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A CLOser Look inside the Matrix

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As asset spreads have tightened and ratings declined, CLO managers are battling to keep their portfolios in line with strict asset quality tests. In a tribute to the upcoming 20th anniversary release of *The Matrix*, we take a closer look at what the asset quality tests are, the purpose of the asset quality matrix, how these tribulations have shaped CLO portfolios' risk profiles, and what secondary effects this may have.

- While CLO liquidations are a rarity in market downturns, as discussed in *CLO Mythbusters*, CLO managers could still be restricted with respect to trading the portfolio in the next downturn.
- CLO managers have been in a battle to keep their portfolios in line with collateral quality tests (CQTs) over the past few years. These tests, used in conjunction with an asset quality matrix, are to ensure that a CLO manager appropriately balances the risk of the portfolio with potential reward.
- As asset spreads have continued to tighten, average ratings deteriorated, and expected recoveries declined, a growing proportion of US BSL CLOs have become tight on CQTs.
- In contrast, most European CLOs are not failing any CQTs currently, have higher test cushions, and have seen lower CQT failure rates historically.
- To mitigate a CQT failure, US deals have increasingly added exposure to single-B rated assets, causing loan spreads to compress.
- If a CQT failure occurs, though, a manager can usually "maintain or improve" failing CQTs when trading the portfolio. However, we believe many CLOs' trading ability is approaching a wall, particularly in the US.
- As more US CLOs become constrained over time, Single-B rated loans will increasingly become difficult to buy, which should reduce demand for these loans and could lead to an eventual decompression within the loan market.
- As such, we believe a constrained CLO market will lead to a bigger headwind for the US loan market, whereas European CLOs appear to have the flexibility available to keep buying lower rated assets.
- As we approach these constraining limits, CLO portfolios' risk profiles have become more barbelled, with relatively high exposures to both low- and high-rated assets.
- We think these barbelled portfolios, with relatively higher CCC and second lien asset exposure, for example, will pose more risks to junior debt tranches and equity investors.
- To help investors better understand the current landscape for manager risk profiles, we show CLO manager statistics for both US BSL and European CLOs in Appendix I and II.
- We will also host a call on March 28, 11.00 EST/15.00 GMT to discuss this further. Please register via the following *link*.

The Asset Quality Matrix

As asset spreads have tightened and average ratings declined, CLO managers are battling to keep their portfolios in line with quality tests set out in the deal documents. These tests, used in conjunction with an asset quality matrix, are designed to ensure a CLO manager appropriately balances the risk of the portfolio with potential reward.

"What is the Matrix? Control."

The collateral quality tests (CQTs) were created to provide a set of control measures for managers to actively trade their portfolios against. One of the appeals of CLOs is the active management perspective, compared with static structured vehicles such as ABS that are generally unable to switch around assets when credit quality deteriorates. To ensure that CLOs do not become too risky in the hopes of building par and increasing returns, CQTs are used to prevent CLO portfolios from becoming too concentrated in riskier credits or are at least being compensated for such risk. For CLOs, these tests can include:

- **Minimum Diversity Score (DS) Test:** The diversity score measures collateral concentration and correlation with respect to individual issuers and industries. A higher diversity score equates to a more diverse collateral pool.
- **Maximum Weighted Average Rating Factor (WARF) Test:** The Moody's WARF measures the underlying assets' default probability ratings. The underlying assets are assigned rating factors based on the 10-year idealized default rate, multiplied by 10,000. For example, a B2 asset would be assigned a Moody's rating factor of 2,720, where a B3 asset would have a 3,490 factor. A higher portfolio WARF equates to a riskier collateral pool.
- **Minimum Weighted Average Spread (WAS) Test:** The WAS of an asset portfolio is simply the average spread of the underlying floating-rate assets. A lower WAS equates to lower asset interest income.
- **Minimum Weighted Average Recovery Rate (WARR) Test:** The WARR measures the average recovery rate assigned to each asset by the deal's documentation, which tends to be more conservative than historical recoveries. A lower WARR is associated with lower expected recoveries on the underlying assets.
- **Maximum Weighted Average Life (WAL) Test:** The WAL is the average remaining life of the collateral pool, not assuming any voluntary prepayments. The test is to ensure that adequate principal repayments will be available to pay down the CLO tranches prior to the final maturity of the CLO. A higher WAL equates to a longer average maturity of the collateral.

Unlike portfolio profile tests (also known as concentration limits) that set strict minimums or maximums on the type of assets purchased by the CLO (eg, minimum level of first lien loans), CQTs are moving targets to provide flexibility for CLO managers to trade the portfolio based on evolving market conditions.

As noted above, the minimum and maximum CQT values are based on one or more asset quality matrices in the CLO's deal documents. Each matrix is a three-way combination grid of the criteria. For example, in a Moody's matrix, the combination of the current minimum diversity score and minimum WAS set the portfolio's maximum WARF.

"...no one can be told what the Matrix is. You have to see it for yourself."

To better understand the concept, we show an example asset quality matrix in Figure 1. As the grid shows, a CLO portfolio with a minimum DS of 80 and minimum WAS of 3.70% would have a maximum WARF limit of 2,772. Subsequently, if asset spreads in the portfolio decline to 3.4%, whether by market refinancing or purposeful de-risking by the manager, and the diversity score declines to 70, the matrix combination would be readjusted by the manager to stay onside of the tests, which would push the maximum WARF limit to 2,544 (228 point decrease). Linear interpolation is used for values between designated column and row headers.

FIGURE 1

Example Asset Quality Matrix

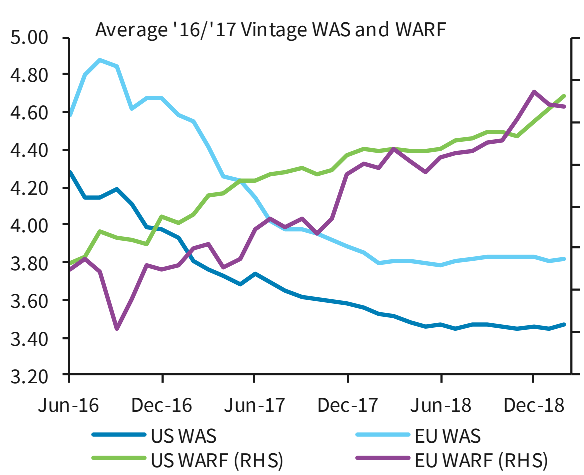
Min. WAS	Min. Diversity Score					
	65	70	75	80	85	90
3.20%	2,433	2,449	2,464	2,475	2,487	2,497
3.30%	2,505	2,523	2,539	2,552	2,565	2,576
3.40%	2,525	2,544	2,592	2,628	2,642	2,654
3.50%	2,549	2,594	2,640	2,677	2,693	2,706
3.60%	2,571	2,616	2,688	2,725	2,744	2,757
3.70%	2,594	2,639	2,737	**2,772**	2,790	2,803
3.80%	2,638	2,684	2,786	2,818	2,835	2,849
3.90%	2,694	2,719	2,828	2,865	2,882	2,896
4.00%	2,807	2,839	2,871	2,912	2,928	2,942

Source: Deal documents, Barclays Research

As Figures 2 and 3 show, CLO managers have had to actively reposition within their matrices over the past few years as loan spreads have tightened, average asset ratings have deteriorated, and estimated loan recoveries have declined. Managers can usually change the positioning of the matrix at any point in time, even when a test is failing, but typically only if it improves the failing test. Managers can also modify the matrices during a refinancing or reset, adding to the long list of incentives to do such. While less common, the matrices can also be updated via an amendment, although it can require a rating agency confirmation and occasionally controlling class consent.

