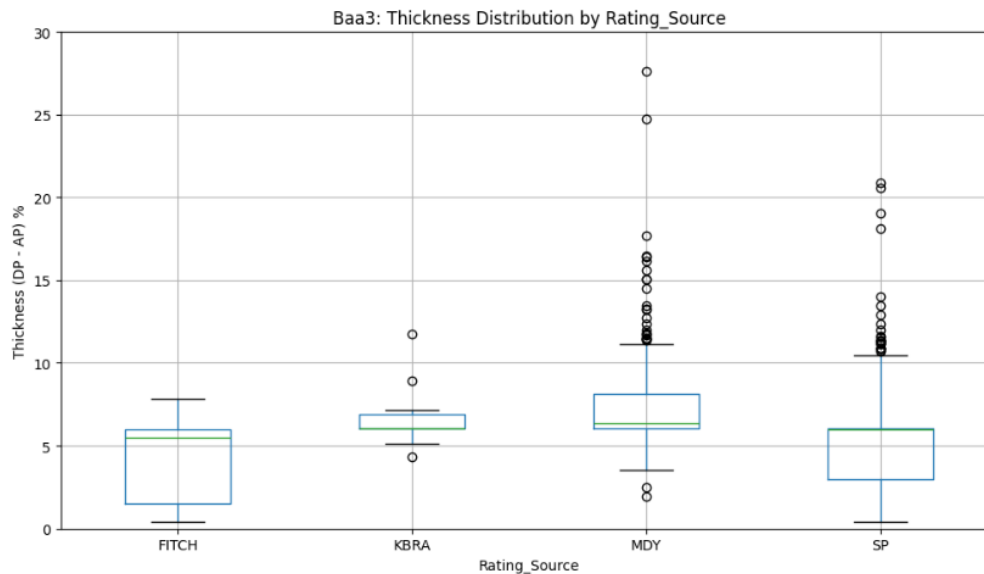
- Within Baa3 tranches, two distinct groups are represented here by two horizontal lines of bubbles.
- Each bubble represents one CLO debt tranche, with larger bubbles having higher C-1 factors.
- Bubbles are larger in the bottom row, showing that thin tranches are riskier.
- Bubbles are larger on the right, showing that longer remaining reinvestment horizons have more modeled risk.



Tranche Thickness by Rating Agency

54

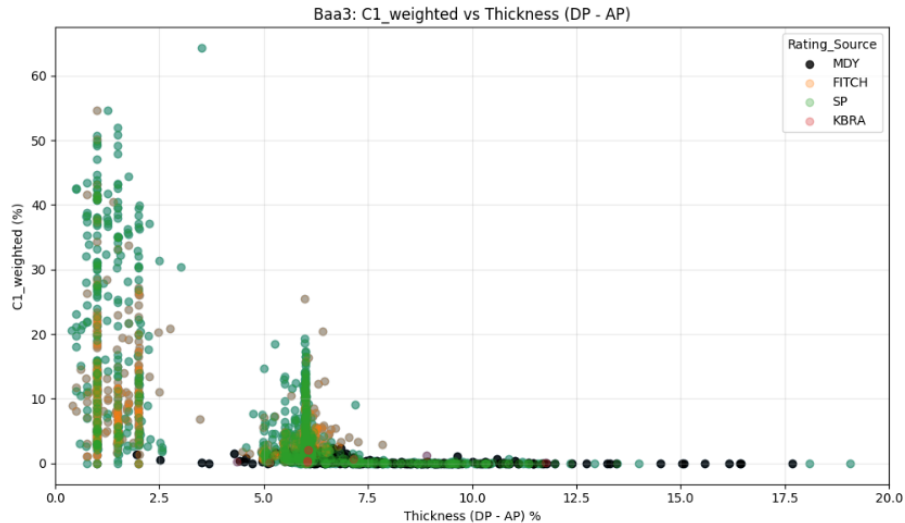
- Thinner tranches can qualify for an investment-grade rating from S&P or Fitch, which rate to the first dollar of loss (attachment point drives rating, detachment point does not).
- Moody's and KBRA* ratings incorporate severity of loss, as do modeled C-1 factors, and thus higher detachment points tend to be required for an investment-grade rating from Moody's or KBRA.



*KBRA is drawn from a smaller sample size in the data-set, consisting of only 10 Baa3 CLOs (see following slide for further details on the dataset)

Tranche Thickness by Rating Agency

- Baa3 CLOs are clustered at a 6% thickness (typical Baa3 attaches at 12% and detaches at 18%).
- Moody's ratings (black dots) tend to have higher thickness than S&P ratings (green dots).



Thickness Distribution by Rating_Source (Baa3 only):

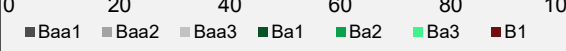
index	Rating_Source	count	mean	std	total_balance	avg_C1_weighted	simple_avg_C1	bal_thickness_<4%	bal_thickness_>=4%
0	FITCH	583	3.98	2.29	10371142500	4.5219	6.8773	15.35	84.65
1	KBRA	10	6.76	2.13	347144739	0.8527	0.7481	0	100
2	MDY	354	7.73	5.36	10257986866	0.6521	0.6579	0.76	99.24
3	SP	1033	5.19	2.65	23010314334	3.774	7.2659	6.72	93.28

5.

Sensitivities

Scope of Sample CLO Deals

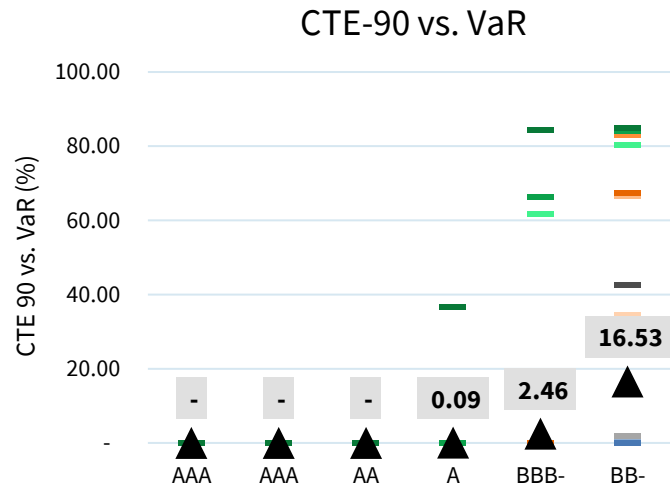
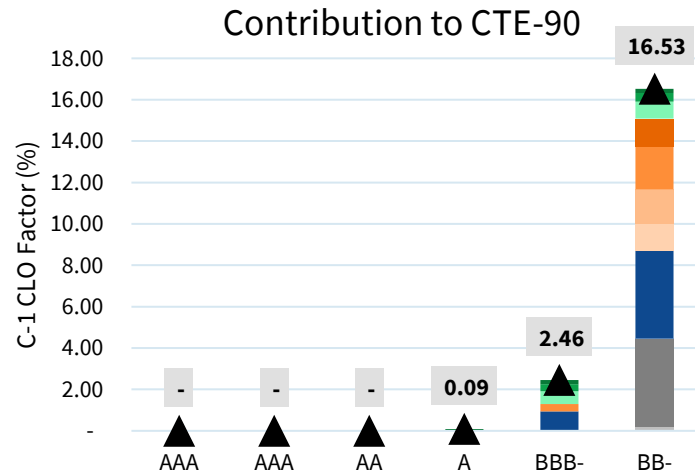
57

As of 9/30/24	Balance (\$mn)	Loans (#)	Unique Issuers (#)	Issuer* Rating Distribution
867331201	496.9	474	381	
867578342	598.6	499	435	
867567170	436.8	307	268	
830960738	684.3	365	329	
830871594	424.7	348	295	
867931338	389.6	171	153	
Sample Deals	3,030.9	1,660	933	
Total Moody's CLO Universe	744,181.3	27,802	2,021	 0 20 40 60 80 100 ■ Baa1 ■ Baa2 ■ Baa3 ■ Ba1 ■ Ba2 ■ Ba3 ■ B1 ■ B2 ■ B3 ■ Caa2 ■ Caa3 ■ Ca ■ NR

*Issuer rating shown. When comparing issuer and loan rating, S&P ratings are the same for 98% of the balance. Moody's ratings are the same for 57% and within 1 notch for 94% of the loan balance.

