FLAT ROCK
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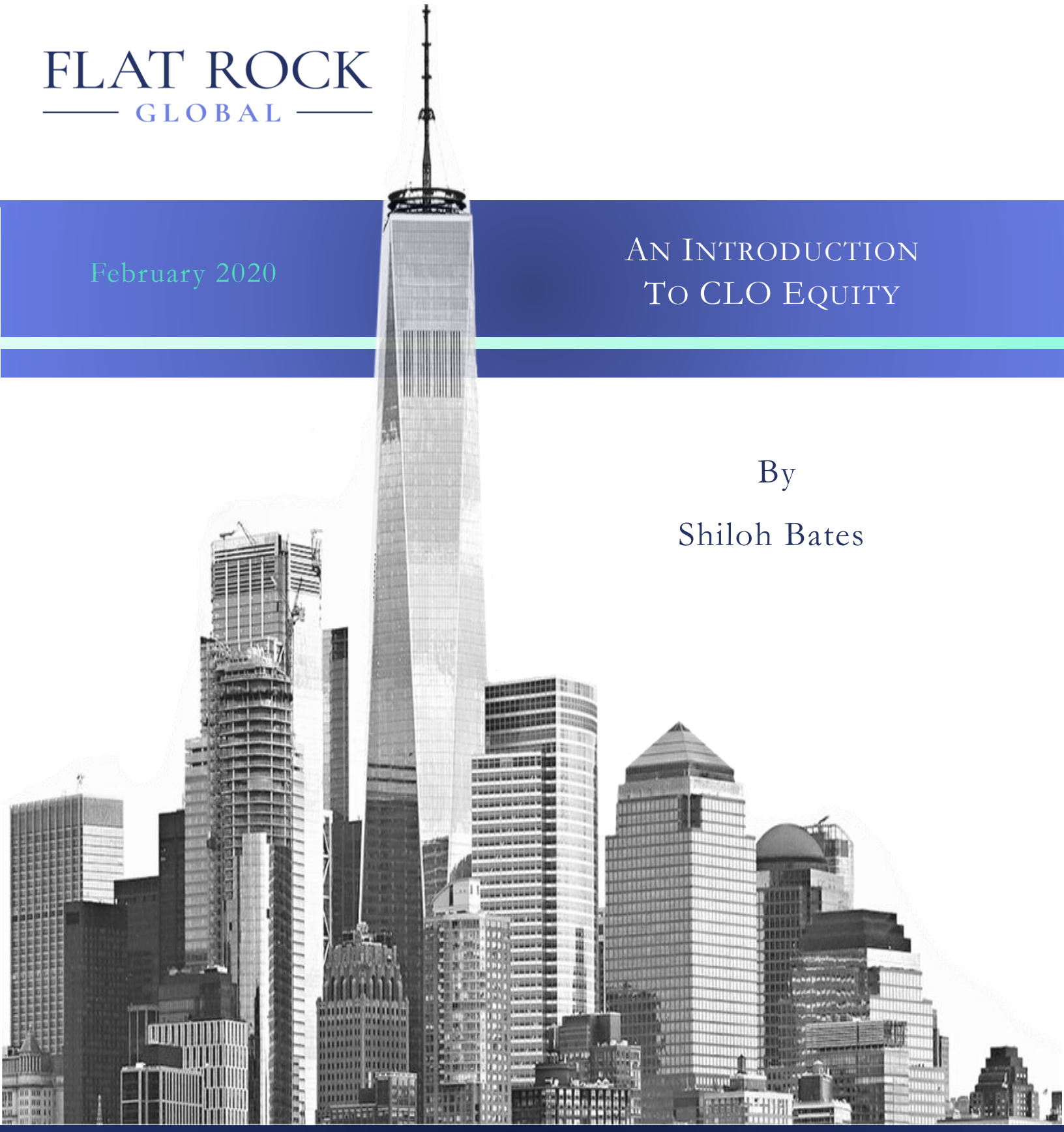
An Introduction To CLO Equity

By

Shiloh Bates



Where Investors Come First

INTRODUCTION

In 1998, I started my finance career as an investment banking analyst at First Union Securities, which is now part of Wells Fargo. One of my first assignments was a financing for a Collateralized Loan Obligation (CLO) manager. At the time, I had never heard of a CLO. Two years later, I was working for the same CLO manager picking loans for its CLOs.

Back then, there was less than $19BN of annual CLO issuance and only a handful of managers. It was truly a backwater of finance. However, during my career CLO assets under management have grown rapidly. As of year-end 2019, there were over 120 managers issuing CLOs in a $600BN asset class.

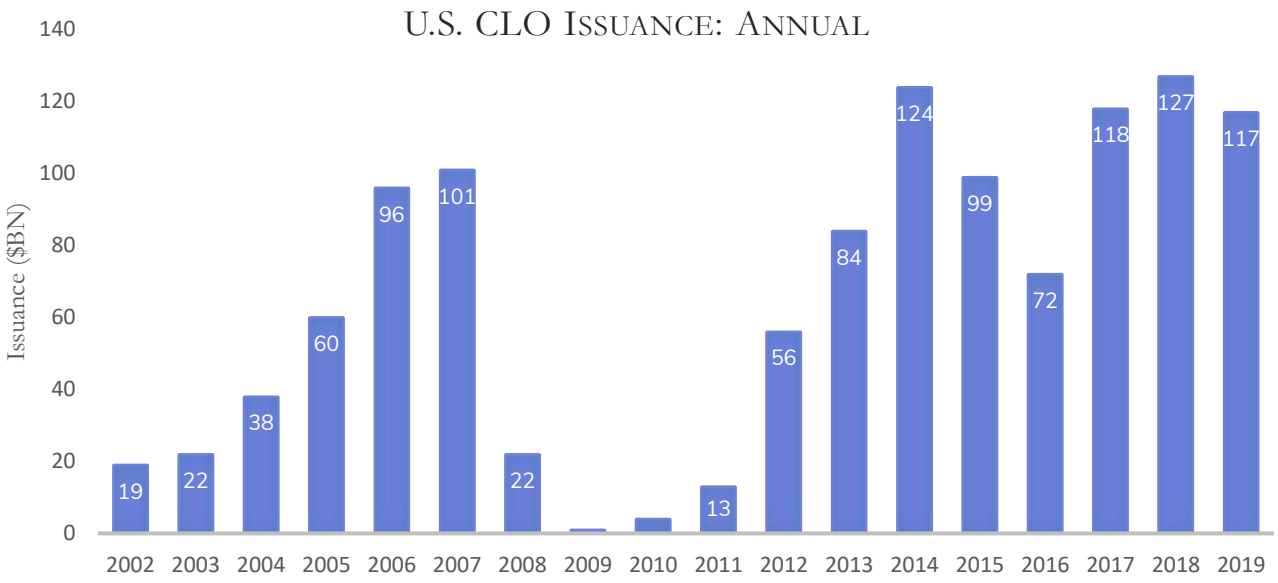


Figure 1

Source: Wells Fargo Research, January 2020

CLO equity offers the potential for mid-teens returns with low correlation to other asset classes like equities or high yield bonds. CLO equity allows investors to gain exposure to a highly diversified pool of broadly syndicated loans using attractive built-in leverage that's locked in for the life of the CLO. In contrast to other alternative investments, there is no "J Curve" in CLO equity. That's because the CLOs pay quarterly distributions and the initial distributions are usually higher than later ones. The higher initial cash flows mitigate the investment risk and make it harder – though not impossible – to have a negative lifetime IRR.

A potential downside to CLO equity is volatility, which can be equity-like in some market environments. While investment banks will make a market in CLO equity, the bid ask spread can be wide and it's best to think of CLO equity as a long-term investment.

During the financial crisis, CLO issuance dried up for almost three years. Surprising to many, it turned out that CLOs issued before the financial crisis did very well on a buy-and-hold basis. Returns were aided by what I refer to as the "self-healing mechanism" specific to CLOs. Later in this paper, I will describe how this works in detail.

CLOs have historically been an asset only available to large institutional investors. Given what I believe is the attractive risk/return characterization of CLOs and CLO equity in particular, I believe retail investors will increasingly want access to the asset class.

A CLO is a leveraged vehicle, at 10x Assets / Equity, which isn't too dissimilar from the leverage of a large US bank today. The CLO, however, is a pure-play investment in the underlying CLO loans, while US banks operate in multiple business lines.

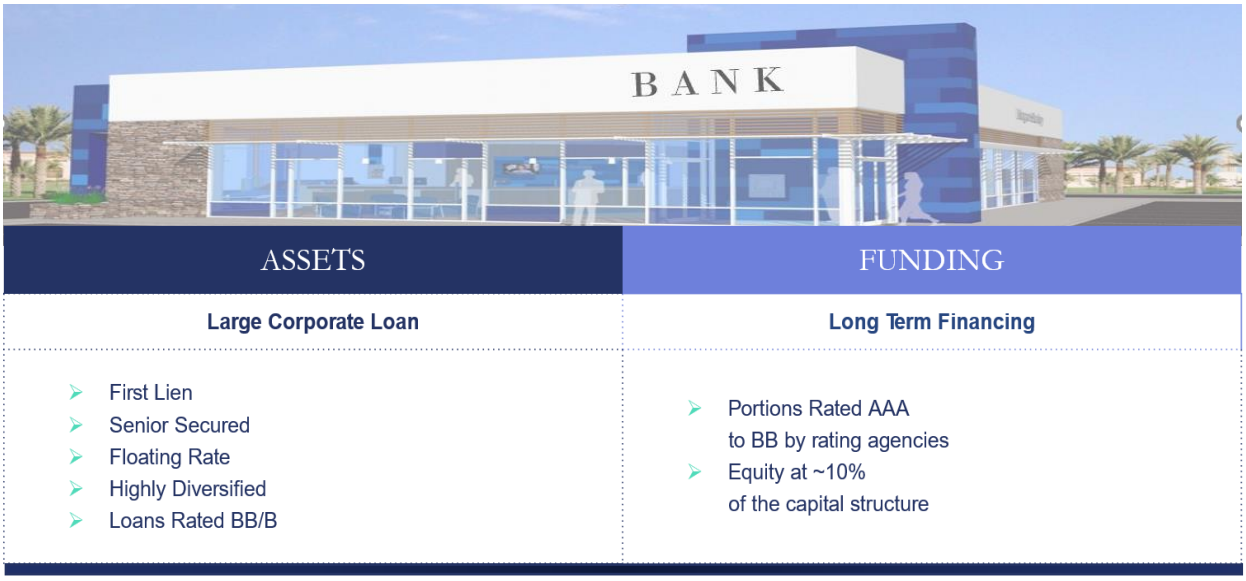


Figure 2

Many banks finance themselves with both short and long-term obligations. For the majority of CLOs issued today, the funding of the CLO is long-term, with many CLOs having expected lives of 7+ years. The cost of debt is locked in for the life of a CLO, but the CLO's equity investors have the option to refinance specific CLO tranches at more favorable rates after the end of a non-call period. Tranches are the different portions of the CLO's financing that have ratings from AAA down to the equity tranche which is not rated.

CLOs issued today have little in common with the Collateralized Debt Obligations (CDOs) issued prior to the financial crisis. Many of those CDOs, featured in the book, *The Big Short* by Michael Lewis, were backed by subprime loans of dubious quality. Securitization is a powerful tool and the results can be favorable when quality assets are securitized and leverage is done on appropriate terms and levels. The association of today's CLOs with the failed CDOs of the past is one of the reasons that investors in CLOs can earn an excess return above comparable risk assets, in my opinion.

ITEM	CLOs	ABS CDOs
Underlying Collateral	Senior Secured Loans	Mezzanine tranches, high grade ABS tranches; subprime mortgages
Transparency	Detailed monthly reporting including all loans / purchases and sales, current ratings and loan prices	Reporting generally did not link to the underlying assets
Management	Actively managed by some of the largest US asset management firms	Static and managed portfolio of securitizations
Correlation of underlying assets	Low - CLOs are required to have a diversified portfolio across industries	Highly correlated to house prices
Losses on debt portion of CLOs	Negligible	High

Figure 3

While there are many participants in a CLO, the CLO equity investor is the belle of the ball. The CLO equity investor will pick the CLO manager and the CLO arranger (investment bank). While investors in the CLO's note liabilities will have a significant say in the CLO's formation, if the CLO equity investor isn't happy with the outcome, the CLO will not form.