FIGURE 2

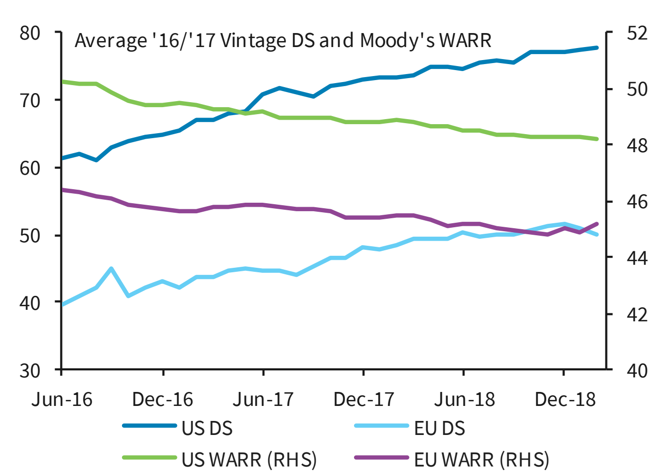
CLO WASs Have Decreased while WARFs Have Increased…



Source: Kanerai, Intex, S&P, Barclays Research

FIGURE 3

…While DSs Have Increased and WARRs Have Decreased



Source: Kanerai, Intex, Moody's, Barclays Research

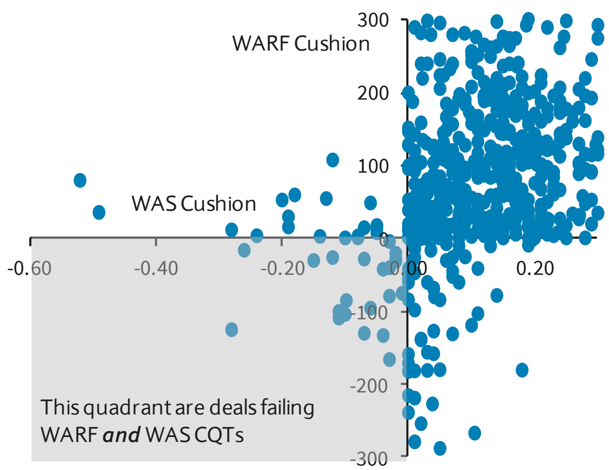
Failing a Collateral Quality Test

However, the story does not end if one of the CQTs fails. No cash flows are diverted, and the deal does not begin amortizing, even if multiple CQTs fail on multiple dates. Instead, most CLO documents require the manager to "maintain or improve" the failing CQT when making new trades. This gives managers the chance to slowly reposition their portfolios without totally restricting trading, which can be helpful in markets like today's, with 11% of 2.0 in-reinvestment US BSL deals currently failing WARF tests.

Even with a number of US CLO tests currently failing (Figure 4), several of which are 2015 and 2016 vintages, even more deals are on the edge of failing. Nearly 25% of US CLOs have less than 5bp of cushion on WAS tests, and another 25% have less than 25pts of cushion on WARF tests. While CQT failure rates for US deals improved in 2018 through an active refinancing and reset market (Figure 6), the failure rate has recently continued higher. In contrast, most European CLOs are not failing any CQTs currently, have larger cushions (Figure 5), and have had lower CQT failure rates historically (Figure 7). This is partially because the European loan market has seen fewer troubled sector downturns than the US.

FIGURE 4

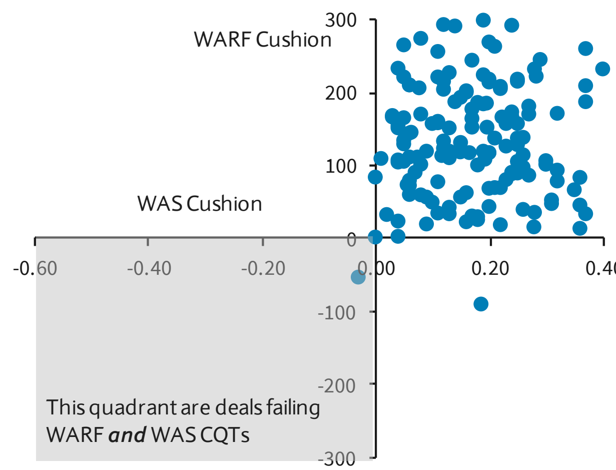
US BSL CLO WAS versus Moody's WARF Cushion



Source: Kanerai, Intex, Barclays Research

FIGURE 5

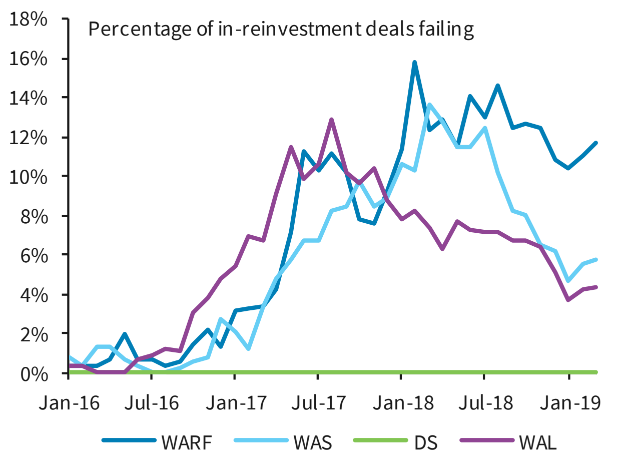
European CLO WAS versus Moody's WARF cushion