Hypothetical Results for Strata II, Deal ID#867931338

58

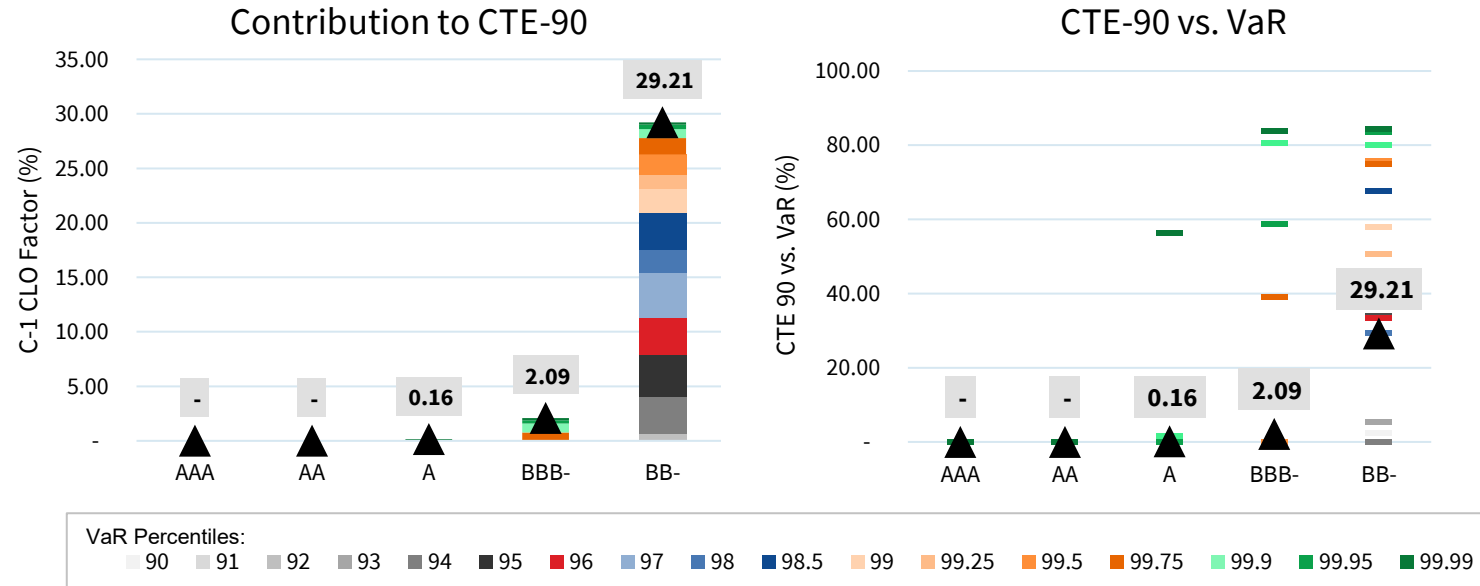


VaR Percentiles:

90 91 92 93 94 95 96 97 98 98.5 99 99.25 99.5 99.75 99.9 99.95 99.99

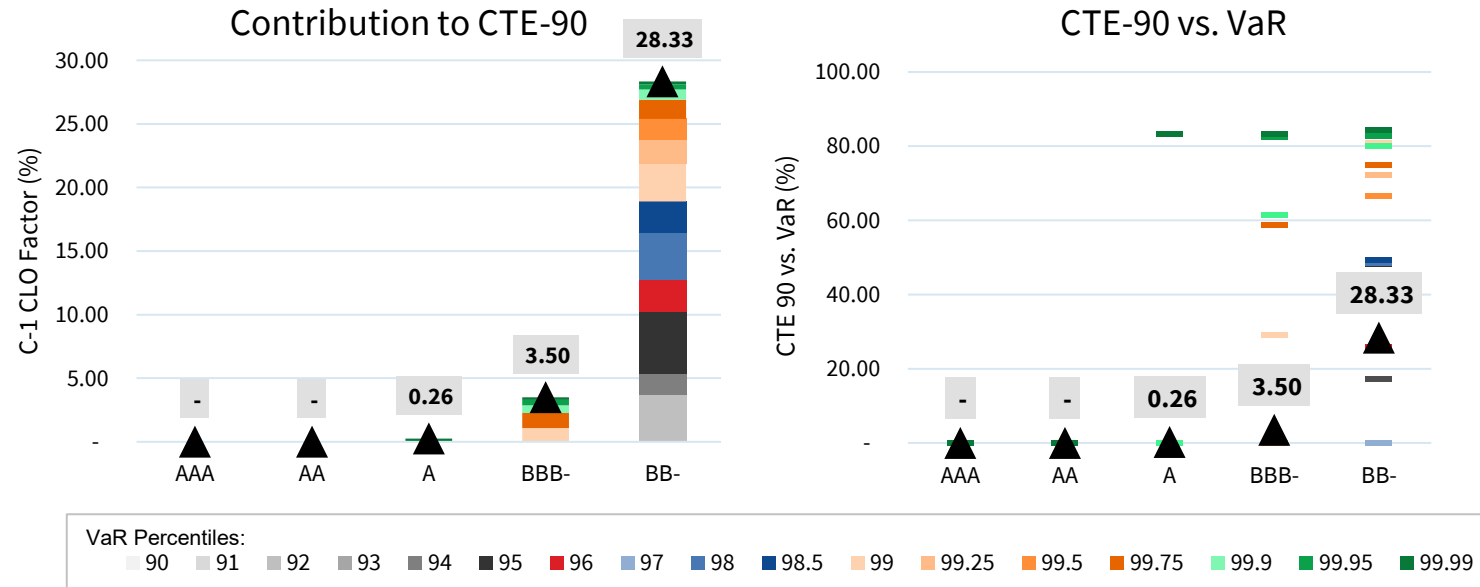
Hypothetical Results for Magnetite 27, Deal ID#867331201