Just as no two snowflakes are created alike, no two CLOs are either. Their differences reflect market conditions at the time of CLO formation and the relative negotiating leverage between all the investors in the CLO. It's this heterogeneity that enables CLO equity investors to express their differing market views and try to earn alpha in what I believe is an inefficient asset class. Without the many nuances of different CLO structures, there wouldn't be the need for so many CLO lawyers and investment analysts. There isn't a way to invest in CLO equity in the same way an investor can get exposure to the S&P 500 by buying an exchange traded fund with minimal management fees.

A CLO's Loan Assets

The typical CLO has, as its assets, around $500 million of first lien senior secured loans (the "CLO loan assets") as underlying collateral. The CLO is very diversified, with 150+ broadly syndicated loans to distinct companies that are rated by S&P and Moody's at B/B2 on average. The CLO loan assets pay interest on a floating-rate based on the London Interbank Offer Rate (LIBOR) plus a spread. At the end of 2019, the CLO loan assets paid a rate of 2.0% for Libor plus a 3.5% spread for a 5.5% total yield. The CLO loan assets often have Libor floors of 0.75% to 1.0%. If Libor drops below the floor, the base rate will be the floor. This provides income protection for the CLO if Libor rates drop significantly. New issue CLO loan assets are usually bought at a slight discount to par (0.5% to 1.0%), which further increases the returns on the loans.

Below are companies that have loans in CLOs. Of course, these are just a few; there are over $1.0 trillion of bank loans to these kinds of companies.

Figure 4

Given the diversity of loans in an individual CLO, an investor could own 5-7 CLO equity tranches and have exposure to over one thousand loans. CLOs managed by different CLO managers usually have lower overlap on the underlying loans while CLOs managed by the same asset manager will own similar loan portfolios. Usually a CLO manager will invest in a new loan and divide its purchase into all the CLOs it manages. While there are hundreds of loans in a CLO, it's really the few loans that default that will likely differentiate the returns of one CLO's equity tranche vs. another.

The Volker Rule, enacted in 2013, essentially prohibits CLOs from owning high yield bonds. This was a change from CLOs issued prior to the financial crisis. However, it

looks like changing regulations may enable small bond baskets to be included in new CLOs.

The typical loan issuer in a CLO is owned by a private equity firm like Carlyle, Ares or Apollo. When the private equity firm acquires a company, they contribute a portion of the purchase price - around 40% - in equity. The remainder of the purchase price is financed by issuing bank loans and bonds. Private equity firms are buying companies they believe will grow revenue and profits over time, which will increase the value of their equity investment. The use of leverage amplifies the returns they expect to make. Of course, the leverage will work against them if the returns are negative. The private equity firms hire investment banks to arrange the debt financings for the companies they buy. JP Morgan, Citigroup and BAML, for example, earn an underwriting fee to place a loan with a variety of investors including CLOs. The loans are referred to as "broadly syndicated" because each loan will have numerous participating lenders/investors. Sometimes the arranging bank will keep some of the loan on its balance sheet and other times the loan becomes fully owned by third parties. Today CLOs are the largest investor in broadly syndicated loans at ~65% market share. Loan mutual funds, alternative asset managers and hedge funds also invest in these loans.

The typical loan has a 5 to 7-year maturity and is secured by all the assets of the company, including property, plant, equipment, accounts receivable, inventory, cash, trademarks, etc. Although secured by the assets of the company, the loan is expected to be repaid with cash flow from the business. Most loans are refinanced within two to three years of their issuance.

Some loans will have financial covenants that require a borrower to have a minimum level of annual cash flow in comparison to the amount of money borrowed. This is called financial leverage. Another common financial covenant is a test that compares the company's annual cash flow to the amount of annual interest expense. A violation of a financial covenant is considered a default under the loan's legal documentation, even though the company may not have missed an interest or principal payment when the covenant default happens. There has been a steady increase in the issuance of covenant-lite loans in the US, and today around 80% of broadly syndicated loans lack financial covenants. The trend reflects a more borrower-friendly loan market, where many lenders are looking to deploy significant amounts of capital.

Most loans have negative covenants which mandate that the business not enter into any arrangement that would result in reduced credit quality of the borrower. Examples include prevention of acquisitions, additional borrowing or sale of certain assets.

While lenders prefer having financial covenants on the loans, a pool that is largely covenant-lite may have lower defaults over its life. That's because only a missed interest

or principal payment can cause a default. There are examples of companies that have experienced sharp decreases in their annual cash flow that would have defaulted if they had covenants in place. Because they didn't, the company managed to survive and recover. Ironically, if the business would have had covenants, its lenders would likely have taken over and the company and sold it to the highest bidder, resulting in a substantial loss. A lack of financial covenants on the loans can push a borrower's problems into the future, while the CLO's equity tranche benefits from high cash flows, especially at the beginning of the CLOs life.

Usually the CLO loan assets have amortization of 1% per year with the remainder due at maturity. There are also loans that allow for borrowing on a revolving basis, but these are found infrequently in CLOs. Some loans will have delayed draw features that allow the borrower to draw the loan in the future for uses like approved acquisitions.

Investment banks buy and sell CLO loan assets in the secondary market. The investment banks try to make a spread of around 50bps if the loan is frequently traded. Some loans are over $1BN in size and trade frequently in the secondary market. Other loans are $250M in size and trade less often. The smaller loans generally have marginally higher interest rates to compensate investors for the lack of liquidity.

Firms that invest in broadly syndicated loans have an investment team that extensively researches the loans before they are purchased. The financial analysts that do this work often have previous commercial or investment banking experience; have earned an MBA or Chartered Financial Analyst® designation. While credit analysis is outside of the scope of this paper, I will outline some of the basics below.

A starting analysis is usually a comparison of the value of the loan to the value of the entire business. This metric is the loan to value. The trick is that most of the businesses don't have a publicly traded stock, so the financial analyst needs to think about the current purchase price and comparable historical transactions. An investor in broadly syndicated loans will want a low loan to value, so that if the business value deteriorates, he will still be able to get repaid. Conversely, the private equity firm that owns the business prefers a high loan to value as that requires less equity to finance the business. In 2019 an initial loan to value in the broadly syndicated loan market is around 60%. When the loan to value is higher, the investor in the broadly syndicated loan will require a premium spread over Libor as extra compensation for the risk he is taking. For the loan investor, the best thing that can happen is for the loan to make all its contractual interest and principal payments. If the business grows as its private equity firm's owner might expect, the loan investor does not participate in the upside. The loan investor takes the risk that the business' prospects decline significantly, and contractual interest and principal payments are not met. When this happens, the business files for bankruptcy and the loans are likely impaired.

Fortunately, historically this has happened to less than 3% of companies in the broadly syndicated loan market on average per year according to JP Morgan Research.

Besides loan to value, an investor in loans needs to consider the company's leverage multiple. A company's Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA) is used as a proxy for annual cash generation. EBITDA is then compared to the amount of debt outstanding, usually net of any cash on the balance sheet. A higher leverage multiple implies more risk for the lender and less equity cushion in the business. A typical broadly syndicated loan has 4.5x its EBITDA in first lien leverage and an additional 1.0x EBITDA of junior debt that might be a second-lien loan or a high yield bond. As shown below, there is usually significant initial equity cushion for a broadly syndicated loan.

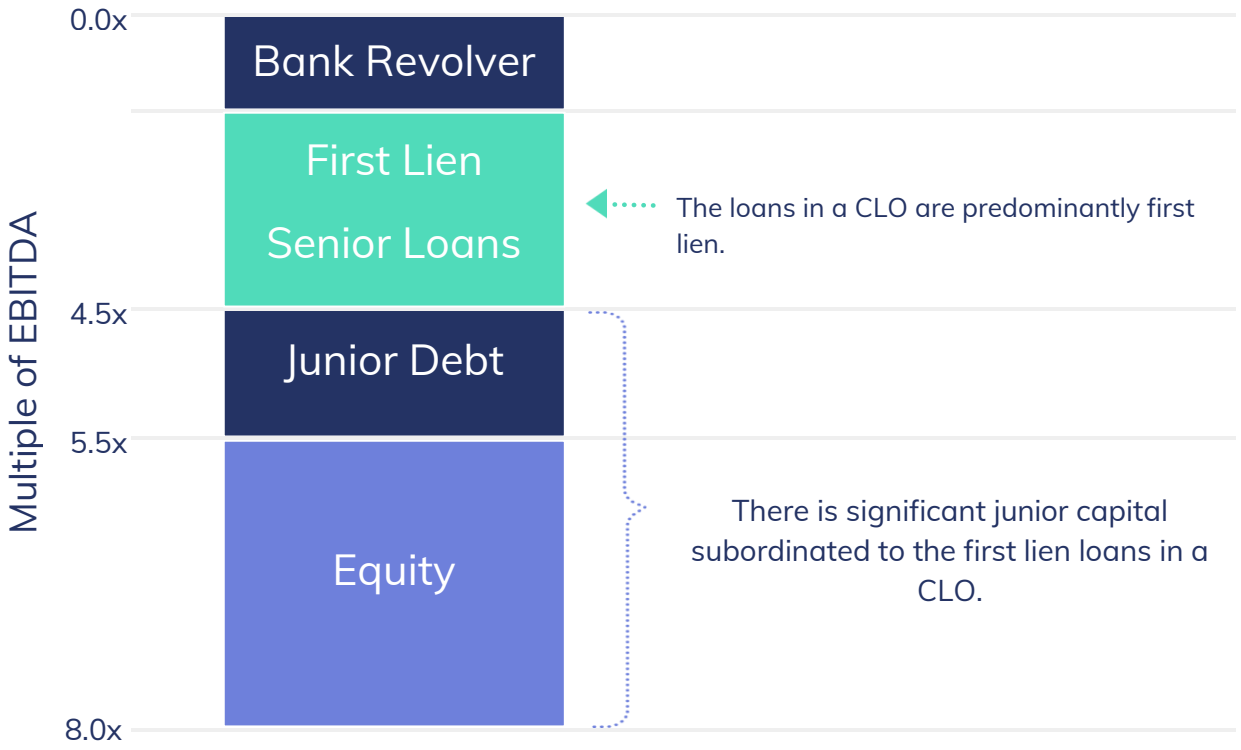


Figure 5

An investor in broadly syndicated loans might be okay with a higher leverage multiple for a business that is growing steadily and showing increased profitability, while a lower leverage multiple would be appropriate for a cyclical company or one with less favorable business prospects. The interest rate will also be a factor - more leverage usually means a higher required spread over Libor to compensate the lender for the increased risk. Most

new-issue broadly syndicated loans today have initial first lien leverage of 3.0x to 6.0x EBITDA, a wide range driven by the factors discussed above.

The private equity firm that acquires a business may be targeting returns of 20% or higher. But there is significant risk to achieving those returns. The owner of a broadly syndicated loan is targeting a ~5.5% return but taking much less risk. If the business has multiple quarters of poor earnings, usually the broadly syndicated loan will eventually be repaid at par. However, if underperformance is severe, a default may arise. Historically, the default rate for broadly syndicated loans is below 2% in times when the economy is growing but in recessionary times the rate has increased to the 8% area.

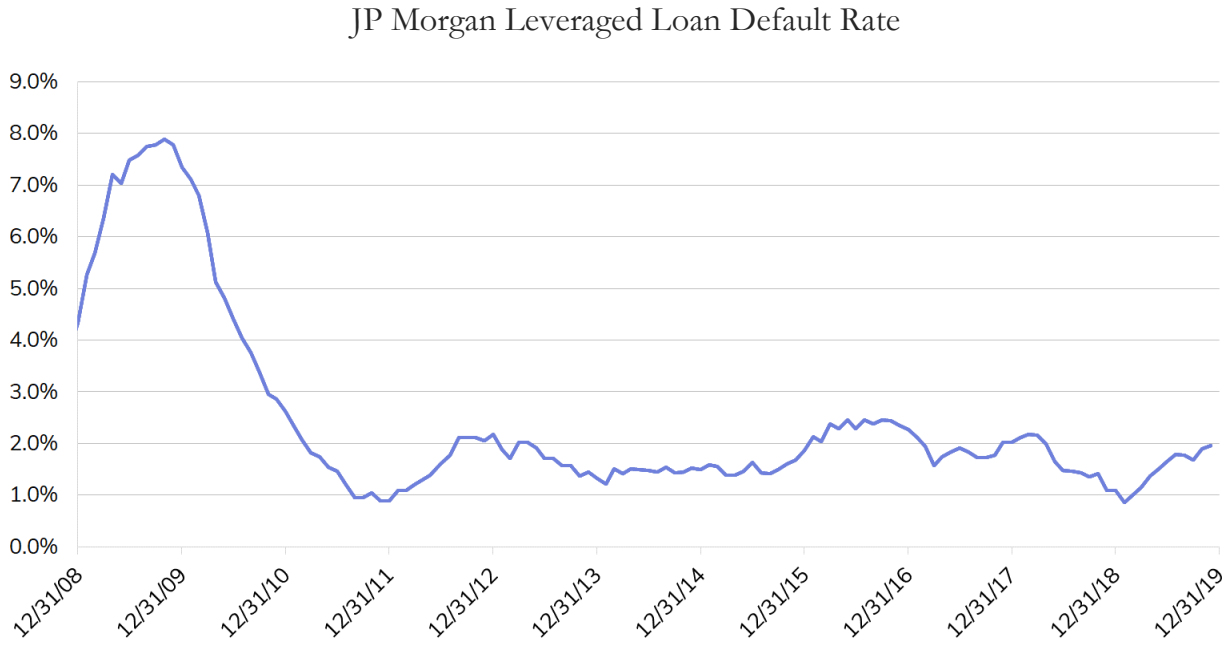


Figure 6

The actual loss on the loan is determined by the recovery rate in the event of a default. Some loans have defaulted and recovered 100% of their par balance, resulting in no loss of principal for the lender. Other loans have experienced dismal recoveries, like some oil and gas companies when commodity prices fell dramatically in 2015/2016.