Source: Kanerai, Intex, Barclays Research

FIGURE 6

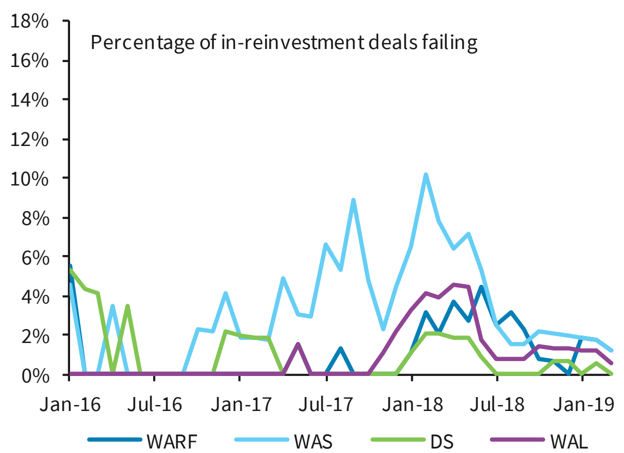
Historical US BSL CLO CQT Failure Rate



Note: Moody's WARF. Source: Kanerai, Intex, Barclays Research

FIGURE 7

Historical European CLO CQT Failure Rate



Note: Moody's WARF. Source: Kanerai, Intex, Barclays Research

Dodging a Failure

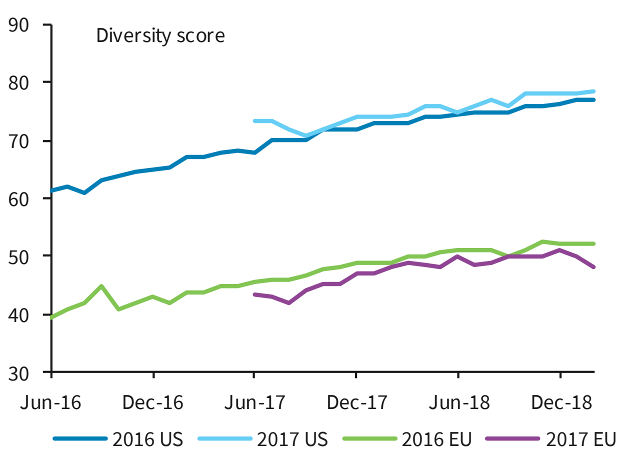
Even without CQT cushions as tight as they are today, a manager rarely makes a trade without considering its effect on the matrix. A standard CLO will not be used as a vehicle to express a strong preference for a specific industry or group of assets, as it will eventually be encapsulated by the trading constraints. Impressively, despite an uncooperative loan market and so many US deals on the edge of failing a CQT, most managers have been able to stay above water. We examine how they have been able to manage this balancing act.

Increasing the Diversity Score

One of easiest places to see where CLO managers are finding room in the asset quality matrix is through increasing the DS (Figure 8). The methods by which managers are doing this, though, can differ and be less clear. Because the DS considers the correlation and concentration between assets and industries, it appears that managers have resorted to decreasing average position sizes (Figure 9), equalizing industry exposure compared with the loan index (Figure 10), and, for European CLOs, equalizing country exposure compared with the loan index (Figure 11).

FIGURE 8

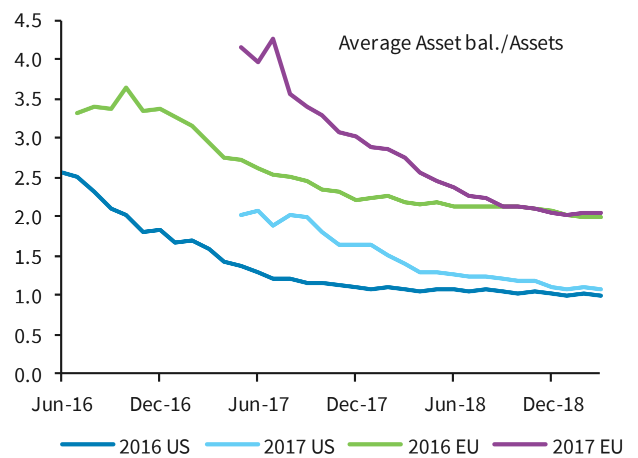
Diversity Scores Are Increasing…



Source: Kanerai, Intex, Barclays Research

FIGURE 9

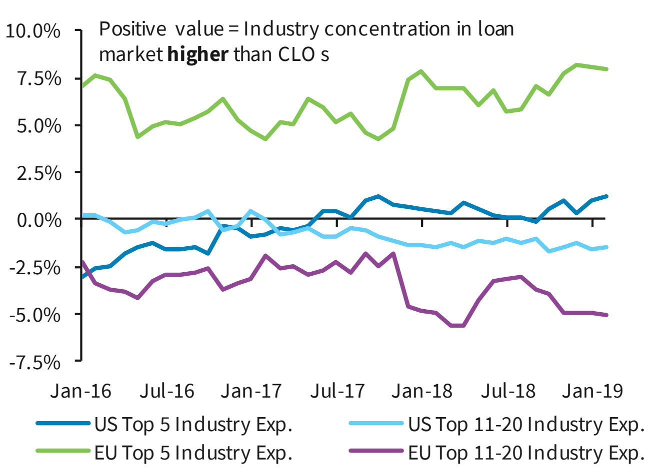
…Through Smaller Position Sizes



Source: Kanerai, Intex, Barclays Research

FIGURE 10

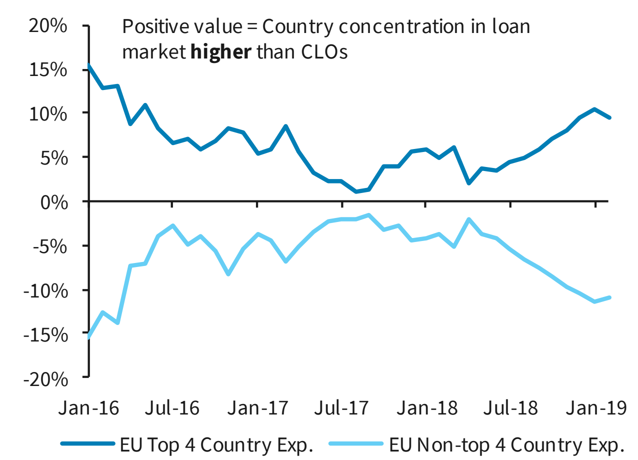
Industry Exposures Deviating from the Loan Index…



Source: Kanerai, Intex, Barclays Research

FIGURE 11

…And, for European CLOs, Deviating Country Exposure



Source: Kanerai, Intex, Barclays Research

Decreasing Asset Liquidity

In order to find assets with higher spreads, with possibly similar or better ratings, some CLO managers are buying less liquid assets (eg, lower bids per loan). In addition, more managers are choosing to invest in assets with smaller facility sizes. While there tends to be a maximum limit on holdings where facility sizes are below a certain amount, there are no liquidity constraints within a CLO. However, a manager could experience greater par losses should the asset become troubled and the manager needs to sell quickly or an economic downturn increases the default risk for smaller businesses. Additionally, if these smaller credits utilize credit estimates, the risk of an unexpected rating jump increases.

Loosening Deal Documents

A manager has typically been able to provide additional cushion to a CLO's WAS and WARF tests using other tests' positive cushion as support. For example, if a CLO's WARR value is above the limit, the manager may be able to apply that excess to the WARF test limit, where an extra point of WARR excess could provide an estimated 60-80pts of additional WARF cushion. However, Moody's WARR cushions for US BSL CLOs have decreased from about 7pts since mid-2016 to 5pts currently. European CLOs have seen a similar decline (4.5pts to 2.5pts), although European CLOs have traditionally had lower WARRs to begin with.

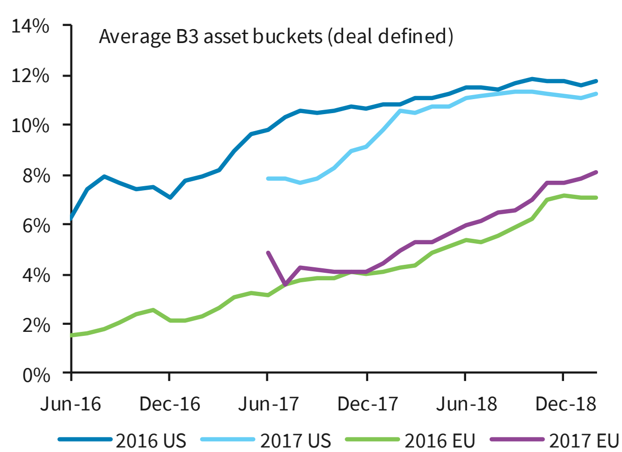
Some recent CLO documents allow the manager to distort the WARF, WAS, WARR, and WAL tests even further, by letting the manager use par value over target par as "extra credit" toward tests. For example, longer-dated assets or worse-rated credits could be excluded from the WAL or WARF tests, respectively, up to the additional extra credit limits. While this benefit is typically capped and can come at the expense of other tests, it could still allow managers to hold riskier credits without correlating with a tighter CQT cushion.