59

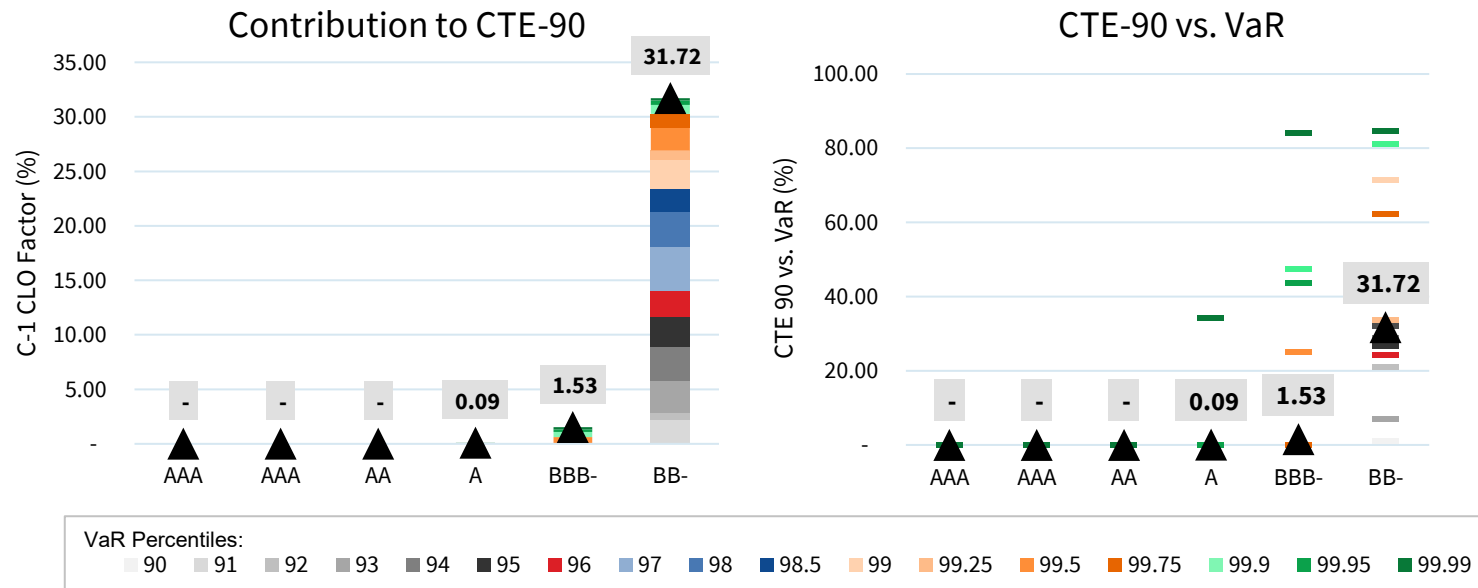


Hypothetical Results for OHA 3, Deal #830960738

60

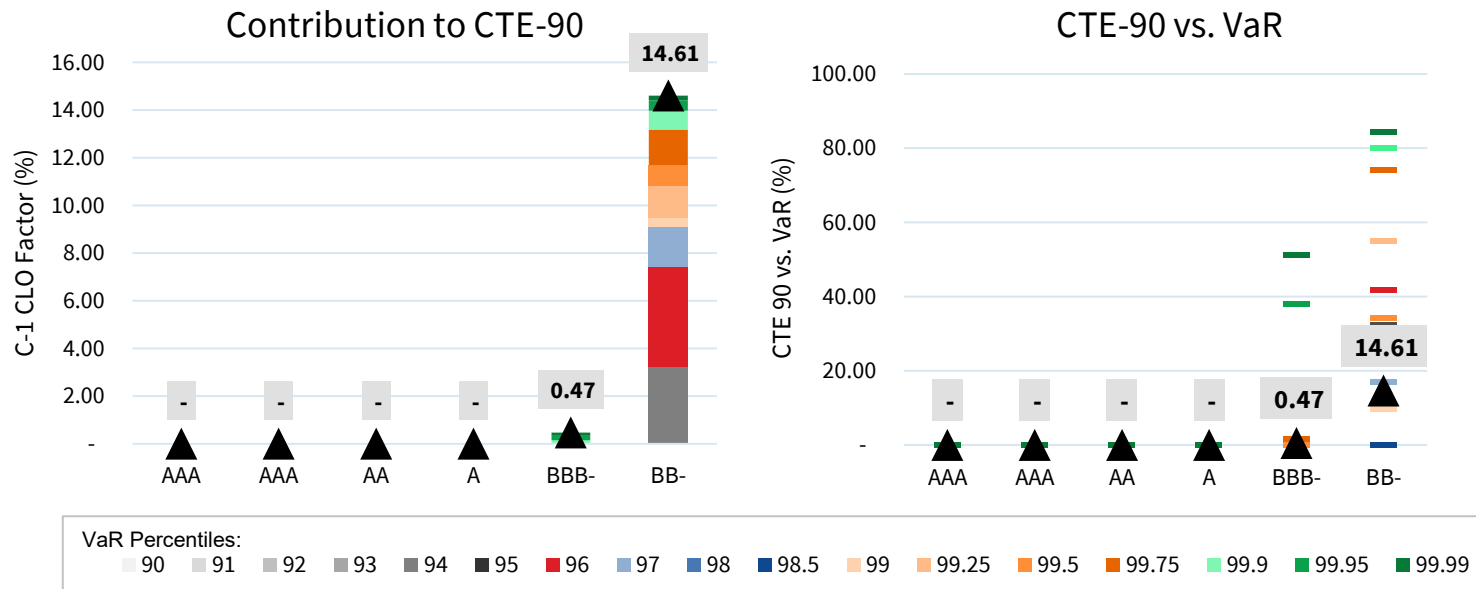


Hypothetical Results for Anchorage 17, Deal ID #867567170 ⁶¹

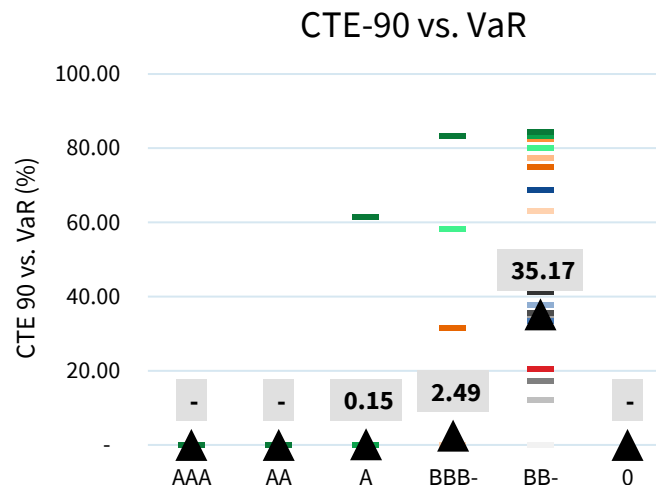
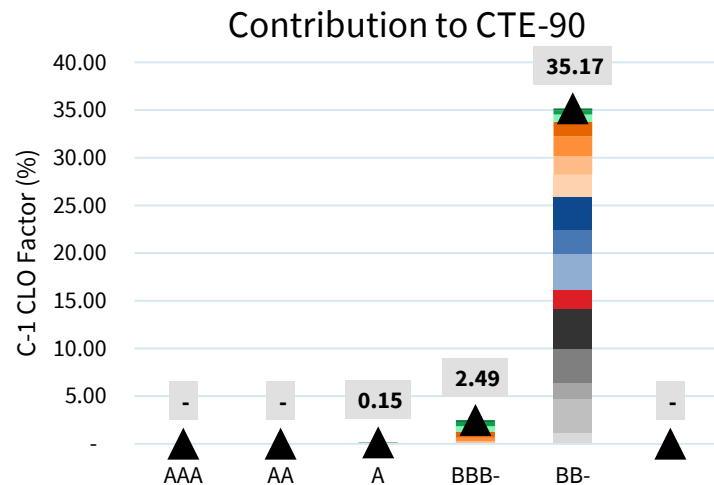


Hypothetical Results for Ares 52, Deal ID#830871594

62



Hypothetical Results for Carlyle 2021-1, Deal ID#867578342 ⁶³



VaR Percentiles:

90 91 92 93 94 95 96 97 98 98.5 99 99.25 99.5 99.75 99.9 99.95 99.99

Sensitivities Considered

64

Potential Sensitivity	Rationale	Source
Sensitivity test of pair-wise correlations $\rho = 0.05, 0.2, \text{ and } 0.4$ under the Gaussian Copula. It is more important to test this assumption for loans than bonds due to potentially more systemic risk among leveraged loans (higher leverage, lower credit rating, more intermediaries, opacity) vs. bonds.	$\rho = 0.02, 0.35$ and 0.51 referenced by Li & Chen as the 1-year, 5-year and 10-year correlations respectively, for approximately B-rated issuers (Altman's Z-scores of 1.2 to 2.8), from 1992 – 2013 based on S&P's Compustat database. $\rho = 0.02, 0.10$ and 0.09 referenced by Qi et al. as the 1-year, 5-year, and 10-year correlations respectively, for B-rated bonds over a longer time horizon 1970 – 2014 based on Moody's Corporate Default Risk Service database (DRS). Limitation: Does not capture tail dependence or asymmetric distribution of correlations.	Li and Chen. (2018). The domino effect of credit defaults: test of asymmetric default correlations using realised default data. Applied Economics. Qi et al. (2019). Default correlation: rating, industry ripple effect, and business cycle. Applied Economics. Financial Stability Board. (2019). Vulnerabilities associated with leveraged loans and collateralized loan obligations.

Sensitivity—Systemic Risk

65

After-Tax C-1 / Tranche Rtg	Baseline Dec '25	1	2
		5% Corr	20% Corr
Aaa	0.00%	0.00%	0.00%
Aa2	0.00%	0.00%	0.05%
A2	0.04%	0.01%	1.24%
Baa2	0.89%	0.04%	8.17%
Baa3	2.34%	0.80%	12.58%
Ba3	30.72%	20.18%	52.93%

*Results are preliminary and subject to change. This is only 6 deals—results may change when all CLOs held by life insurers are included. Baa2 tranche is from only one deal and is therefore potentially especially unrepresentative due to its small sample size.

Systemic risk is modeled with pairwise correlation between loans.

Baseline correlation is 10%.

Li and Chen (2018) reference 2%, 35% and 51% in 1-yr, 5-yr and 10-yr correlations for B-rated issuers

Qi et al (2019) reference 2%, 10% and 9% in 1-yr, 5-yr and 10-yr correlations for B-rated bonds

Sensitivities Considered

66

Potential Sensitivity	Rationale	Source
Use the Clayton Copula instead of Gaussian Copula to capture asymmetric distribution of the default correlations. Parametrize and compare the cumulative distributions (dots of r_i 's) generated by Gaussian vs. Clayton Copulas.	In the left tail, correlations are higher ($0 < r_i < 1$, random numbers generated are more clustered near 0), representing highly stressed credit markets. Limitation: assume no autocorrelation between $\rho(t-1)$ and $\rho(t)$	European Security and Markets Authority. (2019). Leveraged loans, CLOs – trends and risks. Das and Geng. (2004). Correlated Default Processes: A Criterion-Based Copula Approach.

Sensitivity—Copula

67

		3
After-Tax C-1 / Tranche Rtg	Baseline Dec '25	Clayton Copula
Aaa	0.00%	0.00%
Aa2	0.00%	0.00%
A2	0.04%	0.08%
Baa2	0.89%	2.21%
Baa3	2.34%	7.57%
Ba3	30.72%	34.04%

Baseline assumption = Gaussian Copula
Clayton Copula may capture asymmetric distribution of the default correlations and has fatter tails.

*Results are preliminary and subject to change. This is only 6 deals—results may change when all CLOs held by life insurers are included. Baa2 tranche is from only one deal and is therefore potentially especially unrepresentative due to its small sample size.