The recovery rate on first lien loans during the last thirty years is 80.4%, according to Moody's. The first lien loan is the first in line for payment in a bankruptcy, with a lien on all the company's assets. Combining default rate with loss given default, I estimate that a diversified pool of broadly syndicated loans will lose 0.6% per year to defaults. In my opinion, this compares favorably to the interest rate earned on the loans of 5.5%. Unsecured or second lien loans have lower recoveries but entice their investors with higher

return opportunities. A typical CLO will have 2-3% second lien loans and nothing unsecured.

HISTORICAL RECOVERY ANALYSIS

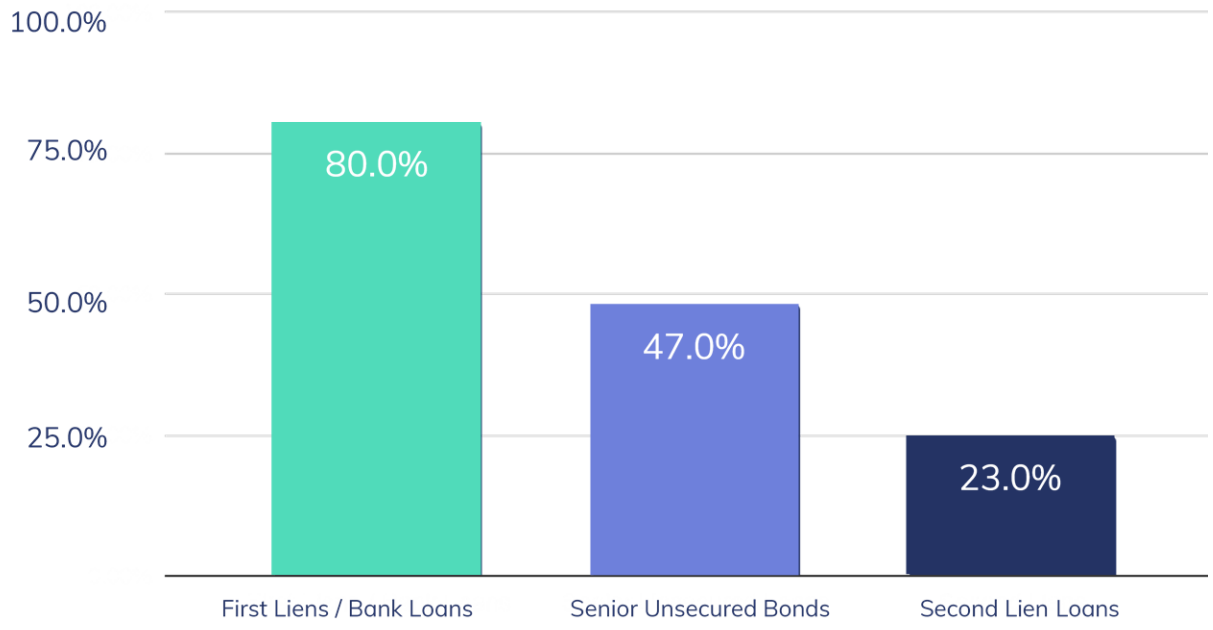


Figure 7

Sources: 1st lien loans & senior unsecured bonds represent the period 1987-2019; Moody's Investor Service, Annual Default Study. Second lien recovery rate is from JP Morgan Default Monitor, for period 2008-2018.

The Loan Sales and Trading Association / S&P have an index that tracks the broadly syndicated loan market (LSTA Index). Usually the index trades close to par value, but there are always some borrowers whose loans trade at discounted levels that pull the overall index down.

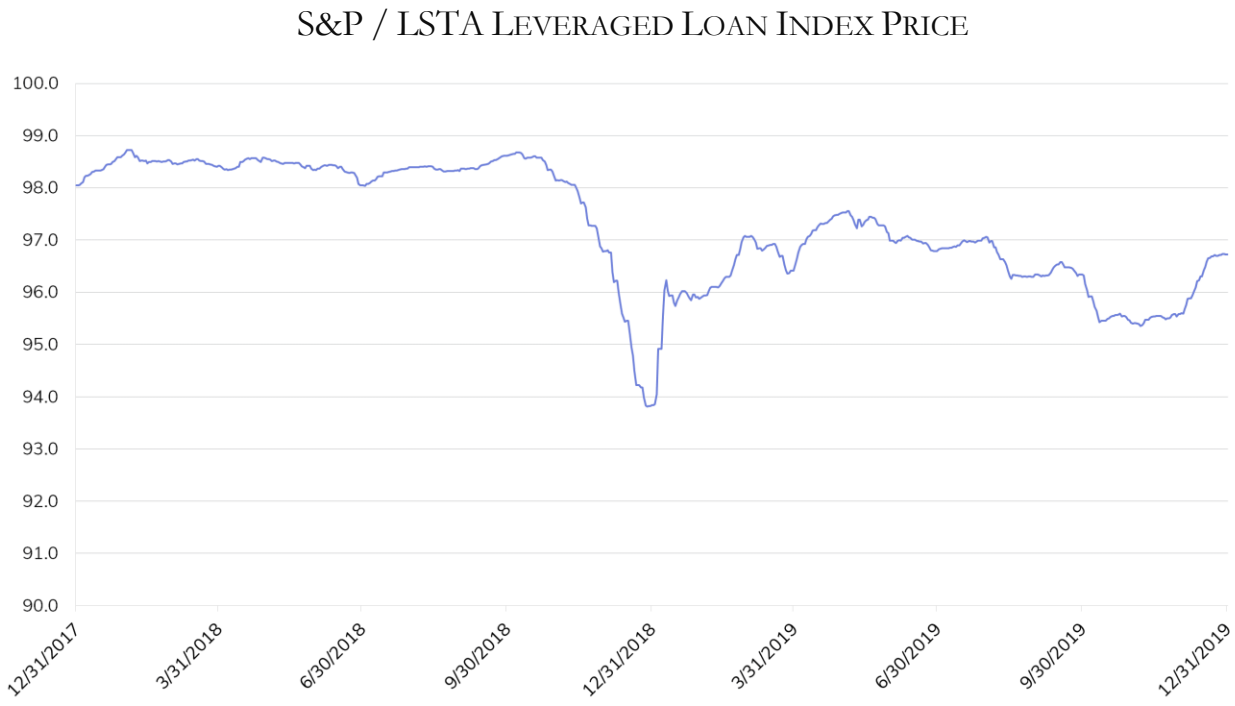


Figure 8

The average annual return is 4.4%. The LSTA Index has had positive returns for every year but two in the last 20 years. CLOs use leverage and structure to turn these returns into the potential for double-digit returns for the owners of CLO equity.

LSTA INDEX RETURNS

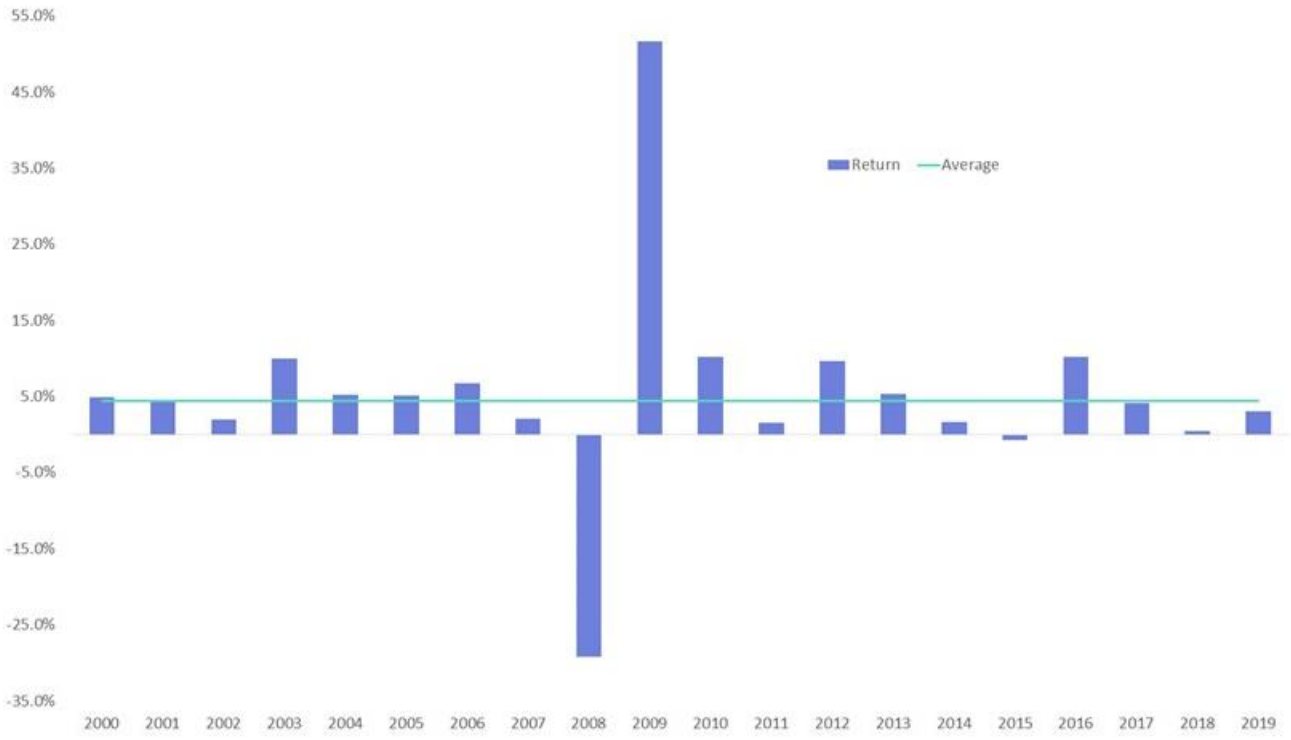


Figure 9

Source: LSTA Index 2000 to 2019

The LSTA Index fell sharply in 2008 as the financial crisis hit loans hard and it seemed possible the entire banking system would fail. By comparison, the S&P 500 Index fell by 53% peak to trough during the financial crisis. At that time, many of the owners of loans had financed their purchase with mark-to-market financing lines called Total Return Swaps (TRS). As the loans began to decline in value, the owners of the loans were forced to sell their loans so that they could meet margin calls. Forced selling in an environment where there were few loan buyers resulted in increased downward pressure on loan prices and even more forced sales. It was a vicious cycle. The loan market bounced back sharply in 2009 as the technical backdrop for loans improved.

The other negative return year for the LSTA Index was 2015. As commodity prices fell at the end of that year, ~5% of loans tied to commodity prices began trading at distressed levels.

Although a typical broadly syndicated loan has a maturity of five to seven years, these loans prepay frequently as there are minimal penalties for doing so. A newly-issued broadly syndicated loan today might have a six-month period in which the borrower could

pay a 50bps fee to refinance the loan. Otherwise the loan would be prepayable at par. The typical broadly syndicated loan is only outstanding for around three years. The Chief Financial Officers of the borrowers in the CLO are risk conscious individuals; they don't like to have near-term debt maturities because the debt markets aren't always open. Prepayments can arise from the debt being refinanced with other loans or bonds or when the company is sold.

THE CLO MANAGER

It's the job of the CLO's collateral manager to pick the initial loans for the CLO and keep it fully invested throughout the reinvestment period. Additionally, the collateral manager will work to ensure that the CLO is passing its many compliance tests. CLO managers usually charge a fee of around 0.4% annually on total assets to perform this function. Most CLO managers earn an incentive fee of 20.0% of equity cash flows after returns exceed a 12.0% hurdle.