Allocating to Riskier Assets

To battle tightening loan spreads, CLOs have also increased riskier asset buckets to gain additional spread. This includes small increases over time, relative to the loan market, to CCC assets (Figure 13), second-lien assets (Figure 14), and fixed-rate bonds for European CLOs (Figure 15). While there are limits to holding these types of assets, they are not direct inputs to the matrix. And while there are no limits to B3 asset holdings (Figure 12), assets placed on negative outlook or negative watch by the rating agencies are typically held one and two notches below the current rating for WARF calculation purposes, respectively.

FIGURE 12

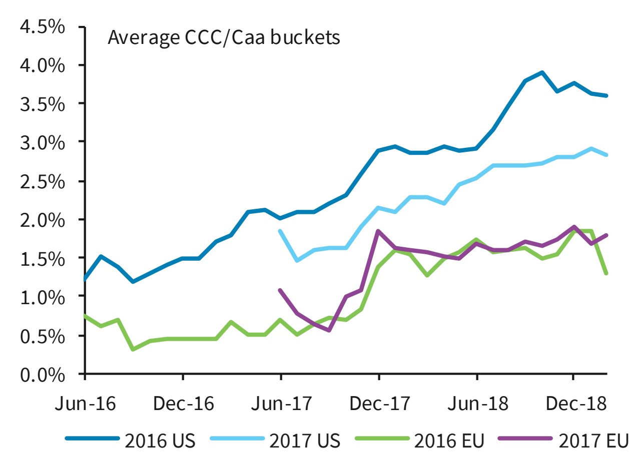
B3 Asset Buckets Continue to Increase…



Source: Kanerai, Intex, Barclays Research

FIGURE 13

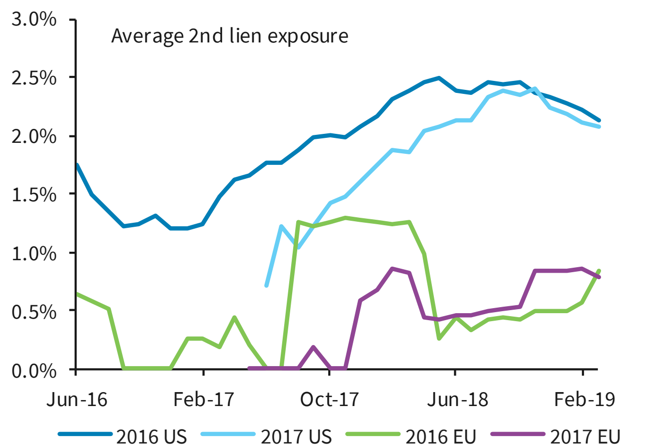
…Along with CCC/Caa Buckets…



Source: Kanerai, Intex, Barclays Research

FIGURE 14

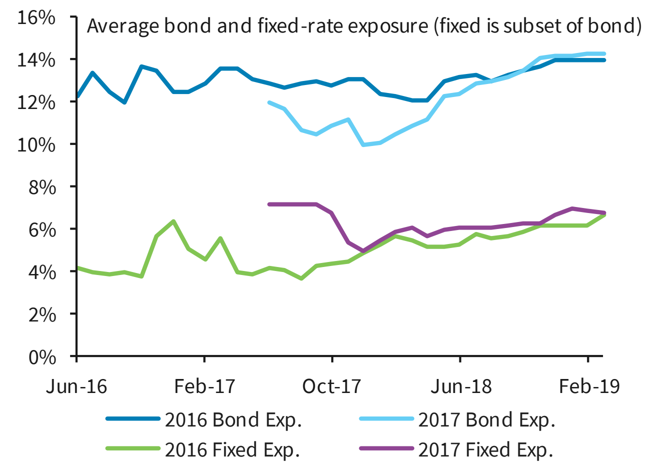
…Second-Lien Assets…



Source: Kanerai, Intex, Barclays Research

FIGURE 15

…And Bond Exposure in European CLOs



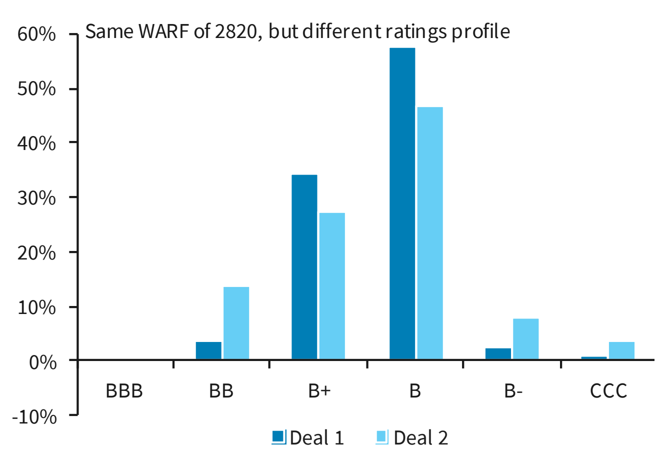
Source: Kanerai, Intex, Barclays Research

With a high percentage of US CLOs on the line of failing CQTs and riskier assets continually being added to CLO portfolios, it begs the question of how CLO managers continue to keep deals within their test limits. One of the more effective methods for managing these increased risk profiles, while keeping within test limits, is use of a "barbell" approach within the portfolio. While it is easy to look at the top-line numbers for a manager's CLOs, it does not fully represent the underlying risks that investors are susceptible to.

For example, Figure 16 compares two deals with similar WARFs, but the location of risk differs. Deal 2 has higher exposure to lower-rated credits compared with Deal 1, but Deal 2 also holds more higher-quality names. As discussed above, the reach for lower-rated, higher-spread assets has pushed managers to compensate by buying assets that provide better ratings. The deals in Figure 17 show a similar scenario, where both deals have a similar WAS. However, Deal 4 is balancing higher-spread assets with lower-spread assets, which may provide higher ratings (helping WARF) and recovery values (helping WARR). We think these barbelled portfolios, with relatively higher CCC and second-lien asset exposure, for example, will pose more risks to junior debt tranches and equity investors.

FIGURE 16

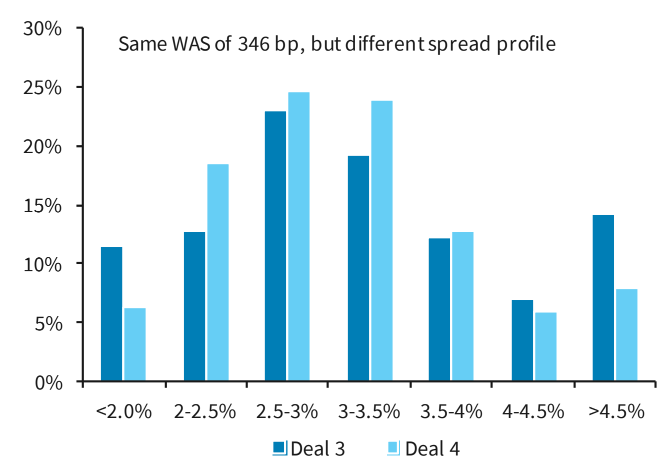
Managers Are Using a Barbell Strategy for Ratings…



Note: Kanerai Moody's derived ratings. Source: Kanerai, Intex, Barclays Research

FIGURE 17

…and Asset Spreads



Source: Kanerai, Intex, Barclays Research

Secondary Effects

As Neo discovered in the movie that the Matrix is bigger than just ourselves, so too we find that the asset quality matrix within deal documents can have outsized effects on markets outside of CLOs.