Hypothetical Impact of Sensitivities on Bond Factors

68

Systemic Risk	Gaussian				Clayton			
	5	10	20	40	5	10	20	40
Aaa	0.15%	0.16%	0.16%	0.18%	0.18%	0.16%	-0.03%	-0.05%
Aa1	0.26%	0.27%	0.31%	0.37%	0.33%	0.38%	0.14%	-0.08%
Aa2	0.41%	0.45%	0.54%	0.81%	0.60%	0.85%	0.96%	-0.14%
Aa3	0.48%	0.53%	0.69%	0.98%	0.80%	1.18%	1.40%	0.00%
A1	0.59%	0.66%	0.90%	1.52%	0.95%	1.51%	2.23%	1.01%
A2	0.68%	0.82%	1.15%	2.16%	1.26%	2.05%	3.29%	3.29%
A3	0.80%	0.99%	1.50%	2.64%	1.53%	2.53%	4.13%	6.46%
Baa1	0.96%	1.23%	1.86%	3.35%	1.89%	3.13%	5.48%	9.20%
Baa2	1.19%	1.53%	2.40%	4.32%	2.39%	4.03%	7.05%	13.48%
Baa3	1.60%	2.14%	3.47%	6.11%	3.18%	5.25%	9.71%	17.02%
Ba1	2.24%	3.10%	4.96%	9.32%	4.42%	7.31%	13.31%	22.86%
Ba2	3.33%	4.64%	7.39%	13.09%	6.17%	9.97%	16.72%	27.95%
Ba3	4.10%	5.77%	8.81%	15.59%	7.37%	11.41%	18.36%	31.28%
B1	5.32%	7.44%	11.23%	18.99%	8.83%	13.72%	21.43%	34.96%
B2	6.94%	9.48%	14.19%	23.55%	10.67%	16.04%	25.21%	39.12%
B3	9.05%	12.53%	17.50%	28.04%	13.60%	19.58%	28.69%	44.52%
Caa1	13.04%	17.23%	23.50%	34.82%	17.34%	23.93%	35.04%	50.14%
Caa2	18.95%	23.80%	30.62%	43.70%	22.92%	30.33%	42.23%	57.75%
Caa3	27.46%	32.86%	42.33%	55.81%	30.34%	37.81%	49.02%	66.69%

Bond factors assuming a Gaussian Copula and 10% systemic risk are shown in the highlighted column (note that these corresponding results differ slightly from published factors due to changes in the random seed).

The impact of changing the systemic risk and copula model are shown here—higher systemic risk and Clayton Copula would lead to hypothetically higher C-1 factors for bonds.

Sensitivities Considered

69

Potential Sensitivity	Rationale	Source
Continuous economic state model: Recoveries are also dependent on a common systematic factor $Z_{i,t}$ (economic state) from the reduced form default model: i) Linear $R_{i,t} = u_R + \beta_R * Z_{i,t} + \sigma_R * \eta_{i,t}$ $\eta_{i,t}$ is standard normal idiosyncratic shocks ii) Beta (α_i, β_i) recovery model, conditional on $Z_{i,t}$, where α_i, β_i can be calculated from u_R and σ_R	From Moody's Structured Finance 2024 paper, across seniorities (s): For first lien, $u_R = 0.6$, $\sigma_R = 0.25$ Senior secured, $u_R = 0.45$, $\sigma_R = 0.30$ Senior unsecured, $u_R = 0.35$, $\sigma_R = 0.30$ Subordinate, $u_R = 0.25$, $\sigma_R = 0.25$	Altman. (2024). Forecasting Credit Cycles: The Case of the Leveraged Finance Market in 2024 and Outlook. The Journal of Risk and Financial Management. Moody's Analytics. (2025). Moody's Ratings Structured Finance team. (2024). Ratings Methodology: Corporate Synthetic CDOs.

Sensitivity—Correlation in Severities

70

		4
After-Tax C-1 / Tranche Rtg	Baseline Dec '25	Corr Severities
Aaa	0.00%	0.00%
Aa2	0.00%	0.00%
A2	0.04%	0.29%
Baa2	0.89%	3.73%
Baa3	2.34%	8.51%
Ba3	30.72%	42.38%

Baseline assumption is no correlation.

Sensitivity test correlated recovery rates, using Gaussian Copula with 10% correlation.

Note: If recoveries are correlated with rate of default (e.g., high default environments have lower recoveries), then recoveries will be correlated with one another.

*Results are preliminary and subject to change. This is only 6 deals—results may change when all CLOs held by life insurers are included. Baa2 tranche is from only one deal and is therefore potentially especially unrepresentative due to its small sample size.

Sensitivities Considered

71

Potential Sensitivity	Rationale	Source
Test lower recoveries (i.e., higher LGD) averages	S&P LGD distributions are more dated and materially lower than historical averages from JPM and Moody's. Limitations: variation of LGD across sectors/industries, year of default or issuance, correlation with defaults are not accounted for.	Jantzen et al. (2025). J.P. Morgan Default Monitor September 2025.
Discrete economic state model Two states: low defaults, severities, and correlations vs. high defaults, severities, and correlations. Dependence between defaults and recoveries is built-in by their dependence on the economic state.	Would need to have two sets of assumptions of defaults by rating and severities. Normal state: correlation between defaults, between defaults and recoveries of 0.1, 0.3 respectively Stressed state: 0.4, 0.5 respectively.	Bruche and Gonzalez-Aguado. (2008). Recovery Rates, Default Probabilities and the Credit Cycle. CEMFI, Madrid. Moody's Analytics. (2021). Assessment of the Proposed Revisions to the RBC C1 Bond Factors.

Sensitivity—Recovery Average

72

After-Tax C-1 / Tranche Rtg	Baseline Dec '25	5
		Lower Recovery
Aaa	0.00%	0.00%
Aa2	0.00%	0.00%
A2	0.04%	1.77%
Baa2	0.89%	21.73%
Baa3	2.34%	19.62%
Ba3	30.72%	59.09%

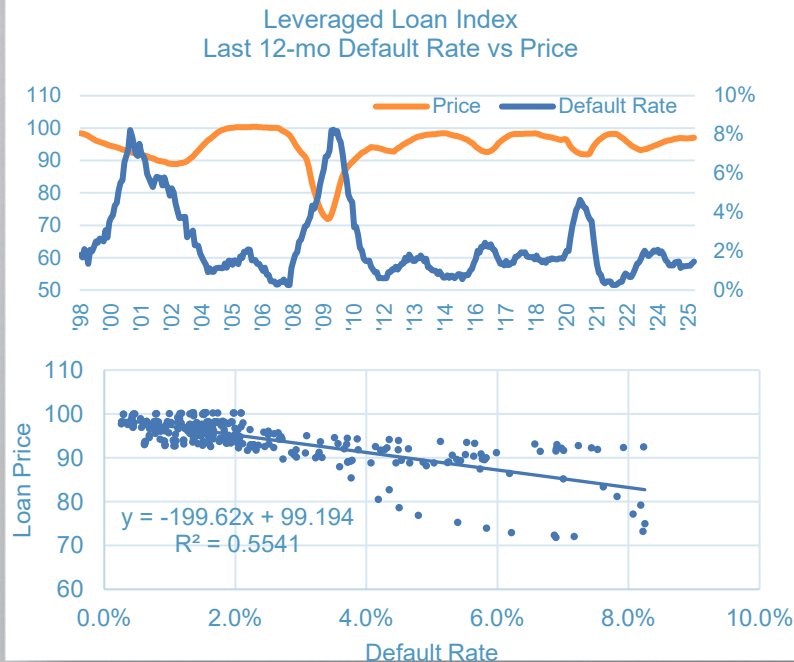
*Results are preliminary and subject to change. This is only 6 deals—results may change when all CLOs held by life insurers are included. Baa2 tranche is from only one deal and is therefore potentially especially unrepresentative due to its small sample size.

Baseline assumption S&P average loss given default (LGD): 27% for senior secured, 60% for senior unsecured.

A higher LGD is tested: 36% for senior secured, 54% for senior unsecured (despite being lower for senior unsecured, this is higher overall because most loans in CLOs are senior secured).

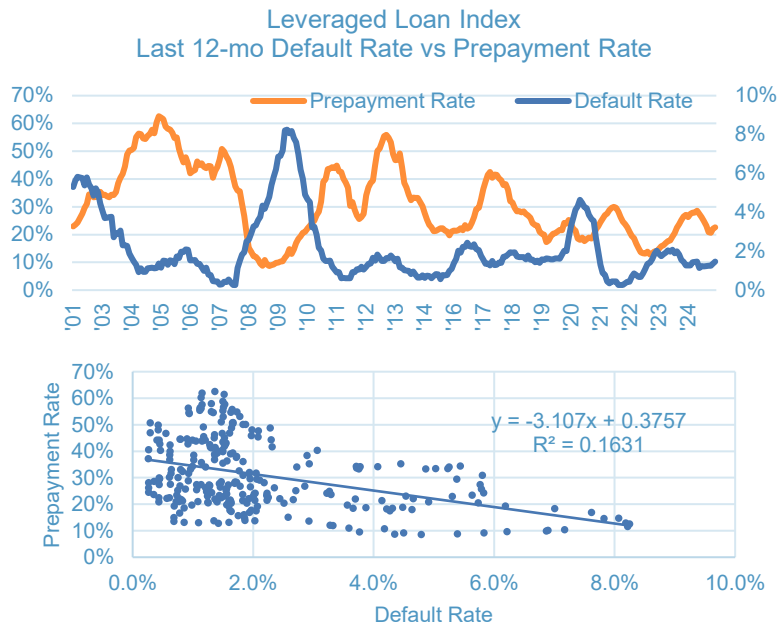
However, in both cases simple averages are not the input to the model. Decile data published by S&P was used so that the tail could be captured. The averages for the sensitivity are fitted to the shape of the S&P deciles by least-squares optimization.