For the CLO's equity investor, adequate diligence of the CLO manager is paramount given the manager's role in investment selection and portfolio construction. It is important to find CLO managers that have superior access to CLO loan assets and an experienced investment team. However, if the CLO exits its reinvestment period, the CLO manager's role is significantly reduced.

The CLO manager will typically be incented to buy loans that have high spreads to maximize interest income into the CLO, but high spreads are also associated with more loan default risk. Indeed, the loan market is rather efficient, in my opinion. Because the CLO is 10x levered, the CLO manager plays it safe with the assets and lets the leverage generate the equity returns. I've heard "shooting layups" used as an analogy to describe this investment style. Generally, a CLO manager wouldn't buy distressed loans into the CLO other than potentially swapping one distressed loan already owned for a different one with better recovery prospects.

Surprising to some, a CLO manager can make a 'good' loan to a 'bad' company if structured correctly. For example, a 'bad' company might be in a cyclical industry with low profit margins. Regardless, some combination of low leverage, high loan spread and financial covenants could result in an attractive loan.

Below is a brief checklist I use to evaluate a CLO manager:

- ✓ Track record of the CLO manager, including during periods of distress in the market for senior secured loans
- ✓ Years of experience of the CLO manager
- ✓ Ability of the CLO manager to obtain favorable terms from the debt investors in the CLO
- ✓ Scale of the CLO manager's platform and other resources
- ✓ Ability to efficiently source broadly syndicated loans for the CLO in the primary loan market
- ✓ Resources to work out loans that default

While picking 'good' loans is the primary role of the CLO manager, a secondary function is optimizing the CLO's distributions and tests. The CLO's rules are complex, and a good CLO manager knows how to extract the most value from the CLO for its equity investors.

I generally focused on CLO managers that have lower spreads on their CLO loan assets, which I believe imply lower default risk. Also, Japanese CLO investors, especially for note liabilities rated AAA to A, offer the lowest debt costs for the CLO. This is important for the initial CLO as well as potential refinancings or resets.

Many of the largest US asset managers are also the largest CLO managers. A ranking from Creditflux, the online paper of record for the CLO industry, is shown below. Credit Suisse Asset Management (CSAM) and Prudential (PGIM) sit at the top of the rankings.

CREDITFLUX 2019 TOP 10 MANAGERS

RANK	MANAGER	SIZE ($BN)	MARKET SHARE
1	CSAM	6.31	3.90%
2	PGIM	5.79	3.58%
3	Carlyle	5.36	3.31%
4	Sound Point	5.31	3.28%
5	Octagon	4.66	2.88%
6	Golub	4.57	2.83%
7	GSO	4.42	2.73%
8	KKR	4.04	2.50%
9	Ares	3.96	2.45%
10	CIFC	3.66	2.26%

Figure 10

CLO market participants like to break managers into different tiers. For example, a CLO manager that has a large investor following is considered tier one while a newer CLO manager might be tier 3. A CLO manager that has underperformed on the CLO loan assets might be regarded as tier 4. While there are a few CLO managers that clearly reside in tier 1, the rest of manager's tiers are debatable.

A CLO manager that can obtain low-cost debt financing on its CLO note liabilities is certainly a good argument for a tier 1 categorization. As the cost of debt on different CLO note liabilities is public information, it's clear who those managers are.

The CLO market has no shortage of data you can analyze about a manager's performance. But there is a qualitative aspect to choosing CLO managers as well. Many CLO investors develop favorable working relationships with certain CLO managers and prefer to work with those managers on future CLOs. It is certainly viewed positively when a CLO manager is willing to frequently discuss the CLO's performance with its investors. Trust and relationships are very important in a market where each CLO is bespoke.

There are three things that align the CLO manager with the CLO equity investor. First, the incentive fee is achieved only when a realized return above 12% has been generated for the CLO equity tranche. This is a high but attainable hurdle to hit. The second alignment comes through reputation – if the CLO manager underperforms other CLOs on one of its

deals, it will be harder for the CLO manager to win mandates for subsequent CLOs. Though not required to do so, many CLO managers will also invest in the CLO equity of their deals. Sometimes they will even be willing to pay a higher price for the CLO equity than a third-party investor. That's because the CLO manager will also benefit from the fees that go along with managing the CLO.

In some cases, the CLO manager will give the CLO's equity investors a fee rebate letter. This is a several page contract that entitles the CLO's equity buyer to a portion of the CLO's management fee. If the CLO management fee in the CLO's indenture is 0.45% per annum, the side letter may discount fees to 0.35% per annum. An investor in CLO equity may prefer that the indenture have the 0.35% fee, as this is the most straight-forward method to do the rebate. The 0.1% decrease in fee is worth around 1.0% per year of incremental cash flow to the equity at 10x leverage. The CLO manager may prefer the fee rebate to be done via side letter (outside the Indenture) for two reasons. First, the fee rebate letter allows for the discounting of fees on a private basis, while the indenture shows the full fee to other market participants. That may help the CLO manager negotiate for a higher fee on its next CLO since its previous fee discounting isn't publicly disclosed. The other reason side letters exist is that some investors may get a fee rebate letter while others do not. This reflects the relative bargaining power of the CLO's equity investors at the time the CLO is formed. The side letter is usually tradeable, but these rarely transact in the secondary market. One benefit of taking a fee rebate letter is that all cash flows associated with the fee rebate letter are captured outside of the 12% incentive hurdle. Thus, the owner of the fee rebate letter will have over a 12% return on the equity plus fee letter payments before the incentive fee kicks in. The downside to taking the fee rebate letter is that it adds to accounting complexity as one investment becomes documented in two distinct agreements and the side letter usually will not have a CUSIP.

MONITORING OF A CLO'S LOAN ASSETS

Fortunately, it's not necessary to get the CLO's manager on the phone to understand how the CLO is performing.

When looking at investing in CLO securities, I need the details on the underlying loans in the CLO. And the CLO's monthly trustee reports provide almost all the information needed. The one thing missing is the current market value of the underlying CLO loan assets.

Bloomberg has prices for each CLO loan asset. That enables us to calculate the total market value of each loan within a CLO. I pay special attention to loans trading under 90 cents on the dollar, as these loans are more likely to default than loans trading near par.

BLOOMBERG SCREEN SHOT OF SEVERAL CLO LOAN ASSETS IN

NEUB 2016-23A SUB Mtge | 1) Save | Export | Market Value: Portfolio View

Mixed CLO 5.386(60)1 CUSIP 64131DAB5 Pool Level | Portfolio as of 09/2019

Clear Overrides | Refresh

Issuer	Security Name	Weight	Curr Par Value	Market Value	Price Override	Bid Price
49) Bass Pro Group, LLC	Bass Pro Group T...	1.07%	4,300,290	4,106,777		95.5000
50) Bausch Health Companie...	Bausch Health Co...	0.05%	189,000	189,000		100.0000
51) Bausch Health Companie...	Bausch Health Co...	1.06%	4,272,956	4,278,297		100.1250
52) BCP Raptor II, LLC	BCP Raptor II (Ca...	0.35%	1,405,000	1,248,694		88.8750
53) BCP Raptor, LLC	BCP Raptor T/L B ...	0.43%	1,733,859	1,536,633		88.6250
54) BCP Renaissance Parent...	BCP Renaissance ...	0.66%	2,663,100	2,403,448		90.2500
55) Beacon Roofing Supply Inc	Beacon Roofing T...	0.21%	826,465	821,300		99.3750
56) Belron Finance US LLC	Belron T/L B	0.04%	165,480	165,894		100.2500
57) Berlin Packaging L.L.C.	Berlin Packaging ...	0.01%	46,737	45,334		97.0000
58) Berlin Packaging L.L.C.	Berlin Packaging ...	0.55%	2,191,209	2,125,473		97.0000
59) Berry Global Group, Inc.	Berry Global (Ber...	0.70%	2,830,000	2,854,763		100.8750

Figure 11

When I want to estimate the future cash flows of a CLO, I need to make an estimate of the amount of losses that will occur on the CLO loan assets in each year. Usually I assume a number consistent with the historical loss experience of 0.6%. If the portfolio was newly assembled, I'll also assume that nothing defaults in the first year. That's because the loans were recently purchased by a well-regarded CLO manager. When loans trade below 90 cents on the dollar, I assume that their probability of loss is higher, and add additional loss reserves for these specific loans. In the screenshot above, a future loss reserve would be taken for the BCP Raptors.

CLO's Debt and Equity

Thus far, I've described the CLO's loan assets. Now let's look at how the purchase of loans in a CLO is financed. The CLO will issue notes in tranches rated AAA, AA, A, BBB, BB, and equity to purchase the CLO loan assets. Occasionally a single B rated tranche will also be issued. The AAA is the largest tranche the CLO issues and that accounts for around 65% of the total financing of the CLO loan assets. When you combine all the CLO note liabilities, you can finance 90% of the CLO's loan assets. Equity finances the remaining 10%.

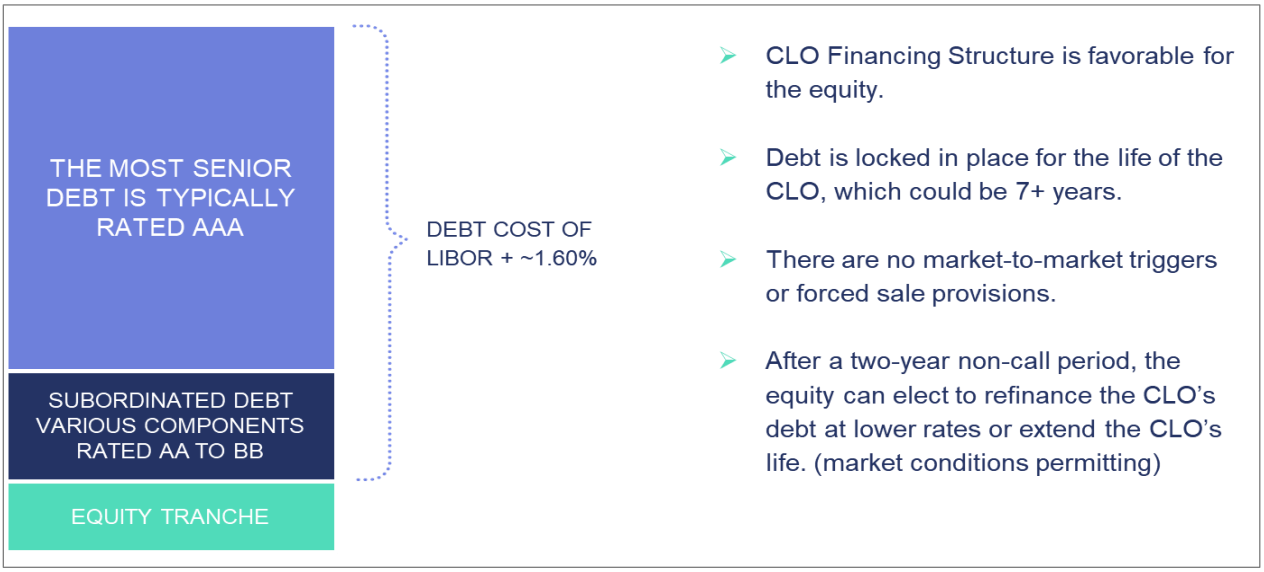


Figure 12

The tranches rated AAA are sold to banks and insurance companies, who earn a rate of Libor + ~1.35% at the end of 2019.

Banks used to be investors in the market for broadly syndicated loans, but now they prefer to own AAA and AA-rated notes issued by CLOs. The bank earns a lower rate but also uses less regulatory capital. In this manner, the bank can optimize its return on equity, the key metric analysts use to analyze a bank's profitability.

The most junior note tranche issued by the CLO, usually rated BB, has a rate of Libor + ~6.75%. These notes are bought by hedge funds, alternative asset managers and high yield bond funds. I like to buy BB rated notes when spreads are wide and equity-like returns are attainable. Occasionally CLOs will issue a single-B rated tranche at Libor + ~10.0%. I believe this cost is too expensive for the increase in leverage and therefore don't focus on CLOs that issue this note. The reason for the disparity in ratings and spread between the different CLO note liabilities is the seniority the AAA tranche has over more junior tranches in what's called the CLO's payment waterfall.

As the loans in a CLO make their interest payments, the AAA is the first note to receive the cash flow, up until its interest is paid in full. Then the AA gets paid its interest. And so it goes down the line until the BB gets paid its interest. The CLO manager needs to get paid too. Its fee is around 40bps, usually split into a senior and junior position in the waterfall. The CLO equity doesn't have a contractual interest rate, rather, it receives all the cash flow that wasn't used to satisfy the CLO's more senior claimants. Why would anyone want to be positioned as the last claimant in the CLOs waterfall? The potential for double-digit returns.