Should loan market ratings continue to deteriorate and spreads remain tight relative to CLO liabilities, CLO managers will eventually run into a scenario whereby CQTs can no longer be avoided. In this "end-of-the-road" scenario, primary CLO issuance could decline until newly issued loan quality improves, asset spreads widen, or CLO investors accept increased risks for new deals, which may include an even more flexible asset quality matrix.

CLOs already outstanding would have to continue to battle for room on tests, although a reset or refinancing could readjust the matrices. In a direr scenario, some CLOs could become essentially static should the manager deem itself unable to purchase collateral that would meet the reinvestment criteria.

CLO Manager "Source Code"

To help investors better understand the current landscape for manager risk profiles, we show median CLO manager statistics for both US BSL (Appendix I) and European CLOs (Appendix II) on the following pages. These data are broken up by time left in the reinvestment period and can be used to help better understand the top-line stats of a manager, but also the make-up of a manager's WAS, WARF, and DS.

Appendix I: US BSL CLO Managers

FIGURE 18

Median US BSL CLOs Manager Stats (Two Years or *Less* Left in Reinvestment Period)

Current Manager	Deals	WAS	Spread<3.0%	Spread>4.5%	Bid Depth	Facil. <250mm	2nd lien	WARF	CCC/Caa*	B-**	>=BB**	Diversity	Top 5 Ind.	Avg. Pos. (mm)
Acis Capital Management	4	311	56.2%	9.4%	5.7	0.9%	1.7%	2,771	4.6%	12.7%	31.3%	62	35%	0.78
Alcentra	3	342	43.1%	8.9%	5.3	2.1%	1.9%	2,932	2.9%	19.9%	12.9%	79	44%	0.61
Anchorage Capital Group	4	366	28.2%	13.4%	4.6	2.6%	1.6%	3,274	5.0%	46.6%	9.4%	63	48%	1.21
Apex Credit Partners	3	392	27.6%	26.1%	4.4	4.5%	2.6%	2,843	6.0%	18.6%	21.3%	83	43%	0.77
Apollo Credit Management	6	353	40.3%	14.6%	5.3	3.4%	2.3%	3,052	5.9%	25.1%	15.2%	60	55%	0.75
AXA Investment Managers	3	360	37.9%	11.9%	4.9	4.2%	1.4%	3,008	3.1%	34.3%	8.6%	69	49%	1.03
Bain Capital Credit	3	341	46.4%	10.1%	5.0	4.4%	1.8%	2,817	3.0%	27.3%	17.3%	85	36%	0.64
Bardin Hill	3	374	38.7%	24.6%	5.1	4.9%	2.9%	2,781	9.8%	15.1%	27.6%	78	41%	0.72
Benefit Street Partners	3	335	44.9%	8.8%	4.8	1.6%	0.5%	2,812	4.1%	14.4%	18.7%	89	46%	0.92
BlueMountain Capital	4	333	47.6%	9.2%	5.4	1.7%	0.4%	2,923	3.7%	13.9%	26.9%	73	46%	1.37
Carlyle Investment Mgt	7	347	48.0%	16.1%	5.3	3.1%	2.3%	2,916	5.4%	17.9%	22.6%	80	44%	1.39
CIFC Asset Management	5	348	44.1%	13.3%	5.0	2.3%	1.8%	2,938	4.9%	19.9%	16.2%	85	47%	0.97
Credit Suisse Asset Mgt	3	345	42.9%	12.7%	4.3	8.7%	3.5%	2,916	4.4%	20.5%	14.0%	74	48%	1.94
CVC Credit Partners	4	325	45.6%	6.7%	5.3	2.0%	2.0%	2,781	3.3%	13.0%	21.3%	89	40%	1.14
GSO/Blackstone Debt Funds	4	341	42.4%	8.1%	5.1	2.4%	2.7%	2,996	3.8%	19.4%	18.1%	80	51%	1.01
ICG Debt Advisors	3	361	31.9%	10.3%	4.7	5.9%	1.8%	2,908	7.1%	15.2%	19.5%	71	39%	0.80
Investcorp	4	335	46.0%	10.2%	5.1	1.5%	2.1%	2,860	5.1%	26.2%	19.0%	82	44%	1.09
LCM Asset Management	3	314	57.1%	7.4%	5.4	2.7%	0.7%	2,659	3.3%	15.4%	19.1%	102	41%	0.99
MJX Asset Management	7	387	34.0%	18.1%	4.4	6.6%	3.0%	2,769	6.1%	17.6%	22.9%	113	42%	0.62
Neuberger Berman	3	314	45.7%	8.0%	4.6	2.3%	1.9%	2,768	1.4%	27.6%	14.7%	92	43%	0.34
Oaktree Capital Management	4	311	60.4%	5.0%	6.3	1.3%	2.2%	2,814	4.8%	16.6%	16.8%	73	52%	0.58
Och-Ziff Loan Management	3	321	49.2%	6.8%	5.3	1.3%	0.9%	2,865	4.3%	16.7%	20.7%	80	46%	1.11
Octagon Credit Investors	5	342	42.3%	12.1%	5.1	4.5%	3.8%	2,778	4.3%	25.0%	25.1%	82	42%	1.21
Onex Credit Partners	3	332	48.3%	10.8%	4.9	2.6%	2.2%	2,593	3.3%	20.7%	23.8%	82	46%	0.71
Regatta Loan Management	4	317	59.2%	8.5%	5.7	1.2%	0.2%	2,812	4.9%	12.2%	20.3%	76	43%	1.85
Sound Point Capital Mgt	6	372	34.1%	20.0%	4.4	1.3%	0.9%	2,587	3.0%	22.6%	23.2%	69	49%	1.49
THL Credit Advisors	5	346	46.3%	9.9%	4.9	3.4%	2.1%	2,826	6.0%	18.7%	18.0%	79	42%	1.33
TICP CLO Management	5	331	46.5%	6.9%	4.9	1.8%	0.5%	3,019	6.9%	20.8%	18.6%	83	45%	0.81
Trimaran Advisors	3	349	38.9%	10.7%	5.0	4.8%	2.1%	2,801	4.9%	21.3%	18.4%	75	43%	1.41
Voya Alternative Asset Mgt	3	326	52.5%	8.1%	5.5	2.5%	3.3%	2,835	4.3%	27.7%	20.6%	96	48%	0.85
Wellfleet Credit Partners	3	373	32.5%	18.3%	4.5	7.8%	2.1%	2,988	4.8%	35.3%	12.7%	78	42%	0.83
Median		**345**	**43.3%**	**11.0%**	**5.1**	**3.0%**	**1.8%**	**2,840**	**4.6%**	**19.4%**	**20.0%**	**78**	**44%**	**1.01**

Note: At least three in-reinvestment deals with two years or less left in reinvestment. Data based on latest Intex update as of March 13, 2019. Deals issued in 4Q18 through 1Q19 excluded.
* Reported maximum CCC/Caa exposure ** Kanerai derived worst deal defined asset rating.
Source: Kanerai, Intex, Markit, Barclays Research