Relationship of Last 12-Month Default Rate and Loan Price 73



- Data from Pitchbook/LCD dating back to 11/30/1997
- Data strongly supports some level of discount relative to par on reinvestment, with moderate support for specific relationship
- Relationship shown here is across all loan ratings
 - ✓ Relationship could differ by rating with tradeoffs for collateral modeling practicality and further reduction in R^2 at rating specific levels

Relationship of Last 12-Month Default Rate and Loan Price 74



- Data from Pitchbook/LCD dating back to 1/1/2000
- Data strongly supports some level of prepayment in all markets with weaker support for specific relationship
- Relationship shown here is across all loan ratings
 - ✓ Relationship could differ by rating with tradeoffs for collateral modeling practicality and further reduction in R^2 at rating specific levels

Sensitivity—Collateral Repurchase Price and Prepayment 75

After-Tax C-1 / Tranche Rtg	Baseline Dec '25	6	7
		Prepay & Discount A	Prepay & Discount B
Aaa	0.00%	0.00%	0.00%
Aa2	0.00%	0.00%	0.00%
A2	0.04%	0.07%	0.07%
Baa2	0.89%	0.00%	0.00%
Baa3	2.34%	0.55%	0.37%
Ba3	30.72%	10.15%	6.67%

*Results are preliminary and subject to change. This is only 6 deals—results may change when all CLOs held by life insurers are included. Baa2 tranche is from only one deal and is therefore potentially especially unrepresentative due to its small sample size.

Baseline scenario models no prepayments and no repurchase discounts. Sensitivities model historically low prepayment speeds and purchase prices, consistent with stressed credit environments.

Sensitivity A = average of every observation less than or equal to the 10th percentile of the historical data of each the prepayment speeds and purchase prices: 11.8% prepayment rate, 82.5 price.

Sensitivity B = prepay and repurchase price equal to VaR(0.5) of historical data: 8.7% prepayment rate, 72.0 price.

Sensitivity—Recovery, Prepayment and Repurchase Price 76

After-Tax C-1 / Tranche Rtg	Baseline Dec '25	8	9
		5 & 6	5 & 7
Aaa	0.00%	0.00%	0.00%
Aa2	0.00%	0.00%	0.00%
A2	0.04%	0.20%	0.11%
Baa2	0.89%	0.00%	0.00%
Baa3	2.34%	5.51%	3.43%
Ba3	30.72%	31.12%	23.27%

Combination of lower recovery averages along with prepayment and repurchase discounts.

*Results are preliminary and subject to change. This is only 6 deals—results may change when all CLOs held by life insurers are included. Baa2 tranche is from only one deal and is therefore potentially especially unrepresentative due to its small sample size.

Sensitivity #6—Widely Varying Results Across Deals

77

After-Tax C-1 / Tranche Rtg	Prepay & Discount A						
	Average	Carlyle 2021-1	Strata II	Ares 52	Magnetite 27	OHA 3	Anchorage 17
Aaa	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Aa2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
A2	0.07%	0.00%	0.00%	0.00%	0.00%	0.41%	0.00%
Baa2	0.00%	0.00%	n/a	n/a	n/a	n/a	n/a
Baa3	0.55%	0.00%	1.89%	0.83%	0.00%	0.60%	0.00%
Ba3	10.15%	0.00%	15.43%	31.11%	5.45%	1.22%	7.66%

*Results are preliminary and subject to change. This is only 6 deals—results may change when all CLOs held by life insurers are included. Baa2 tranche is from only one deal and is therefore potentially especially unrepresentative due to its small sample size.



Sensitivity #7—Widely Varying Results Across Deals

78

After-Tax C-1 / Tranche Rtg	Prepay & Discount B						
	Average	Carlyle 2021-1	Strata II	Ares 52	Magne-tite 27	OHA 3	Ancho-rage 17
Aaa	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Aa2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
A2	0.07%	0.00%	0.00%	0.00%	0.00%	0.41%	0.00%
Baa2	0.00%	0.00%	n/a	n/a	n/a	n/a	n/a
Baa3	0.37%	0.00%	0.81%	0.79%	0.00%	0.60%	0.00%
Ba3	6.67%	0.00%	10.00%	28.68%	0.01%	1.22%	0.13%

*Results are preliminary and subject to change. This is only 6 deals—results may change when all CLOs held by life insurers are included.

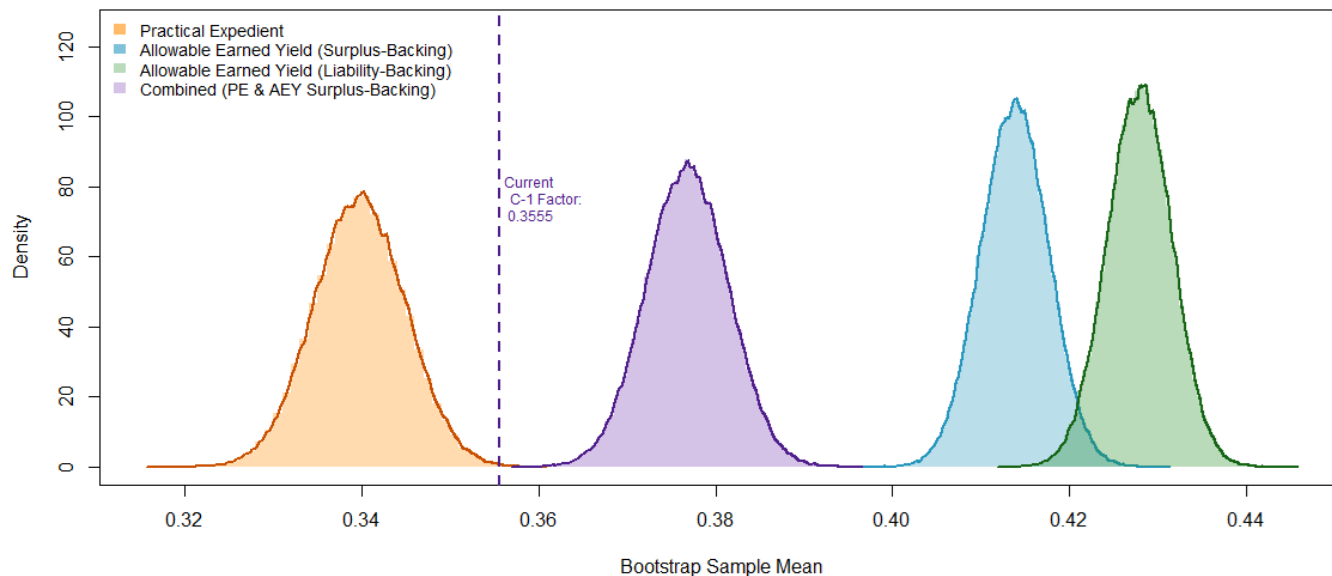
6.

Residual Tranches

Sample Means of C-1 Factors

80

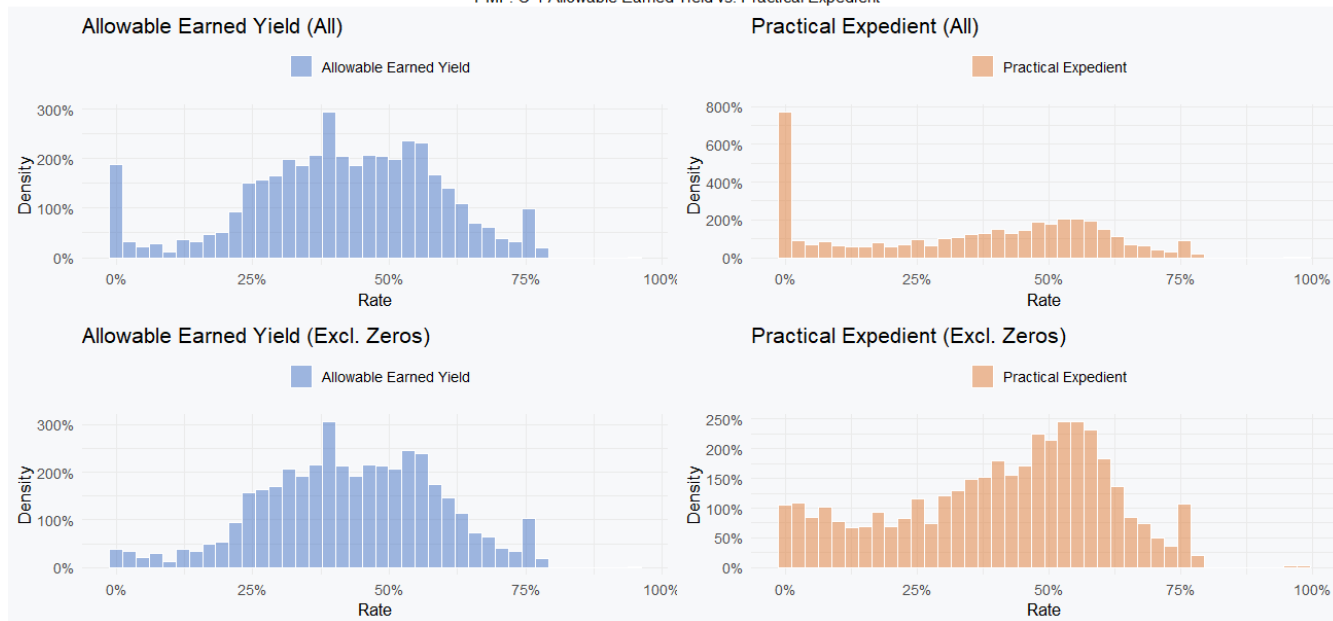
Distribution of Estimated Residual Tranche C-1 Means, by Accounting Method