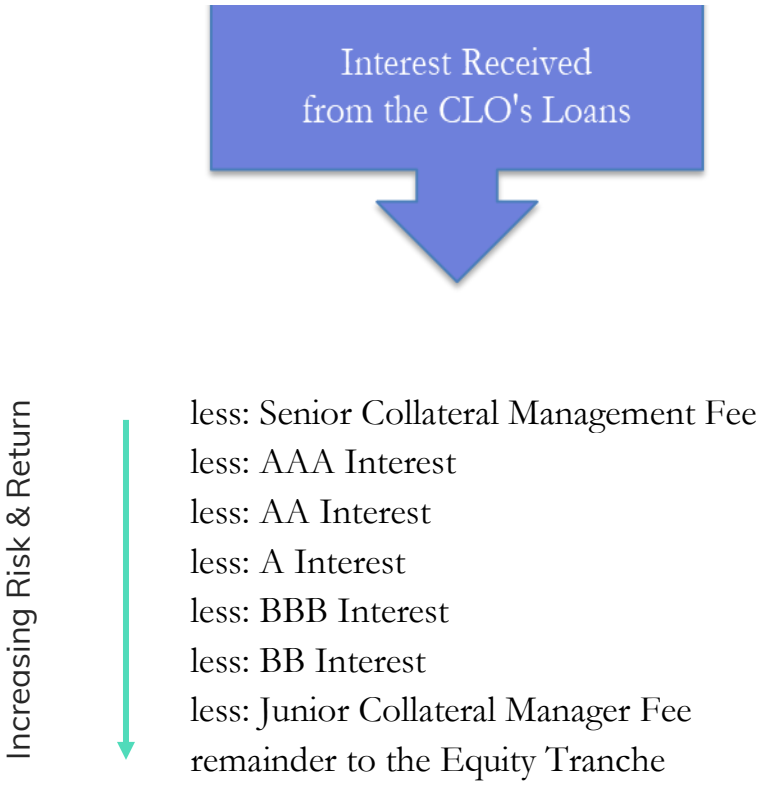


Figure 13

An investor in the AAA tranche is taking very little risk; it's assumed that the probability of default on this note is almost zero. In fact, there have been no defaults on the AAA-rated tranche of CLOs. An investor in the AAA tranche probably considers his biggest risk a downgrade in ratings or an illiquid market in a time he wants to sell.

An investor in the BB tranche is taking more risk as he sits in a more junior position in the waterfall. Still, he probably thinks the default probability of his tranche is remote. After all, there is initially 10% of equity that's subordinated to the BB-rated tranche. The first defaults in the CLO are, of course, absorbed by the equity tranche. The equity tranche takes this risk in exchange for high cash distributions. The extent of losses on the CLO's loan assets will be a big driver of the returns of the equity tranche.

Loan losses below the 0.6% historical loss rate will be beneficial to CLO equity returns while loan losses above 0.6% are detrimental to CLO equity returns. In most reasonable scenarios, loan losses would not rise to the rate where there is an impairment on any of the CLO's note liabilities, in my opinion.

The debt tranches used to finance the CLO are executed on terms that I believe are favorable for the CLO equity. While the CLO's loan assets are often traded and priced by banks, there is no mark-to-market margining of forced sale provisions in the CLO. If the loans trade down, the distributions to the equity will continue, provided there aren't too many defaults or CCC/Caa-rated CLO loan assets. The CLO's financing is long-term, with most CLO's having a projected life of 7+ years. Because the debt is placed on such favorable terms for the CLO's equity, I often think of the CLO's note liabilities as an asset. After all, if the CLO's note liabilities are not executed on attractive terms, there wouldn't be a reason for the equity tranche investor in a CLO to participate in the deal.

CLO Covenants & Tests

The buyers of CLO note liabilities receive material structural protections, otherwise the rating agencies wouldn't give them the ratings they do. Although CLOs don't have mark-to-market margining or forced sale provisions, CLOs are still required to maintain compliance with important tests such as par value or Over Collateralization (O/C). An example of a recent CLO I analyzed had the following O/C test calculation:

Example O/C Tests and Cushions

TRANCHE	COUPON	RATING	PAR VALUE OF CLO LOANS	CLO DEBT AMOUNT O/S	DENOMINATOR OF O/C TEST	O/C TEST	REQUIRED O/C	CUSHION
A1	LIBOR_3MO + 1.07	AAA/AAA	500,688,729	290,000,000				
A2	LIBOR_3MO + 1.40	-/AAA	500,688,729	35,000,000				
B	LIBOR_3MO + 1.65	AA/-	500,688,729	55,000,000	380,000,000	131.8%	121.6%	10.2%
C	LIBOR_3MO + 1.95	A/-	500,688,729	31,000,000	411,000,000	121.8%	113.7%	8.2%
D	LIBOR_3MO + 3.00	BBB-/-	500,688,729	29,000,000	440,000,000	113.8%	107.6%	6.2%
E	LIBOR_3MO + 5.70	BB-/-	500,688,729	20,000,000	460,000,000	108.8%	104.9%	3.9%
Equity	N/A	-/-	500,688,729	51,600,000				

Figure 14

This CLO has two AAA-rated tranches with the A2 junior to the A1. There are no O/C tests for the AAA-rated notes because there are no tranches senior to the AAA.

The senior-most O/C test is applied to the $55M AA-rated note. The numerator of the Class B O/C test is the par value of loans, adjusted downward when there are excess CCC/Caa-rated or defaulted CLO loan assets. The denominator of the O/C test is the principal balance of the Class B plus all notes senior to the Class B (in this case the class A1 & A2). The par balance of loans is $500.7M so the Class B O/C test ratio is $500.7M / ($290M+$35M+$55M) = 131.8%. The CLO's required ratio is 121.6% so the deal is passing this O/C test. That means the CLO's waterfall will allow interest to be paid on notes junior to the Class B. The O/C test ratios that pertain to debt less senior than the class B are naturally lower as more debt is included in the ratio's denominator, while the numerator remains the same. In the example above, the most junior O/C test is passing by a cushion of 3.9%. Assuming a 30% loss when a CLO loan asset defaults, the CLO would need to see a default rate of 13% (3.9% / 30%) before the CLO's equity distributions are

halted. This asumes that the CLO manager doesn't buy loans below par to make up some of the losses.

While the denominators of the O/C tests are fixed using the debt outstanding for that particular note, the numerator can be adjusted downward if there is significant credit deterioration on the CLO's loan assets. Most importantly, if a loan defaults, it is no longer carried at par value. Its carrying value is the lower of current market value and a hypothetical recovery value assigned by a rating agency.

Loans rated CCC/Caa which exceed 7.5% of the portfolio can also haircut the par balance of CLO loan assets. For example, in a CLO that has 8.6% CCC-rated CLO loan assets, the 1.1% of CCC-rated CLO loan assets above the limit would be carried at market value. The CLO loan assets used to haircut the CCC-rated bucket would be the ones trading at the lowest market value. In the example below, the CLO has an excess CCC-rated amount. So the numerator of the O/C test is reduced by the mark-to-market losses in Company C and E.

Example Excess CCC Ratio Calculation

LOAN	S&P RATING	PAR BALANCE	% OF PAR	MARKET PRICE	MARKET TO MARKET LOSS
Company A	CCC	6,000,000	1.20%	100.00%	-
Company B	CCC	5,500,000	1.10%	89.00%	605,000.00
Company C	CCC	4,000,000	0.80%	70.00%	1,200,000.00
Company D	CCC	4,500,000	0.90%	84.00%	720,000.00
Company E	CCC	5,000,000	1.00%	68.00%	1,600,000.00
Company F	CCC	6,250,000	1.25%	96.00%	250,000.00
Company G	CCC	5,700,000	1.14%	99.00%	57,000.00
Company H	CCC	6,250,000	1.25%	100.00%	
Total		43,200,000			
CCC % of Par		8.63%			
CCC % Threshold		7.50%			
CCC % Excess		1.13%			
Worst CCC by price					
Company E		5,000,000	1.00%	68.00%	1,600,000.00
Company C		6,500,000	0.80%	70.00%	1,200,000.00
Reduction in Par Balance for O/C Test					**2,800,000.00**

Figure 15

Moody's will also have a similar test, and whichever rating agency produces the largest reduction in par balance will usually be the haircut used by the CLO. If the CLO is failing the test above, it will be prohibited from buying another CCC-rated asset. The CLO manager may want to sell Company A's loan at par so as to reduce the excess CCC bucket.

But, CCC-rated loans generally have high spreads that the CLO manager may not want to part with.

Newly issued CLOs may have 2-4% CCC-rated assets, so the example above shows significant negative credit migration. This example would probably correspond to a CLO in a recessionary period or a CLO that began its life several years ago.

As the CLO's loan assets show deterioration, there is one test that will fail before the O/C test. This is the interest diversion test and its cushion is slightly inside the junior-most O/C test. When this test fails, the CLO will take up to 50% of the cash flow that would have otherwise been paid to the equity and instead use it to purchase additional CLO loan assets. This puts the CLO's liability note investors in a better position, as they are secured by more collateral. It's also not the worst thing for the CLO's equity, because the new CLO loan assets will pay interest into the CLO's waterfall and the CLO's equity should ultimately recover these CLO loan assets when the CLO is liquidated. Regardless, tripping this test would not be fun for the CLO's equity investors, considering how many CLO loan assets would have to default before the CLO arrived at that position.

Of course, most investors in CLOs are aligning themselves with CLO managers that are not expected to fail any of these tests. Also, CLO equity investors generally have a favorable view of the loan market in general.

If excess Caa/CCC-rated assets and defaults rise to a level where an O/C test is failing, the distributions to the equity are stopped. Cash flow otherwise payable to the equity is used to repay the senior-most outstanding CLO note liability until the O/C test comes back into compliance. Any interest due but unpaid on the CLO's liability notes is capitalized into its principal balance. But there is no event of default. Unfortunately for the CLO's equity, when this happens the CLO is repaying its lowest cost debt and there isn't an ability to reborrow what was repaid. A surprising result of the CLO's rules is that the worse the CLO loan assets perform, the faster the AAA-rated tranche gets repaid.

One thing that may surprise someone new to CLOs is that when a CLO loan asset is purchased for a price above 80-85 cents on the dollar, the CLO loan asset is carried at the full par balance for purposes of the O/C test. Thus, the O/C test initially appears to be a test that's easy to game. But, buying discounted loans can be risky, as the discounted loans imply a higher risk of default or downgrade. If the discounted loans default, the manager has moved the problem into the future but compounded the problem.

CLOs also have interest coverage tests, which function the same way as O/C tests. They measure the amount of interest received on the loans in comparison to the interest due to the CLO's note liabilities. In my experience it's more likely the O/C tests fail when the quality of the CLO's loan assets deteriorate. Usually the manager will buy CLO loan assets with enough spread to satisfy interest coverage tests.

For CLOs outstanding during the financial crisis, the average equity tranche missed 2-3 payments. And around 25% of equity tranches missed no payments at all. These were the deals managed by what are today considereded the best CLO managers. Their skill was both in picking CLO loan assets that didn't suffer significant deterioration and understanding the rules of the CLO to maximimize cash flows to the CLO's equity tranche.

There are other collateral quality tests in a CLO but these tests are measured on a maintain or improve basis. That means the CLO can be failing these tests, but cash flows in the CLO waterfall are unaffected. But, the CLO manager can not buy a CLO loan asset that would push the CLO farther into failing a test. For example, if the Moody's diversity test (explained below) was failing, the CLO manager could not buy a new loan that would make the test result worse. These are some key collateral quality tests for a CLO I analyzed recently:

COLLATERAL QUALITY TEST	ACTUAL	REQUIRED	PASSING	NOTE
Weighted Average Ratings Factor	2,824	2,889	yes	Moody's calculates the weighted average rating of the CLO loan assets. A B2 rating is equivelant to 2,720 and a B3 rating is equivelant to 3,490
Moody's Diversity	75	65	yes	The diversity test is optimized by having the largest amount of borrowers in the CLO also factoring in diversity by industry
Caa or Less %	2.6%	7.5%	yes	Maximum Caa1 or lower rated CLO loan assets; if max limit is exceeded the O/C test levels will be effected
CCC+ or Less %	3.5%	7.5%	yes	Maximum CCC+ or lower rated CLO loan assets; if max limit is exceeded the O/C test levels will be effected
Weighted Average Spread	3.5%	3.2%	yes	The weighted average spread on the CLO loan assets needs to surpass a mimimum so that the CLO's note lliability interest expense can be comfortably serviced
Weighted Average Life	4.85	6.50	yes	The weighted averag life or maturity of the CLO loan assets declines over time so that eventually the CLO won't be able to buy new loans and the CLO will begin to amortize
S&P Recovery Rate	45.61	44.00	yes	S&P assigns a hypothetical recovery rate for each CLO loan asset
Moody's Recovery Rate	49.10	43.00	yes	Moody's assigns a hypothetical recovery rate for each CLO loan asset

Figure 16

There will also be concentration limits for the largest loan owned by the CLO (1-2% of assets) and a maximum industry concentration (10-15% of assets). The largest industry concentrations in CLOs are usually healthcare, technology and business services. The manager has considerable leeway in deciding industry categorization. Some business models could easily fit into several different industry classifications.