FIGURE 19

Median US BSL CLO Manager Stats (Two Years or *More* Left in Reinvestment Period) – Part 1

Manager	Deals	WAS	Spread<3.0%	Spread>4.5%	Bid Depth	Facil. <250mm	2nd lien	WARF	CCC/Caa*	B-**	>=BB**	Diversity	Top 5 Ind.	Avg. Pos. (mm)
40 86 Advisors	4	320	49.8%	6.6%	4.4	5.7%	0.6%	2,760	2.6%	27.8%	21.1%	96	43%	0.53
AEGON USA Investment Mgt	6	327	49.2%	5.9%	4.7	2.5%	0.2%	2,840	3.5%	15.2%	16.4%	80	41%	1.32
Alcentra	7	342	43.8%	9.7%	5.3	2.2%	1.8%	2,923	3.3%	19.5%	13.8%	77	46%	0.80
American Money Mgr Corp	9	334	45.6%	12.3%	4.4	6.1%	0.4%	2,841	5.0%	18.0%	22.4%	95	45%	0.65
Anchorage Capital Group	6	365	29.1%	13.2%	4.6	2.6%	1.1%	3,188	4.5%	48.6%	9.6%	62	49%	1.75
Angelo, Gordon & Co	5	384	32.2%	22.9%	4.3	7.3%	2.6%	2,692	5.4%	14.4%	19.6%	63	40%	2.59
Apollo Capital Management	7	356	37.4%	13.1%	5.2	3.9%	2.0%	3,040	5.7%	22.4%	13.5%	65	54%	1.11
Ares CLO Management	18	343	49.4%	8.1%	5.5	2.0%	2.1%	2,982	4.8%	18.6%	16.7%	81	50%	0.59
ArrowMark	6	361	36.9%	13.3%	4.9	6.5%	4.3%	2,824	2.6%	23.8%	18.9%	78	43%	0.55
AXA Investment Managers	4	360	31.8%	7.9%	4.8	3.4%	0.5%	2,973	0.9%	37.7%	6.1%	72	51%	1.28
Bain Capital Credit	7	351	43.1%	9.8%	4.9	4.6%	1.6%	2,863	2.9%	33.4%	11.7%	87	35%	1.48
Barings	8	337	43.6%	10.3%	5.0	6.0%	3.5%	2,792	3.6%	29.5%	19.0%	76	47%	1.33
Benefit Street Partners	10	339	42.9%	9.5%	4.8	1.4%	0.6%	2,817	3.7%	16.2%	17.6%	90	45%	1.00
Blackrock Financial Mgt	7	320	54.0%	7.1%	5.7	1.3%	2.3%	2,755	2.7%	28.7%	21.6%	80	53%	1.09
BlueMountain Capital Mgt	12	336	44.0%	9.5%	5.3	1.3%	0.5%	2,932	3.7%	22.5%	18.8%	73	47%	1.46
Brigade Capital Management	4	354	42.1%	15.0%	4.8	4.2%	1.1%	2,784	4.0%	19.2%	24.9%	71	43%	1.34
Canyon CLO Advisors	8	349	47.8%	15.1%	5.1	1.6%	2.3%	2,827	7.0%	17.1%	24.2%	68	44%	1.70
Carlson Capital	4	340	45.8%	11.7%	5.1	1.4%	1.3%	2,937	6.0%	17.7%	22.3%	64	50%	0.89
Carlyle Investment Mgt	19	346	46.5%	15.7%	5.2	3.6%	2.2%	2,888	5.2%	18.0%	21.8%	80	43%	1.41
CBAM CLO Management	6	361	39.6%	14.0%	4.4	6.3%	4.0%	2,739	2.1%	25.7%	22.3%	67	59%	1.83
CFI Partners	4	313	54.9%	5.7%	6.1	1.1%	2.1%	2,752	4.0%	12.1%	15.8%	64	45%	2.22
CIFC Asset Management	19	350	42.0%	13.0%	5.0	2.6%	1.8%	2,921	4.0%	19.7%	15.9%	83	48%	1.15
Credit Suisse Asset Mgt	17	351	43.7%	11.6%	4.3	8.1%	3.4%	2,823	2.6%	32.1%	11.4%	76	48%	1.89
Crescent Capital Group	6	359	37.1%	12.1%	5.1	1.2%	2.4%	2,848	3.8%	18.8%	20.4%	73	51%	1.31
Crestline Denali Capital	10	329	45.0%	6.5%	5.3	2.4%	1.9%	2,795	3.0%	16.4%	16.5%	89	40%	1.17
CVC Credit Partners	4	355	28.2%	11.2%	3.7	9.8%	0.0%	2,832	1.6%	27.8%	14.1%	86	44%	0.88
DFG Investment Advisers	7	350	38.8%	11.1%	4.7	2.9%	0.7%	2,508	1.0%	17.3%	21.1%	74	44%	1.66
GoldenTree Asset Management	8	336	45.3%	8.5%	5.1	0.8%	0.3%	2,816	3.8%	22.0%	14.7%	59	50%	2.95
Golub Capital	4	359	31.1%	12.3%	3.9	10.0%	1.5%	2,959	3.2%	36.8%	9.1%	73	44%	1.80
Greywolf Loan Management	4	339	45.6%	8.3%	6.5	0.6%	1.8%	2,897	4.3%	13.4%	13.4%	55	43%	2.79
GSO/Blackstone Debt Funds	20	341	41.0%	8.2%	5.0	3.1%	3.1%	2,969	3.8%	21.8%	16.4%	79	54%	1.28
Guggenheim Investment Mgt	6	345	46.4%	12.7%	4.5	6.8%	1.1%	2,980	6.7%	25.9%	22.7%	73	38%	1.56
Median		**344**	**43.6%**	**10.0%**	**5.0**	**2.7%**	**1.9%**	**2,824**	**3.6%**	**21.1%**	**18.3%**	**78**	**46%**	**1.13**

Note: At least four in-reinvestment deals with more than two years left in reinvestment. Data based on latest Intex update as of March 13, 2019. Deals issued in 4Q18 through 1Q19 excluded.
* Reported maximum CCC/Caa exposure ** Kanerai derived worst deal defined asset rating.
Source: Kanerai, Intex, Markit, Barclays Research

FIGURE 20

Median US BSL CLO Manager Stats (Two Years or *More* Left in Reinvestment Period) – Part 2