Distribution of Raw C-1 Factors

81

PMF: C-1 Allowable Earned Yield vs. Practical Expedient



Initial Comparable Attributes Results

82

- The Academy regresses Raw C-1 against potential comparable attributes
- The std dev of C-1 is 23.5% while the std dev of model residuals is 16.4%

Regression Results

```
Residuals:
    Min       1Q   Median       3Q      Max
-0.65564 -0.11078 -0.01858  0.09074  0.89382

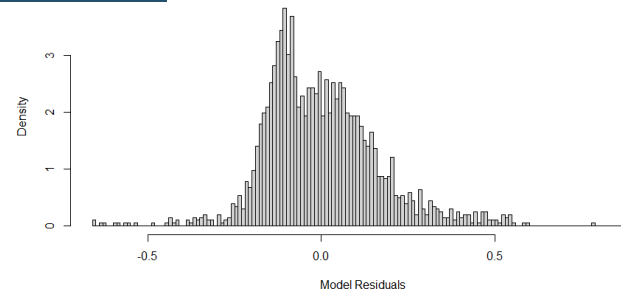
Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   3.569e-01  3.484e-02  10.245 < 2e-16 ***
int_prin_to_face -5.466e-01  1.180e-02 -46.320 < 2e-16 ***
WARF           7.511e-05  8.925e-06  8.415 < 2e-16 ***
TR_DP          -8.333e-01  1.191e-01 -7.000 3.46e-12 ***
max_rating_num  9.674e-03  2.058e-03  4.701 2.76e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1639 on 2060 degrees of freedom
Multiple R-squared:  0.5148,    Adjusted R-squared:  0.5139
F-statistic: 546.5 on 4 and 2060 DF,  p-value: < 2.2e-16
```

Comparable Attributes Considered

- TR_DP: Tranche Detachment Point
- WARF: Weighted average rating factor
- max_rating_num: Deal's worst debt rating (where Aaa=1, Aa1=2, etc.)
- int_prin_to_face: Ratio of the sum of interest and net principal paid to model start-date, as a proportion of original face value (capped at 0 and 1)

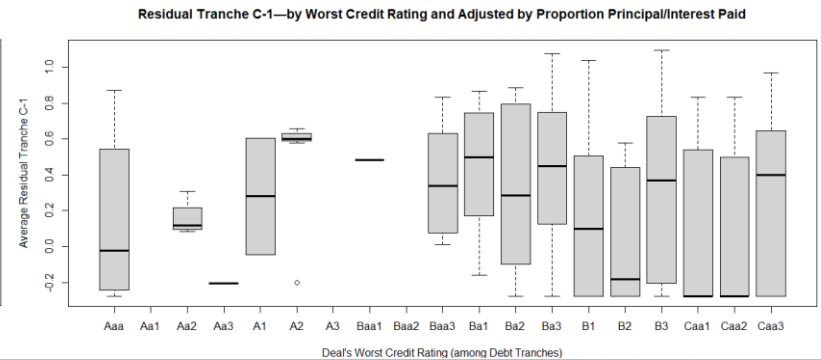
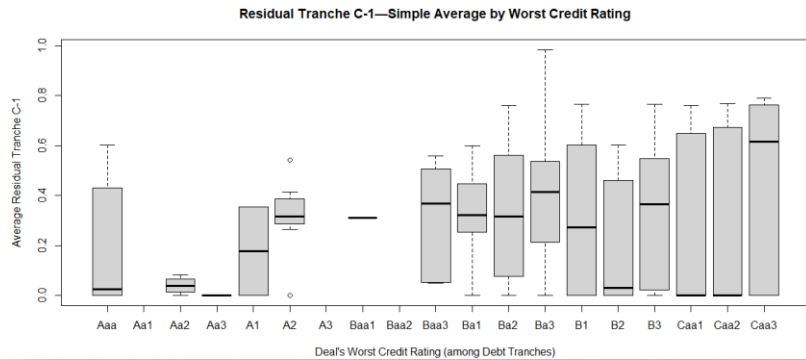
Model Residuals



Limitations of Worst Credit Rating

83

- While a lower worst credit rating does *on average* indicate a greater C-1, there is no monotonicity across ratings; Ba3 has the highest median C-1 (except Caa3)
- When adjusting for the proportion of principal and interest already paid (assuming the mean value), the same problem persists
- The wide inter-quartile ranges (IQRs) indicate potential credibility issues with the data



Alternative Comparable Attributes Results

84

- To address the issue of credibility, the Academy considered the proportion of balance within “low quality” debt CLO tranches (defined by different cutoff points)
 - The different cutoff points considered are: Baa1, Ba1, B1 and Caa1
- When adding these variables, max_rating_number becomes less statistically significant
- Condensing the credit covariates to just Ba1 / below retains roughly the same level of explanatory power

Regression Results

```

Residuals:
    Min       1Q   Median       3Q      Max
-0.65135 -0.10772 -0.01554  0.09166  0.89091

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   0.521259   0.028137  18.526 < 2e-16 ***
int_prin_to_face -0.551976  0.011878 -46.472 < 2e-16 ***
max_rating_num  0.005093   0.002131  2.390  0.01692 *
prop_Baa1_or_worse -0.011413  0.166946 -0.068  0.94550
prop_Ba1_or_worse  1.078025   0.250951  4.296  1.82e-05 ***
prop_B1_or_worse  0.538916   0.188661  2.857  0.00433 **
prop_Caa1_or_worse -0.533315  0.190012 -2.807  0.00505 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1616 on 2058 degrees of freedom
Multiple R-squared:  0.5288,    Adjusted R-squared:  0.5274
F-statistic: 384.9 on 6 and 2058 DF, p-value: < 2.2e-16
  
```

Regression Results

```

Residuals:
    Min       1Q   Median       3Q      Max
-0.65121 -0.10922 -0.01788  0.09184  0.88010

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   0.578114   0.007294  79.26 <2e-16 ***
int_prin_to_face -0.545435  0.011453 -47.62 <2e-16 ***
prop_Ba1_or_worse  1.335676   0.090402  14.78 <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1622 on 2062 degrees of freedom
Multiple R-squared:  0.5242,    Adjusted R-squared:  0.5238
F-statistic: 1136 on 2 and 2062 DF, p-value: < 2.2e-16
  
```

Considering WARF and Detachment Point

85

- WARF is not statistically significant when the proportion of Ba1/below balance is considered (collateral credit is captured by CLO credit)
- Detachment point is statistically significant, but removing it from the model only slightly reduces R^2 from 52.9% to 52.4%
- The ratio of total interest and principal paid to current face value is the most explanatory variable; removing all other covariates reduces the R^2 from 52.9% to only 47.4%

```

Residuals:
    Min       1Q   Median       3Q      Max
-0.66481 -0.11001 -0.01731  0.09306  0.88431

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   5.932e-01  2.667e-02  22.241 < 2e-16 ***
int_prin_to_face -5.555e-01  1.166e-02 -47.624 < 2e-16 ***
WARF          1.483e-05  1.132e-05   1.310   0.19
TR_DP         -5.798e-01  1.187e-01  -4.885 1.11e-06 ***
prop_Ba1_or_worse 1.146e+00  1.215e-01   9.430 < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1613 on 2060 degrees of freedom
Multiple R-squared:  0.5299,    Adjusted R-squared:  0.529
F-statistic: 580.6 on 4 and 2060 DF,  p-value: < 2.2e-16