CLO Equity Returns

Surprising to many, CLO equity tranches issued prior to the financial crisis performed well on a buy-and-hold basis.

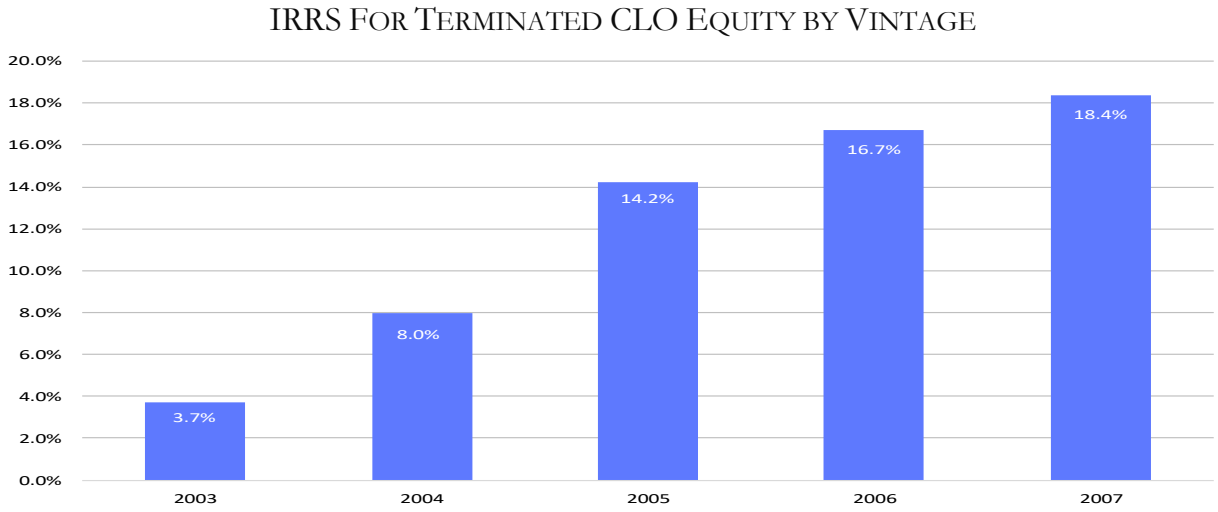


Figure 17

Source: Intex, Wells Fargo Securities US CLO Equity Report 11-26-2019.

An investor who bought CLO equity in the 2007 vintage was likely targeting ~13% returns, after factoring in the historical annual loan losses of 0.6%. In 2008 & 2009, CLO loan asset losses were coming in at multiples of the projected rate. The equity was feeling the pain.

At the same time, most broadly syndicated loans were trading in the market at discounts to par. The CLOs were slowly getting repaid at par on some loans and the CLO manager was buying new loans at discounted levels. Fortunately, many more loans prepay at par than default. Over time, this substantially increased the profitability of the CLOs. In fact, the CLO's increased profitability from buying discounted CLO loan assets was well in excess of the increased loan losses absorbed by the equity.

During the financial crisis, the index of broadly syndicated loans traded into the 60s. Indeed, during this time it looked like several major US banks would collapse.

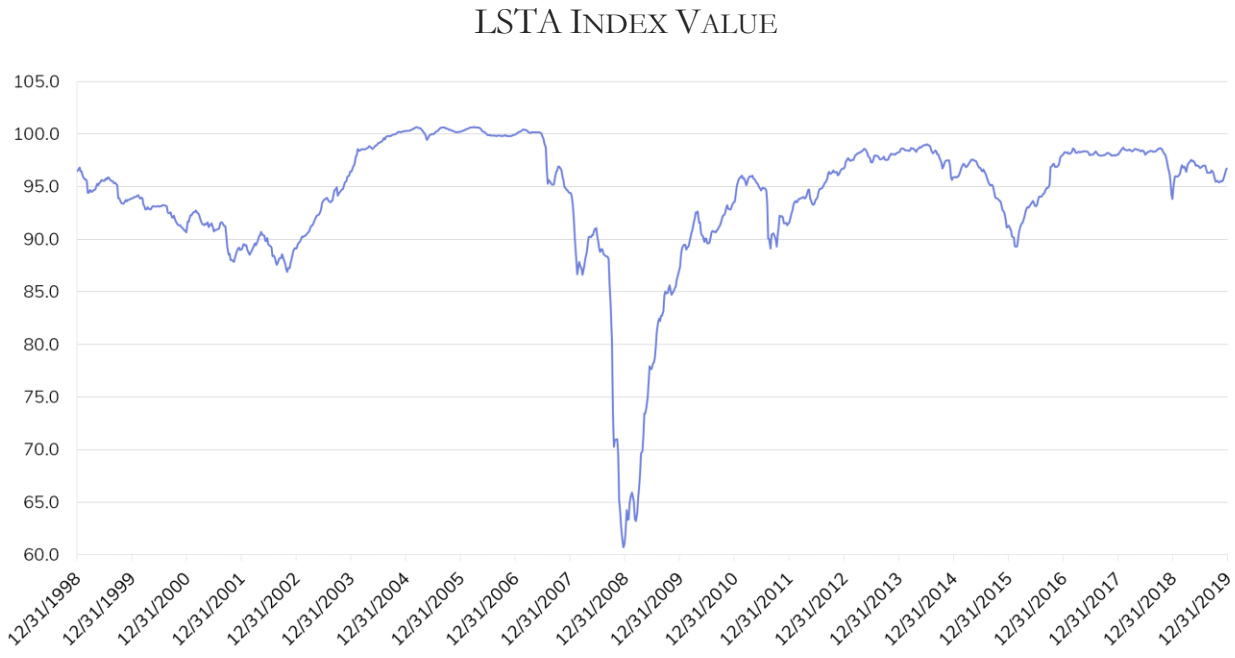


Figure 18

Source: Bloomberg

There isn't an index that shows where CLO note liabilities or equity tranches would have traded during the financial crisis. I do know the equity and more junior debt tranches traded at very distressed levels, and investors who hung on were rewarded with solid returns. I believe that many of the investors who sold at distressed levels did not understand that CLOs could make up many of the increased losses by buying discounted loans into the CLO.

The 2003 CLO vintage of Figure 17 also merits a comment. When the 2003 vintage began its life, loan spreads were high. At inception, the CLO locked in its CLO note liability costs for the life of the CLO. In subsequent years, spreads on newly issued CLO loan assets declined. As the CLO loan assets prepaid at par, the vehicle bought new CLO loan assets that paid lower interest rates. Gradually the CLO's profitability was negatively affected. This is the opposite path of CLOs issued in 2007. CLO technology has since changed so that CLOs can refinance and reset the CLO's note liabilities after a non-call period. That should provide protection in a market where CLO loan asset spreads are declining, as the rates on CLO liability notes and CLO loan assets are very highly correlated.

For CLOs issued since the financial crisis, most are still around, making investments in CLO loan assets and paying distributions to the equity tranche. For these CLOs, there

isn't a realized return. However, these CLOs have distributed significant cash flows to investors, and the last cash flow in a CLO's life is the largest one (when all the CLO loans assets are liquidated.)

CASH FLOWS FOR REINVESTING CLOS AS % OF INVESTMENT

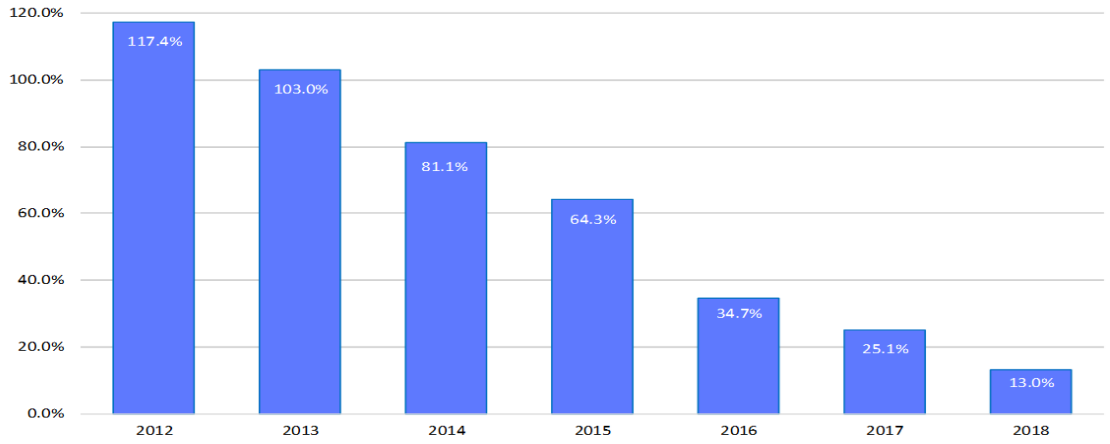


Figure 19

Source: Intex, Wells Fargo Securities US CLO Equity Report 11-26-2019; assumes 90 equity purchase price.

I'm often asked, "What's the probability I have a negative return on a CLO equity investment?" One prominent CLO investor, Eagle Point Credit, published a study of all CLOs issued between 2002 and 2011 and found only 4% had negative returns. That surprises many people who erroneously lump CLOs in with other securitizations that performed very poorly during the financial downturn.

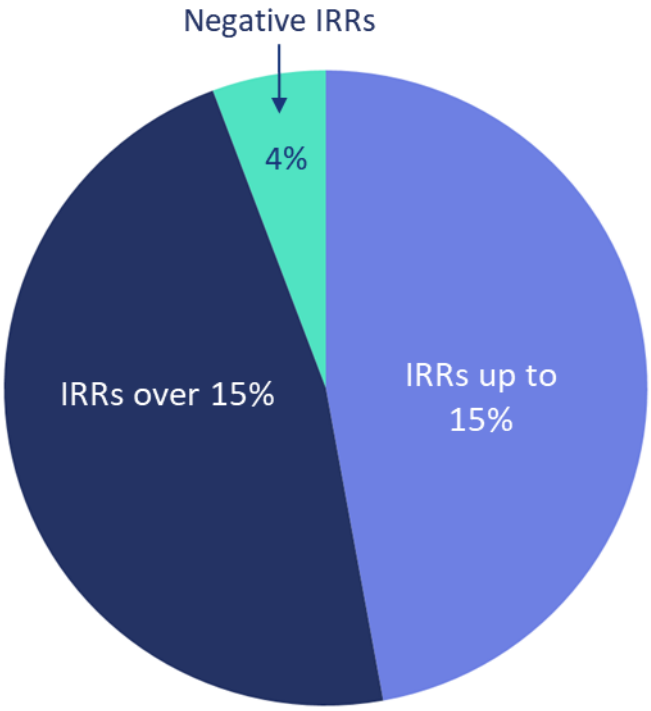


Figure 20

Source: Eagle Point Credit

While I spend most of my time focused on CLO equity, it's important to note that returns for CLO liability notes have also been favorable. According to S&P, there have only been 38 CLO liability note defaults out of 10,894 CLOs rated.

U.S. CLO Lifetime Transition & Default Summary (1996 – 2018)

CLO VINTAGE	RATINGS (NUMBER)	DEFAULTS (%)	DEFAULTS (NUMBER)
PRE FINANCIAL CRISIS CLOS	4,322	0.9	38.0
POST FINANCIAL CRISIS CLOS	6,572	0.0	0.0
OVERALL	10,894	0.3	38.0

Figure 21

Source: S&P Global Ratings 2018 U.S. Lifetime Transition and Default Summary (1996-2018)

Historical default rate for CLO note liabilities by tranches are shown below. As the ratings decline from AAA down the stack, the amount of defaults picks up but is still quite small. There are less single-B rated tranches than BB-rated tranches so that explains the fewer defaults in the single-B ratings category.