Manager	Deals	WAS	Spread<3.0%	Spread>4.5%	Bid Depth	Facil. <250mm	2nd lien	WARF	CCC/Caa*	B-**	>=BB**	Diversity	Top 5 Ind.	Avg. Pos. (mm)
HPS Investment Partners	10	328	44.7%	9.0%	5.4	1.6%	2.6%	2,780	5.1%	16.0%	24.4%	72	47%	1.20
ICG Debt Advisors	7	367	30.7%	8.7%	4.6	5.3%	1.9%	2,862	4.6%	17.2%	17.2%	71	41%	0.78
Invesco	6	327	55.7%	6.6%	5.7	2.1%	2.0%	2,806	3.5%	16.5%	22.9%	89	42%	0.69
KKR Financial Advisors	13	347	47.2%	12.2%	5.1	2.6%	1.8%	2,982	4.2%	35.6%	16.6%	74	44%	1.23
LCM Asset Management	13	321	52.7%	8.3%	5.3	2.6%	0.7%	2,673	2.8%	24.2%	18.1%	100	37%	0.96
Marathon Asset Management	4	389	32.5%	21.6%	4.1	7.1%	0.3%	2,926	5.6%	20.2%	17.7%	78	44%	1.77
Mariner Investment Group	5	322	52.2%	5.6%	5.4	1.1%	2.1%	2,642	2.6%	13.9%	15.4%	72	52%	1.09
MidOcean Credit Fund	6	360	40.7%	11.8%	4.7	3.0%	0.0%	2,847	5.6%	32.9%	17.5%	67	44%	1.85
MJX Asset Management	15	387	32.6%	18.5%	4.2	6.7%	2.8%	2,772	4.7%	24.0%	19.6%	110	43%	0.64
MP CLO Management	5	347	39.3%	10.1%	4.8	4.1%	2.8%	2,970	6.5%	32.1%	14.3%	72	48%	1.58
Regatta Loan Management	6	312	46.1%	7.6%	4.6	2.2%	1.4%	2,753	1.0%	22.4%	14.3%	91	44%	0.59
Neuberger Berman	12	314	59.6%	5.1%	6.3	1.6%	2.2%	2,754	4.0%	17.9%	16.2%	73	51%	0.61
Oak Hill Advisors	9	340	38.6%	6.6%	5.2	5.0%	3.5%	2,882	5.2%	27.1%	18.7%	68	52%	1.43
Och-Ziff Loan Management	13	348	38.6%	11.6%	5.0	4.9%	3.9%	2,813	4.4%	29.1%	22.7%	80	42%	1.40
Octagon Credit Investors	20	354	37.8%	12.1%	4.9	2.7%	3.1%	2,686	2.8%	22.5%	19.4%	81	46%	0.71
Onex Credit Partners	8	329	54.0%	8.8%	5.7	1.4%	0.4%	2,814	4.3%	13.8%	17.2%	79	43%	1.60
Palmer Square Capital Mgt	6	324	54.9%	6.6%	5.7	1.8%	2.8%	2,661	2.5%	24.4%	21.8%	75	51%	1.39
PineBridge Investments	8	318	55.4%	6.9%	6.1	2.1%	1.3%	2,848	3.3%	18.2%	19.4%	81	45%	0.95
PGIM	23	321	49.4%	4.6%	5.4	2.2%	1.9%	2,808	3.5%	24.8%	19.5%	96	46%	0.61
Rockford Tower Capital Mgt	5	345	43.3%	9.7%	5.1	2.3%	2.2%	2,662	2.5%	15.9%	21.5%	69	42%	1.90
Saranac CLO Management	4	373	31.5%	16.9%	4.8	3.3%	0.7%	2,922	4.0%	18.0%	16.0%	84	40%	0.68
Seix Advisors	4	355	42.5%	18.7%	4.9	3.0%	1.1%	2,680	3.1%	14.3%	23.4%	77	42%	1.28
Shenkman Capital Mgt	4	334	44.6%	6.4%	5.2	2.4%	1.8%	2,859	2.5%	28.4%	14.8%	84	46%	0.98
Sound Point Capital Mgt	10	371	29.1%	17.6%	4.2	3.0%	0.7%	2,613	1.4%	22.3%	20.9%	68	47%	2.39
Steele Creek Investment Mgt	6	361	41.0%	19.3%	4.5	4.3%	0.6%	2,722	3.2%	27.0%	26.1%	75	44%	0.81
Symphony Asset Management	6	323	54.9%	8.9%	5.9	1.7%	3.4%	2,769	5.0%	13.4%	23.0%	74	45%	1.53
THL Credit Advisors	13	348	42.4%	14.5%	4.9	5.5%	2.3%	2,857	3.5%	21.8%	16.8%	78	46%	1.44
TICP CLO Management	6	329	43.0%	3.3%	4.9	1.1%	1.1%	2,817	1.5%	24.8%	17.3%	79	47%	0.78
Trinitas Capital Management	4	354	36.2%	9.3%	4.9	2.3%	2.2%	2,865	3.8%	27.9%	14.5%	76	49%	1.03
Voya Alternative Asset Mgt	16	329	51.7%	7.7%	5.5	2.4%	3.2%	2,710	4.3%	26.8%	20.6%	94	48%	0.83
Wellfleet Credit Partners	5	359	34.4%	10.8%	4.4	6.2%	1.7%	2,889	2.8%	34.3%	15.5%	73	47%	1.10
York CLO Managed Holdings	4	350	40.2%	15.2%	4.7	4.1%	2.7%	2,758	3.7%	20.3%	23.7%	80	38%	0.98
ZAIS Leveraged Loan Manager	5	405	27.6%	26.5%	4.0	8.6%	3.2%	2,810	6.1%	15.7%	16.9%	94	35%	1.11
Median		**344**	**43.6%**	**10.0%**	**5.0**	**2.7%**	**1.9%**	**2,824**	**3.6%**	**21.1%**	**18.3%**	**78**	**46%**	**1.13**

Note: At least four in-reinvestment deals with more than two years left in reinvestment. Data based on latest Intex update as of March 13, 2019. Deals issued in 4Q18 through 1Q19 excluded.

* Reported maximum CCC/Caa exposure ** Kanerai derived worst deal defined asset rating.

Source: Kanerai, Intex, Markit, Barclays Research

Appendix II: European CLO Managers

FIGURE 21

Median European CLO Manager Stats (Two Years or *Less* Left in Reinvestment Period)

Current Manager	Deals	WAS	Spread<3.0%	Spread>4.5%	Facil. <250mm	2nd lien	WARF	CCC/Caa*	B-**	>=BB**	Diversity	Top 5 Ind.	Top 5 Ctry.	Avg. Pos. (mm)
Alcentra	2	403	22.9%	9.5%	10.3%	0.4%	2,868	1.4%	14.5%	6.5%	47	57%	75%	1.66
Barings	2	415	21.3%	15.8%	14.8%	0.5%	3,035	4.9%	8.3%	6.9%	56	52%	79%	1.59
Cairn Loan Investments	3	379	21.6%	11.3%	10.7%	2.2%	2,909	1.7%	7.4%	9.3%	42	58%	81%	2.35
CELF Advisors	3	410	19.4%	8.5%	11.2%	0.0%	2,935	0.6%	17.3%	5.6%	55	47%	75%	2.05
GSO / Blackstone Debt Funds	5	386	30.5%	10.8%	5.6%	0.2%	2,777	1.2%	10.8%	14.0%	51	56%	72%	1.53
Intermediate Capital Managers	2	388	21.2%	13.2%	8.7%	0.1%	2,906	1.5%	15.6%	8.4%	51	49%	76%	1.56
KKR Credit Advisors	2	353	30.6%	4.2%	7.7%	0.9%	2,817	1.0%	5.1%	11.5%	49	58%	76%	2.14
Oaktree Capital Management	2	350	34.2%	1.9%	6.6%	0.0%	2,792	2.0%	7.8%	13.3%	49	54%	75%	2.05
PineBridge Investments	2	364	28.9%	7.7%	7.9%	1.2%	2,896	2.4%	12.1%	10.8%	55	30%	79%	1.49
PGIM	4	413	18.8%	12.0%	6.3%	0.9%	2,914	2.7%	28.4%	4.1%	54	46%	71%	1.98
Spire Partners	2	409	21.8%	12.8%	12.4%	1.0%	2,716	2.1%	7.8%	17.3%	55	49%	76%	1.68
Tikehau Capital	2	383	24.6%	9.4%	6.1%	0.5%	2,799	1.8%	6.9%	11.1%	52	45%	77%	2.25
Median		**391**	**22.4%**	**10.8%**	**9.2%**	**0.8%**	**2,880**	**1.9%**	**10.3%**	**9.7%**	**51**	**51%**	**76%**	**1.96**

Note: At least two in-reinvestment deals with two years or less left in reinvestment. Data based on latest Intex update as of March 13, 2019. Deals issued in 4Q18 through 1Q19 excluded.