```

```

Residuals:
    Min       1Q   Median       3Q      Max
-0.65121 -0.10922 -0.01788  0.09184  0.88010

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   0.578114   0.007294   79.26 <2e-16 ***
int_prin_to_face -0.545435  0.011453  -47.62 <2e-16 ***
prop_Ba1_or_worse 1.335676   0.090402   14.78 <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1622 on 2062 degrees of freedom
Multiple R-squared:  0.5242,    Adjusted R-squared:  0.5238
F-statistic: 1136 on 2 and 2062 DF,  p-value: < 2.2e-16

```

```

Residuals:
    Min       1Q   Median       3Q      Max
-0.61412 -0.12794 -0.02465  0.08551  0.85010

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   0.614118   0.007228   84.96 <2e-16 ***
int_prin_to_face -0.486175  0.011279  -43.10 <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

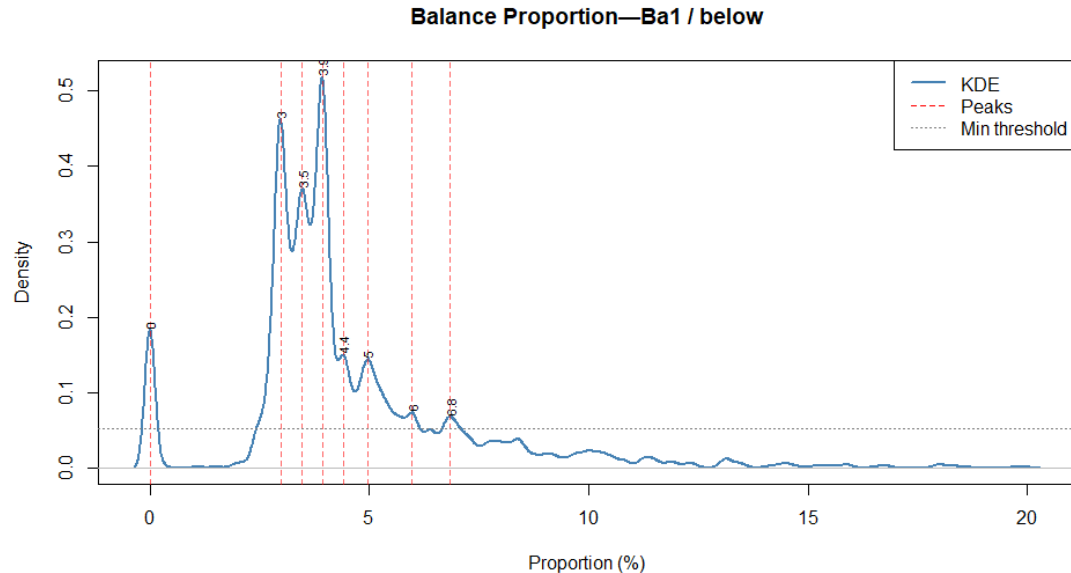
Residual standard error: 0.1705 on 2063 degrees of freedom
Multiple R-squared:  0.4739,    Adjusted R-squared:  0.4736
F-statistic: 1858 on 1 and 2063 DF,  p-value: < 2.2e-16

```

Distribution of Ba1 / Below Credit

86

- Balance in Ba1 or below credit averages 4.53% of total deal balance
- Proportions are clustered around 0%, 3% and 3.9%
- 87% of deals have less than 7% of balance in Ba1 or below credit



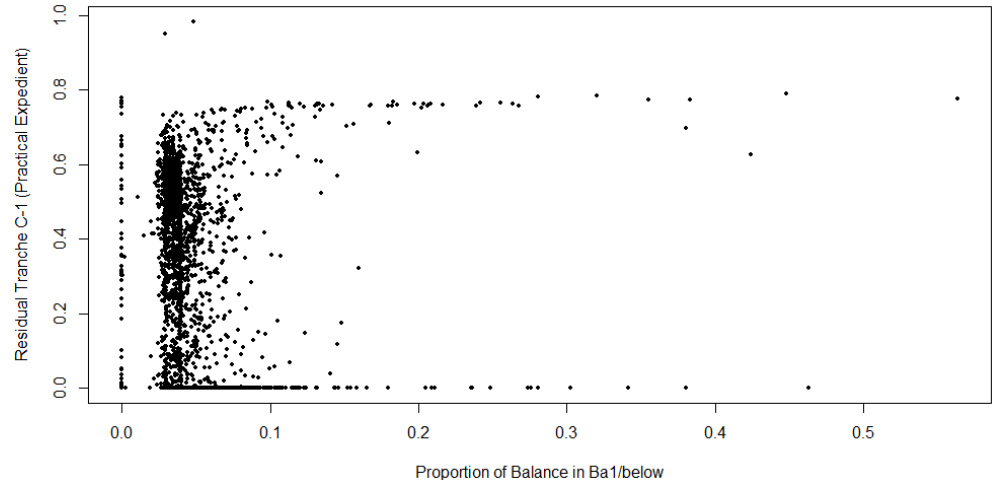
Considerations for Additional Comparable Attributes

87

- Assuming the range of 0% – 7% for the proportion of Ba1 / below (debt credit quality, by balance), the implied C-1 factors range from 27.12% to 36.47%
- Because
 - This <10% range of modeled factors is small compared to the wide dispersion of residual tranche C-1
 - The relationship between debt credit and C-1 is not visually apparentthe Academy concludes that the explanatory power of debt credit quality does not warrant the operational complexity of adding a new attribute; a simple average factor is sufficient

Considered Formula:

$$27.12\% + 1.34 \times \text{Proportion of Ba1/below}$$



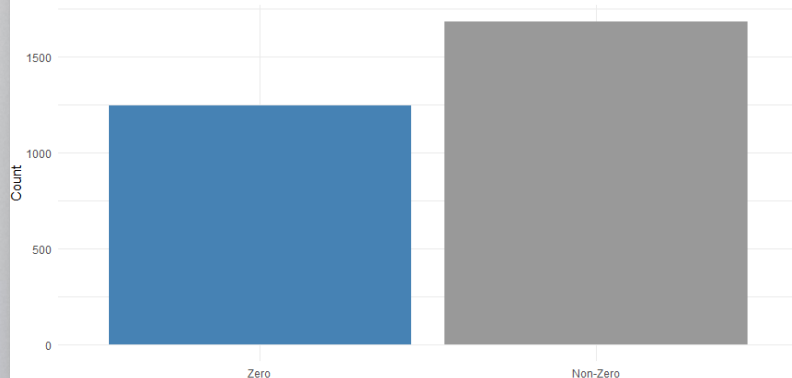
Embedded Model Conservatism

88

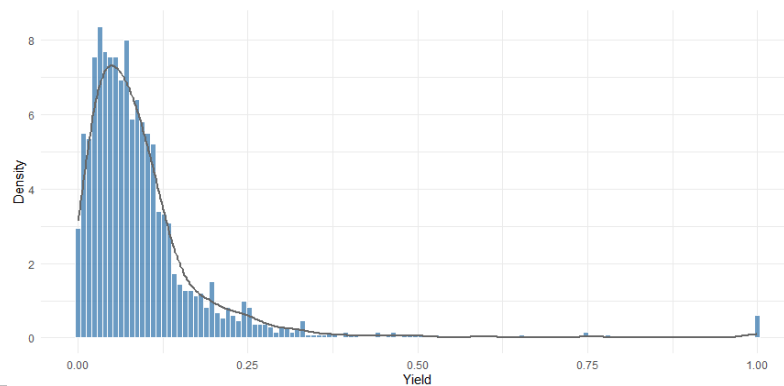
- CLO managers target >15% yields in the residual tranche
- The Academy's "Mean Loss Scenario" (assuming average levels of losses) produces an average yield of only 5.42%; a 15% yield is in the 92nd percentile
- This suggests that the collateral loss distribution assumptions are conservative and may overstate losses

Description	Value	Description	Value
Proportion of Yields = 0	42.55%	Mean Yield	5.42%
Mean Non-Zero Yield	9.43%	25 th percentile of Non-Zero Yields	3.79%
Std of Non-Zero Yields	10.37%	50 th percentile of Non-Zero Yields	7.06%
		75 th percentile of Non-Zero Yields	11.28%

Residual Tranche Yields under Mean Loss Scenario—Zero vs. Non-Zero



Distribution of Non-Zero Residual Tranche Yields under Mean Loss Scenario



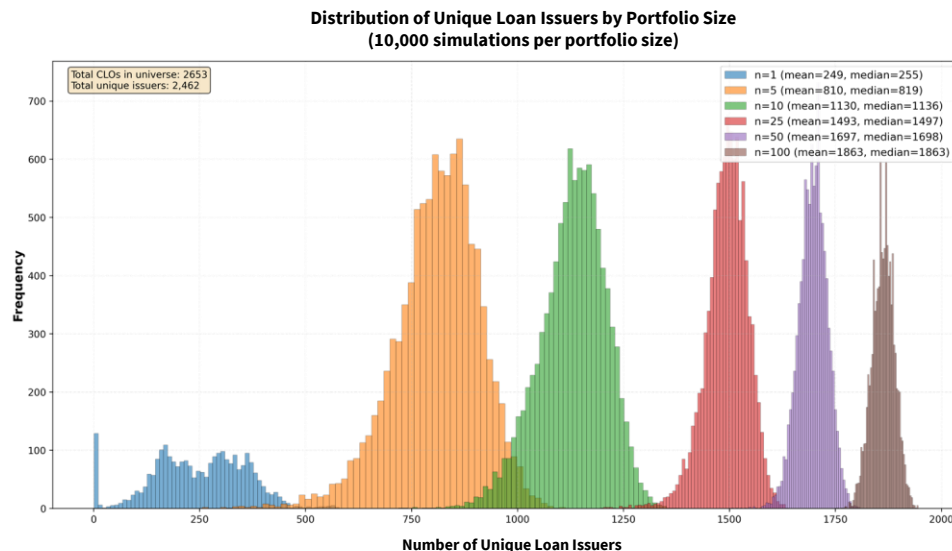
7.