ORIGINAL RATING	TRANCHES RATED	DEFAULT
AAA	3,341	0
AA	2,004	1
A	1,969	5
BBB	1,790	9
BB	1,468	20
B	322	3
TOTAL	**10,894**	**38**

Figure 22

Source: S&P Global Ratings 2018 U.S. Lifetime Transition and Default Summary (1996-2018)

Since 20 out of 1,468 CLO liability note tranches rated BB defaulted, the cumulative default rate is 1.39%. However, analysts usually talk about default rates in annual terms. Assuming the average BB-rated tranche is outstanding for five years, the annual default rate is 0.28%. This compares quite favorably to the annual default rate for broadly syndicated loans of 2.7%. Also, surprisingly, the BB-rated CLO note liability has a higher spread than the loan index.

Of course, it makes sense that favorable returns for CLO equity would also imply few defaults on CLO note liabilities.

Some market participants consider CLO equity to be less risky than a BB-rated CLO liability note. The reason is the CLO equity cash flows are front-end loaded, with an average duration of ~3 years. The holder of BB-rated CLO note may have to wait eight years or more before he receives any principal repayment. In that time, a lot of things could go wrong.

The CLO Arranger

A CLO arranger is the the investment bank that brings a CLO to life. Its role is to place all the CLO's note liabilities with market participants. It mediates all of the negotiations between the various investors in the CLO, but usually doesn't invest in the CLO. The arranger receives a one-time fee of approximately 0.4% of the CLO's total liabilities. CLO equity is sold to accredited investors and qualified institutional buyers with over $100M of assets under management. It's not sold directly to individuals.

The leading CLO arrangers are some of the world's largest investment banks.

RANK	ARRANGER	TOTAL ($BN)
1	Citi	16.56
2	JP Morgan	13.16
3	Wells Fargo	12.18
4	Barclays	10.81
5	Morgan Stanley	10.24
6	BofA	9.23
7	Goldman Sachs	8.14
8	BNP Paribas	7.79
9	Natixis	7.40
10	Credit Suisse	7.09
11	Jefferies	5.59
12	GreensLedge	4.23
13	Deutsche Bank	3.45
14	MUFG	2.61
15	SocGen	1.51
16	Mizuho	1.22
17	RBC	1.04
18	Amherst	0.33
19	Capital One	0.11
20	HSBC	0.09
TOP 20	TOTAL	122.81

Figure 23

Source: Creditflux 2020 Annual Ranking

It takes a lot of work to bring a CLO into existence. The investors in the different CLO securities have wildly different agendas. For example, the AAA liability note wants as many constraints on the CLO loan assets as possible, while the equity tranche wants the least. Additionally, the CLO manager, lawyers, and rating agencies all must agree on terms in the CLO's indenture. It's only because precedents have been set for what the CLO's multiple parties should expect that CLO's are able to form so frequently.

The fee to the CLO arranger is a negotiable item. If the formation of the CLO runs smoothly, the CLO arranger may make an elevated fee. If the equity isn't easy to sell, the CLO arranger may reduce its fee to increase the equity returns. The CLO arranger may also ask the CLO manager to reduce its fee to improve the returns of the equity tranche.

A CLO'S NET ASSET VALUE

An investor in CLOs will often want to know the Net Asset Value (NAV) of the specific CLO tranche they have invested in. For a AAA note investor, the calculation is the market value of the CLO's loan assets plus any uninvested cash divided by the AAA note amount outstanding. The NAV for the equity in a new CLO starts at around 70%. That's because the CLO has upfront costs that are borne by the equity: lawyers, rating agencies, and investment banks. Over time the NAV will change based on the fair market value of the underlying CLO loan assets. A small move in CLO loan asset prices will be magnified by 10x at the equity tranche level, given the embedded leverage in the CLO. Using a Bloomberg terminal, I can pull up a CLO and type 'MV' to see the daily NAVs of most CLOs. An example is shown below.

SAMPLE NET ASSET VALUE CALCULATION

EATON 2018-1A SUB Mtge | View Portfolio | Export | Market Value

Mixed CLO 5.362(60)1 CUSIP 27831EAC1 Pool Level

Class	Orig(000)	Curr(000)	% Bal	% Sub	Cpn	MV OC	Month Chg	Par OC	Month Chg
1) A1	276,750	276,750	60.3%	39.7%	3.131	157.9%	-0.5	162.7%	-0.1
2) A2	15,750	15,750	3.4%	36.2%	3.451	149.4%	-0.5	153.9%	-0.1
3) B	49,500	49,500	10.8%	25.5%	3.751	127.8%	-0.4	131.6%	-0.1
4) C	26,500	26,500	5.8%	19.7%	4.201	118.6%	-0.4	122.2%	-0.1
5) D	27,250	27,250	5.9%	13.7%	5.201	110.4%	-0.3	113.8%	+0.0
6) E	18,250	18,250	4.0%	9.8%	8.001	105.6%	-0.3	108.7%	+0.0
7) SUB	44,775	44,775	9.8%	0.0%	0.000	51.5%	-3.0	80.9%	-0.4

Portfolio Statistics

	10/2019	09/2019
Weighted Avg Price	97.04	97.30
Loans Priced / Total	340 / 356	333 / 352
Percent Priced	95.5%	94.6%
Portfolio Par Value	444.89MM	445.04MM
Portfolio Market Value	431.73MM	433.03MM
Principal Acct Bal	5.32MM	5.37MM
Total Market Value	437.05MM	438.40MM

Pricing Information

Weighted Avg BVAL Score	6.85
Pricing Sources	
Override	0.0%
BVAL	95.5%
MSG1	0.0%
Other	0.0%
No Source	4.5%
Total	100.0%

Figure 24

Source: Bloomberg

According to Figure 24 above, this CLO has a portfolio market value of $437.05M. After subtracting out the principal amount of the CLO liability notes, the CLO's equity, (referred to as 'sub notes') would have 51.5% of its principal balance. If all the CLO loan assets

were to somehow be worth par, the CLO equity would receive 80.9% of its par balance. While this isn't very likely, it's good to know that there is some upside to the 51.5% current NAV if loans increase in price. Occasionally, I see CLOs that have a class X note. The class X note is paid out of the CLO waterfall with interest proceeds and is therefore excluded from the NAV calculation. The X tranche is usually rated AAA and pays around Libor + ~0.6%, depending on the term (usually two years).

MODELING A CLO'S ASSETS

CLOs are generally not static pools. The CLO manager will keep the CLO fully invested during a ~5-year reinvestment period. CLO loan assets frequently prepay at par, leaving the CLO manager with cash to reinvest in new CLO loan assets. Also, CLO managers may execute relative value trades where they sell a CLO loan asset they expect to underperform in favor of another one.

Around 35% of CLO loan assets prepay in a year. To project cash flows from the CLO loan assets I need to make assumptions about the spread and price of future CLO loan assets. At the end of 2019, it was common to model newly purchased loan assets at a Libor + 3.25% spread bought at a price of 99.5.

In a typical CLO, I model a 2% annual default rate and a 70% recovery rate. This creates annual losses of 60bps, which is in line with historical results.

MODELED LOAN PREPAY RATE	MODELED REINVEST LOAN SPREAD	MODELED REINVEST LOAN PRICE	LOAN DEFAULT RATE	LOAN RECOVERY RATE
35.00%	3.25%	99.50%	2.00%	70.00%

Figure 25

Some CLO loan assets may be trading below 90 cents on the dollar, which requires us to make different assumptions as the risk of default is elevated. When I find CLO loan assets trading below 50 cents on the dollar, I assume they will default immediately and recover their current market value. A loan at 85 cents on the dollar is less risky, so I model a default in 24 months and recovery of 85. In this case, the CLO benefits from two years of interest received. And there are few levels in between the prices above. A CLO loan asset trading below 90 will always default and recover its current market value, it's just a question of how long the lag is.

MODELED LAG DEF LOANS 80<X<90 (MONTHS)	LAG DEF LOANS 70<X<80 (MONTHS)	MODELED LAG DEF LOANS 60<X<70 (MONTHS)	LAG DEF LOANS 50<X<60 (MONTHS)	LAG DEF LOANS X<50 (MONTHS)
24	18	12	6	0

Figure 26

Additionally, I run a lower prepayment rate for loans trading below 90. Loans trading in the 80s have a 5% annual prepayment rate while loans that trade lower than that have a 0% prepayment rate.

I also need to calculate the weighted average price for loans trading above 90. That's the price I'll use to liquidate the CLO at the end of its life.

SIMPLIFIED CLO MODEL IN EXCEL

DEAL ASSUMPTIONS	
Initial Par (in thousands)	$ 500,000
Upfront Costs	0.60%
Reinvestment Period (years)	5
Leverage	10.0x
Annual Operating Expenses	0.50%
Equity Purchase Price	80.00%

DATES	12/31/2019	12/31/2020	12/31/2021	12/31/2022	12/31/2023	12/31/2024	12/31/2025	12/31/2026	12/31/2027
KEY ASSUMPTIONS									
Asset Spread		3.25%	3.25%	3.25%	3.25%	3.25%	3.25%	3.25%	3.25%
Liability Spread		1.65%	1.65%	1.65%	1.65%	1.65%	1.65%	1.65%	1.65%
Loan Purchase Price		99.50%	99.50%	99.50%	99.50%	99.50%	99.50%	99.50%	99.50%
Prepayment Rate		35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%
Default Rate		0.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Recovery Rate		70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%
Libor Curve	1.92%	1.00%	0.65%	1.10%	1.30%	1.50%	1.70%	1.90%	2.10%
ASSETS									
Initial Par Value of Loans (in thousands)	$ 500,000	$ 500,000	$ 500,879	$ 498,755	$ 496,640	$ 494,533	$ 492,436	$ 317,129	$ 204,231
Prepayments		(175,000)	(175,308)	(174,564)	(173,824)	(173,087)	(172,353)	(110,995)	(71,481)
Reinvests		175,879	176,189	175,441	174,697	173,956	-	-	-
Losses due to Defaults		-	(3,005)	(2,993)	(2,980)	(2,967)	(2,955)	(1,903)	(1,225)
Ending Par Value of Loans	$ 500,000	$ 500,879	$ 498,755	$ 496,640	$ 494,533	$ 492,436	$ 317,129	$ 204,231	$ 131,525
INCOME STATEMENT / EQUITY CASH FLOWS									
Income from Loans		23,550	20,393	20,617	22,148	23,045	23,934	20,442	13,686
Interest Expense		(13,995)	(11,148)	(11,358)	(12,759)	(13,590)	(14,413)	(12,240)	(7,690)
Management + Operating Expenses		(2,500)	(2,502)	(2,499)	(2,488)	(2,478)	(2,467)	(2,024)	(1,303)
Net Income		7,055	6,742	6,760	6,900	6,976	7,053	6,178	4,692
Equity Cash Flows	(40,000)	7,055	6,742	6,760	6,900	6,976	7,053	6,178	23,665
Cash on Cash Returns		17.64%	16.86%	16.90%	17.25%	17.44%	17.63%	15.44%	59.16%
Internal Rate of Return	12.45%								

Figure 27

Let's look at the cash flows for a CLO I recently modeled. The CLO initially has $500M of par loans in it. The upfront costs of 60bps are paid predominantly to the CLO's arranger, lawyers and ratings agencies. These expenses are ultimately borne by the equity investor. A typical new issue CLO in 2019 had a five-year reinvestment period and 10.0x leverage, expressed as the par balance of CLO loans / face value of the equity. Annual operating expenses of 50bps are comprised of 45bps to the CLO manager and 5bps in other operating costs.

The CLO's loan assets are assumed to yield Libor + 3.25% with Libor initially at 2.0%. Since future Libor levels are unknown, I use the forward Libor curve to estimate total asset yields in the future. Loans are purchased into the CLO at a price of 99.5, a slight discount to par. Each year 35% of the loans prepay at par. The collateral manager will buy new loans with the prepayment cash received at the same price and spread as the existing portfolio. The modeled default rate in the first year is zero. That's because the CLO

manager recently bought all the loans; it's rare that a newly purchased loan would default in the first year. After that loans are assumed to default at 2% per year at a 70% recovery (or 30% loss given default). As we've discussed, it's the equity that absorbs these losses.

During the five-year reinvestment period, the par value of the CLO loan assets remains around $500M. Losses reduce the par balance of CLO loan assets but reinvesting in discounted loans is a partial offset. After the five-year reinvestment period, the CLO begins to amortize. As loan prepayments come in, the CLO begins repaying its CLO note liabilities instead of investing in new CLO loan assets. It's the AAA-rated CLO note that gets repaid first. Then prepayments will begin to repay the AA-rated note, etc. For simplicity, I don't show the breakout of the CLO liability notes in the model. When the lowest cost CLO liability notes are repaid, the CLO's equity distributions will decline. A majority of the equity investors can decide to liquidate the deal. In the model above the liquidation occurs in year seven, when the AAA is repaid. Of course, the actual timing of the liquidation would depend on market conditions. Usually CLO equity investors liquidate CLOs when the loans are trading near par, to maximize their liquidation proceeds.