* Reported max CCC/Caa exposure ** Kanerai derived worst deal defined asset rating.

Source: Kanerai, Intex, Markit, Barclays Research

FIGURE 22

Median European CLO Manager Stats (Two Years or *More* Left in Reinvestment Period)

Manager	Deals	WAS	Spread<3.0%	Spread>4.5%	Facil. <250mm	2nd lien	WARF	CCC/Caa*	B-**	>=BB**	Diversity	Top 5 Ind.	Top 5 Ctry.	Avg. Pos. (mm)
Accunia Credit Management	2	366	18.3%	8.0%	7.5%	0.0%	2,627	0.0%	9.4%	12.4%	53	49%	65%	1.94
Alcentra	7	379	23.1%	9.8%	10.2%	1.3%	2,847	1.6%	9.2%	8.2%	48	54%	72%	1.81
Apollo Management	3	364	25.9%	7.1%	13.8%	0.8%	2,803	1.4%	10.1%	11.2%	45	58%	78%	2.26
Ares Loan Management	3	362	25.3%	4.1%	7.9%	0.0%	2,888	0.2%	14.7%	10.1%	51	52%	77%	1.54
AXA Investment Managers	3	360	19.1%	3.1%	9.1%	0.0%	2,821	0.0%	28.9%	1.8%	46	59%	80%	1.58
Bain Capital Credit	4	361	23.2%	6.4%	9.1%	0.9%	2,811	2.1%	16.8%	10.5%	55	51%	77%	1.32
Bardin Hill	5	384	19.8%	12.4%	8.3%	2.2%	2,811	3.4%	12.5%	14.7%	57	44%	74%	1.62
Barings	5	401	20.8%	13.2%	11.9%	0.8%	3,000	5.9%	9.7%	10.2%	53	50%	80%	2.04
BlackRock Investment Mgt	5	402	25.7%	11.0%	7.9%	0.5%	2,827	2.9%	17.0%	12.1%	59	48%	73%	2.03
BlueMountain Fuji	3	367	28.6%	9.2%	7.0%	0.0%	2,835	0.9%	18.8%	10.8%	54	50%	74%	1.81
BNP Paribas	3	367	21.9%	7.1%	8.9%	0.0%	2,857	0.3%	6.6%	6.6%	46	59%	78%	1.74
Brigade Capital Management	2	364	24.9%	7.3%	5.0%	0.0%	2,815	0.0%	23.9%	11.5%	48	55%	81%	2.46
Cairn Loan Investments	3	372	22.5%	9.5%	10.9%	1.6%	2,950	1.6%	21.5%	9.5%	43	57%	80%	2.54
CELF Advisors	11	381	15.6%	7.2%	9.8%	0.0%	2,920	0.7%	16.0%	5.9%	57	47%	74%	2.16
Chenavari Credit Partners	3	399	17.7%	16.7%	11.1%	0.8%	2,915	4.1%	7.2%	7.5%	47	54%	73%	2.11
Credit Suisse Asset Mgt	7	387	25.8%	12.2%	11.6%	2.2%	2,859	2.5%	15.6%	9.3%	59	47%	74%	1.91
CVC Credit Partners	8	394	24.1%	15.3%	6.4%	1.4%	2,820	3.4%	12.4%	12.5%	47	55%	75%	2.14
Five Arrows Managers	3	359	23.4%	8.3%	8.6%	0.9%	2,763	3.7%	11.8%	10.7%	47	58%	81%	1.77
GLG Partners	3	377	19.8%	8.2%	5.2%	0.0%	2,927	0.9%	15.5%	9.4%	51	49%	70%	1.78
GoldenTree Asset Management	2	384	22.3%	10.5%	9.7%	0.0%	2,864	0.0%	23.6%	6.9%	48	41%	74%	2.82
GSO / Blackstone Debt Funds	8	359	30.0%	8.4%	5.5%	0.5%	2,797	1.6%	7.2%	12.2%	49	56%	71%	2.01
HPS Investment Partners	2	343	30.4%	3.0%	7.5%	0.8%	2,807	1.1%	9.9%	11.2%	48	58%	76%	2.79
Intermediate Capital Managers	6	385	20.7%	12.4%	8.0%	1.0%	2,939	1.6%	26.6%	6.7%	51	51%	73%	1.87
Investcorp Credit Mgt	10	378	22.5%	12.1%	11.0%	1.7%	2,865	2.1%	15.8%	6.3%	55	52%	75%	1.84
KKR Credit Advisors	7	349	32.3%	3.9%	5.1%	0.5%	2,829	0.9%	5.7%	10.4%	50	59%	76%	2.73
Oak Hill Advisors	3	383	20.2%	9.8%	10.7%	1.6%	3,007	1.8%	11.9%	7.1%	48	48%	73%	2.20
Oaktree Capital Management	2	350	30.9%	2.6%	7.1%	0.0%	2,764	2.0%	8.4%	13.9%	50	54%	75%	2.00
Och-Ziff Loan Management	3	406	24.5%	8.1%	9.7%	1.1%	2,828	2.6%	14.5%	15.2%	61	44%	77%	2.31
Onex Credit Partners	2	343	30.1%	3.3%	3.8%	0.0%	2,767	1.8%	19.4%	10.9%	47	42%	-	3.58
Partners Group	2	357	24.9%	3.7%	10.2%	1.5%	2,839	1.5%	12.3%	7.3%	48	56%	75%	2.06
PineBridge Investments	2	359	26.5%	6.1%	8.1%	0.8%	2,916	3.4%	15.7%	7.0%	54	46%	78%	1.47
PGIM	9	406	19.1%	11.7%	6.1%	1.1%	2,918	2.7%	28.6%	4.7%	56	42%	74%	1.74
Spire Partners	2	406	22.6%	10.5%	9.0%	1.1%	2,722	2.4%	7.9%	15.6%	55	48%	74%	1.51
Tikehau Capital	2	362	23.5%	5.6%	8.5%	0.2%	2,775	1.2%	10.8%	10.5%	53	49%	75%	2.07
Median		**377**	**23.4%**	**8.8%**	**8.6%**	**0.8%**	**2,839**	**1.8%**	**14.0%**	**9.2%**	**50**	**51%**	**75%**	**2.02**

Note: At least two in-reinvestment deals with two years or less left in reinvestment. Data based on latest Intex update as of March 13, 2019. Deals issued in 4Q18 through 1Q19 excluded.

* Reported maximum CCC/Caa exposure ** Kanerai derived worst deal defined asset rating.

Source: Kanerai, Intex, Markit, Barclays Research

Analyst Certification

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