Diversification

Loan Issuer Diversification by CLO Portfolio Size

90

- The average number of unique issuers in the collateral universe is 277 per CLO deal
- Here, CLO diversification is measured based on the number of unique loan issuers in the underlying collateral pool



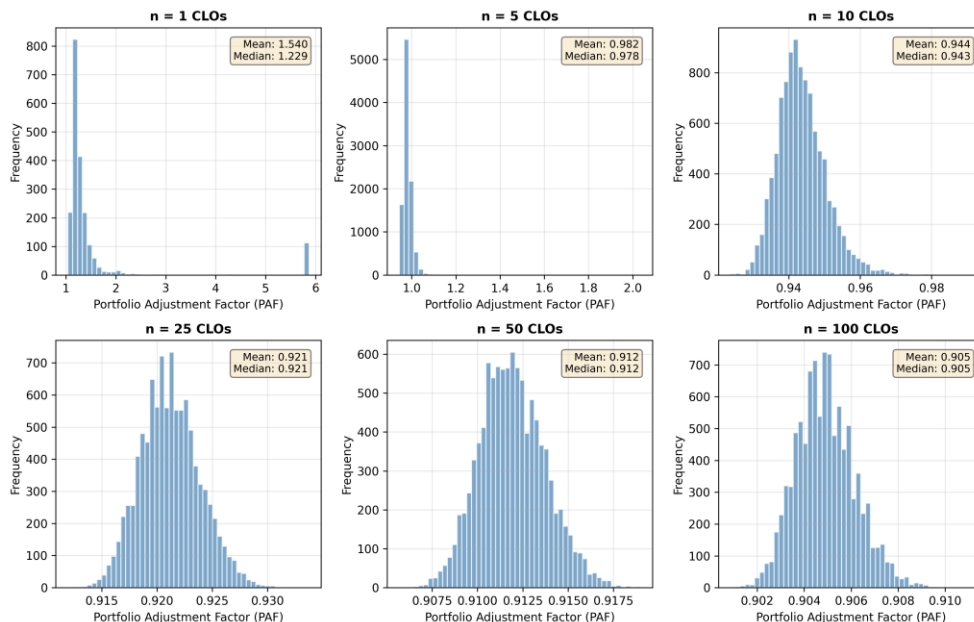
N	1	250	500	750	1,000	1,250	1,500	1,750	2,000	2,250	2,500
Bond PAF	2.400	1.296	1.073	0.989	0.947	0.921	0.904	0.892	0.883	0.876	0.871

Absolute CLO Portfolio Adjustment Factor

91

- CLO Collateral and Bond Factor default risk is modeled at the issuer-level
- We apply the Bond PAF methodology to estimate *absolute* PAF for simulated portfolios of N randomly drawn CLO deals

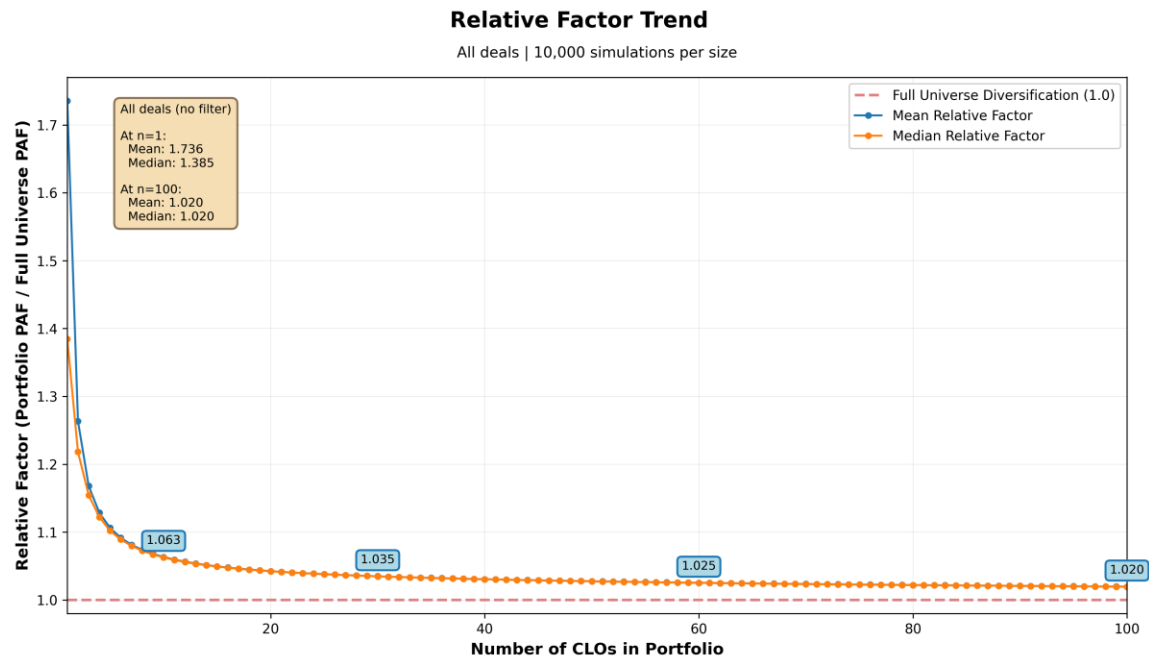
Distribution of Portfolio Adjustment Factors (PAF) by Portfolio Size



Relative CLO Portfolio Adjustment Factors

92

- PAF is calculated consistent with the bond PAF methodology assuming portfolios of N randomly drawn CLO deals
- We observe *relative* PAF quickly converges to 1.0 as the number of unique CLO deals in the portfolio increases

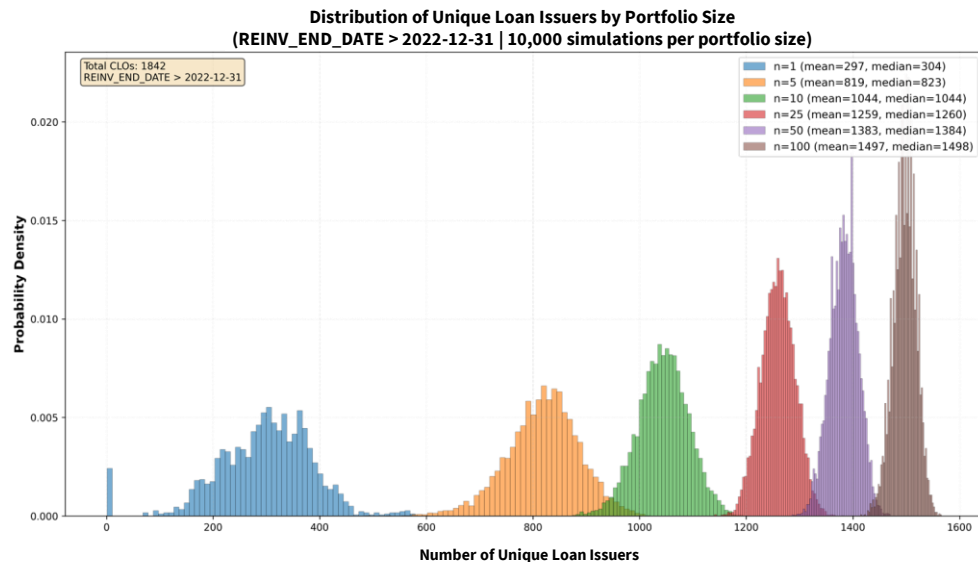


Loan Issuer Diversification by CLO Portfolio Size

93

The Academy does not observe meaningful differences in relative PAF or loan issuer diversification when limiting the universe to “newer” CLO deals (reinvestment end date > 2022-12-31)

Metric	All	Newer CLOs
Unique CLO Deals	2,053	1,842
Unique Loan Issuers	1,874	1,864
N=1 Mean Relative PAF	1.736	1.526
N=10 Mean Relative PAF	1.063	1.060
N=100 Mean Relative PAF	1.020	1.019



Questions?

94

For more information, please contact
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