The CLO's income in a year is the par value of the CLO loan assets multiplied by Libor + 3.25%. The CLO's income is gradually declining initially because the libor curve is downward sloping. Also, less par loans results in less income over time. CLOs have 10% initial equity, so the debt interest costs are high. But those costs also decline with Libor. Operating expenses are simply 50bps * par balance of CLO loan assets. There are no current expenses for credit losses but as loans default there is less par in the CLO and less loans to recover when the CLO is liquidated.

Most CLO equity is sold at a discount to par. This can be thought of as the CLO arranger rebating some of its fee to the equity. The magnitude of the discount is highly negotiated because it's a key driver of equity returns. And the CLO arranger is very reluctant to give up part of its fee. For this deal, I assumed an 80% purchase price. Cash on cash returns are quite high initially. But they decline over time, especially after year 5 when the CLO begins to delever. When the CLO is liquidated the equity recovers 59.2%. The CLO's equity tranche will rarely recover par as its value is reduced due to projected losses on loans and the initial upfront costs of the CLO. The internal rate of return across all cash flows is 12.45%.

It's probable that some of the CLO's note liabilities will be refinanced after the two-year non-call period. As the CLO moves through its reinvestment period, the risk that the CLO will default on its CLO note liabilities is decreasing. A future buyer of CLO note liabilities may be willing to refinance the CLO's note liabilities at lower spreads even if overall market spreads have not declined. Perhaps the best scenario for the equity would be a refinancing in two-years followed by a reset in five years. As I discussed more below, the reset could extend the reinvestment period and materially increase the cash flows to the

equity. However, in our base case modeling, I do not model refinancings and resets. But I do retain valuable optionality.

CLO Modeling using third party solutions

While it's certainly possible to model a CLO in Excel, most industry practitioners use software from Intex Solutions, Kanerai or Bloomberg. Bloomberg has the advantage of being included for free in the standard Bloomberg monthly fee.

These firms have already modeled in detail all the nuances of the CLO's payment waterfall. The CLO's payment waterfalls aren't always plain vanilla and reflect the bargaining power of the different CLO participants at the formation of the CLO. The nuances of diverting cash flows if any of the CLO's tests fail, would be a considerable increase in complexity for an Excel model. Additionally, with third party modeling it's possible to model projections for each underlying loan in a CLO. Using these third-party models, it's possible to get a good sense for the projected cash flows of any CLO in a short period of time.

It should be stressed that it's very important that there are no errors when modeling a CLO. A CLO will produce a string of cash flows for an equity investor and nothing more. In contrast, let's say there is an error in a model a financial analyst used to project the cash flows of a loan investment. Even with a modeling error, most loans simply repay at par - the mistake doesn't affect the return. In CLO equity there is no par payment at the end of the CLO's life and modeling errors could result in IRRs materially different from what you initially expected. In many areas of finance, it's the junior people who run excel models and the senior executives that review them at a high level. In contrast, the senior-most investors in CLOs are still spending most of their days modeling CLOs – that's where all the action is! Using third party models, it's very easy to quickly model lots of different scenarios.

For any CLO security that an investment bank sells, the investment bank would be happy to model out the cash flows using their internal models. This is a mistake for the investor. Besides the assumptions I laid out above, there are many other assumptions that can, in aggregate, materially affect the CLO's projected equity returns. Small changes in input variables on 10x leverage add up quickly.

Here is one example: a seller of CLO equity might use the assumption that when a CLO manager buys a new loan, the new loan will not default for at least 12 months. It's a reasonable assumption, but not one that I use when modeling. By using my own models, I know that the assumptions the seller is making are not being carried over into my models. That way I can always compare CLOs apples to apples.

CLO Analysis

Investing in CLOs is a quantitative exercise. A best practice for an investor is to track all CLOs in a format where comparison is easy. These are some of the things I track when looking at deals to invest in.

Date	Deal	Weighted Average Spread (WAS)	Junior Most O/C Cushion	Deal Single 'B' Tranche	First Call for CLO Debt (Yrs.)	Weighted Average Life (WAL) Test Cushion (Yrs)	Weighted Average Rating Factor (WARF)	Percent 2nd Lien	AAA Spread	Diversity Score	Mgr. Fees	WA Bid Price for Loans	Loans Bid Sub 90
10/31/2019	[redacted]	3.30%	3.70%	no	0.00	0.94	2,877	2.91%	0.97%	97	0.40%	95.3%	13.2%
10/31/2019		3.56%	3.60%	yes	0.25	2.39	2,792	2.61%	1.07%	83	0.50%	95.9%	13.6%
10/31/2019		3.44%	4.67%	yes	0.50	3.00	2,898	2.83%	0.98%	79	0.40%	95.8%	10.4%
10/28/2019		3.30%	3.70%	no	0.00	0.94	2,877	2.91%	0.97%	97	0.40%	95.6%	13.2%
10/21/2019		3.19%	4.20%	no	0.00	1.57	2,710	1.47%	1.25%	75	0.36%	95.9%	10.0%
10/21/2019		3.36%	4.14%	no	0.00	2.01	2,870	0.94%	1.25%	77	0.40%	96.5%	8.0%
10/21/2019		3.40%	5.26%	yes	1.75	4.19	2,945	3.02%	1.32%	78	0.50%	96.1%	10.4%

Figure 28

The first is the weighted average spread. The higher the spread, the higher the income into the CLO. However, higher spreads are also correlated with higher default risk on the underlying loans. I prefer low spread CLO loan assets (Libor +3.10% to 3.40% area) because often these CLOs will have modeled equity returns around 14.0% yet have less expected volatility than a CLO with a higher weighted average spread pool.

For the junior most O/C cushion, higher is certainly better. A deal with 4% O/C cushion could theoretically have 13.3% of the pool default at 70% recovery before the test fails, and equity cash flows get diverted from the equity tranche. Of course, a higher O/C test level will likely result in a higher purchase price.

If the CLO issues a single-B rated note, the CLO will be more levered than one that doesn't. The excess leverage is mildly accretive to base case projected IRRs, but if CLO loan assets incur losses above the 0.6% that investors usually model, the increased leverage works against returns. The single B interest cost is Libor + 10%, which is more like an equity return than a debt return. (Many people think of a single-B rated tranche as senior equity) The inclusion of the single-B can create another O/C test which could potentially divert cash flows from the equity. For this reason, I don't prioritize CLOs that have this added leverage.

The CLO's equity investors have the right to call, refinance or reset the CLO's notes after a non-call period, which is generally two years for a new CLO that has a five-year reinvestment period. The shorter the amount of time to exiting the non-call period is better

for the equity, regardless of if the option is currently in the money. Indeed, CLO equity investing requires accumulating options that may be valuable to you in the future, without paying much for them today.

Two items can determine the life of a CLO. The first is the end of the reinvestment period. For new CLOs today, the longest reinvestment period is five years. During that time, when CLO loan assets prepay, the collateral manager will buy a new loan in its place so that the CLO stays fully invested. It's somewhat counterintuitive, but a CLO can continue to make new investments even after the reinvestment period ends, as there are carveouts to reinvest any unscheduled principal repayments on the CLO's loan assets. In CLOs almost all the loan prepayments are unscheduled. The collateral manager can buy new loans with the unscheduled principal proceeds but is subject to several restrictions.

The other item that can limit the life of the CLO is the weighted average life test. In practice, this is the test that really governs how long a CLO can stay fully invested. The weighted average life test might begin at 9 years and step down by 0.25 years every quarter. Five years into the life of the CLO, the collateral manager will have a weighted average life test limit of four years, so each new loan acquired will need to have less than four years until maturity. As this test limit ratchets down, there are fewer and fewer loans that are eligible for purchase by the CLO. When that happens, the CLO will begin amortizing or could possibly be reset or amended into a new CLO with a longer weighted average life test or reinvestment period.

A longer weighted average life test cushion is generally better, because it gives the CLO more time to make distributions and possibly build gains and incremental spread on the CLO loan assets, market conditions permitting. However, a longer weighted average life test usually commands a higher purchase price, all things being equal. Conversely, a shorter life CLO may be closer to the expiration of the non-call period, which could provide options for pickup in equity value.

The Weighted Average Rating Factor (WARF) is a key collateral quality test for the CLO, however, I tend to focus more on the amount of loans trading below 90 as the metric that gives real-time feedback on the performance of the CLO's loan assets. Rating agency opinions may be stale or unreflective of the underlying risks in the loans.

Each CLO has a basket for second lien loans. These loans offer 2-3% spread premiums to first lien loans but are higher risk as they are second in line in a bankruptcy. I assume that a pool of 100% first lien loans will have a recovery of 70% in the event of default but if there are second liens in the CLO, I give those a 30% recovery. The result is a usually a 68-70% modeled weighted average recovery value for the CLO's loan assets.

I use AAA spread as a proxy for the overall debt costs of the CLO, as this tranche finances ~65% of the CLO. Obviously, a lower spread is better for the equity, but the seller will want the buyer to pay a higher price for the low funding cost of the CLO's note liabilities.

Diversity is a mixed bag for the equity investor. On the one hand, investors in the CLO's note liabilities like higher diversity CLO managers and award them with lower debt costs. On the other hand, equity investors may prefer a less diverse portfolio with high-conviction bets that may be higher spread. Very high diversity levels indicate a "buying the market" loan strategy that may not be worth the management fees the CLO manager is charging.

CLO management fees can vary in the 30-50bps range. The fee represents the perceived quality of the manager but also the initial projected profitability of the CLO when it was formed. If the projected CLO equity profitability was low, the equity investor in the deal probably pushed for the CLO manager to lower its fees to increase the CLO's profitability.

The weighted average bid price of the CLO loan assets will move around based on the specific performance of the CLO loan assets and the trading level of the loan index. Usually, higher is better. However, loans trading above par may be a precursor to the loan being refinanced at a lower spread in the future.

Loans trading below the low 90s will have higher probability of default. For this metric the average doesn't tell the real story. For example, if all loans traded down by one point because the loan index moved lower, I probably wouldn't be too concerned. In fact, that may be a good thing as the CLO reinvests in CLO loan assets at a lower price in the future. On the other hand, if the weighted average price of the loans declined by a point because several loans traded from par to below 80, this would not be favorable, as the likelihood of default for those loans is elevated. Additionally, the below 90-price bucket is also moving with the overall level of the LSTA Index.

Would it be interesting to invest in a CLO with many loans trading below 90? Perhaps. The reason is that all these loans will be modeled as defaulting and recovering their current market value. The result is a lower purchase price for the equity, with upside if defaults do not materialize or are pushed into the future.

When analyzing CLOs, I evaluate new primary offerings, secondary trade opportunities and CLOs that trade in semi-public auctions called Bids Wanted In Competition (BWICs). In a BWIC, the seller of CLO equity announces to the market an intention to sell a CLO position on a certain date. Investors submit their bids through an investment bank and the position is sold in an auction-like process. There is no obligation on the part of the seller to trade. In fact, many times the result of the auction is no trade occurred. When the position does trade, the second highest bid – the 'cover bid' is often published to the market. This provides investors very valuable trading color.

Investment banks are making markets in CLO securities and selling positions outside of the BWIC process. Buying a CLO security from an investment bank often becomes a multi-day process of negotiations over price.

Below is a summary of the pros and cons of buying in the primary and secondary CLO markets.

Primary CLO Equity	Seasoned Secondary CLO Equity
Pros:	**Pros:**
Long deals; potential to benefit from wider reinvestments	Less expensive; often 1-2 payments from NAV
Potential to flush excess par on the first or second payment date	If deal is reset, you end up with a new deal with a five year reinvestment period at improved valuation
Valuation is less NAV dependent	Manager may have the ability to continue to reinvest even after the reinvestment period ends
Newer loan pool; few loans trading sub 90	If deal is called, it may be at loan mid price instead of bid price
	If deal is called, the timing of the call may be better than initially modeled
Cons	**Cons**
Purchase price ~3.5 payments above NAV, can be expensive	NAV is larger driver of valuation
New deals have high debt costs	More seasoned pool of loans
First distribution often 5+ months from closing	If reset, new debt costs are higher
Initial portfolio is really hypothetical	

Figure 29

The spreadsheet below details how I track investment opportunities as they come in:

Date	Deal	CLO Manager	Amt ($)	Primary / Secondary	Seller	Price Context	Implied Price	Net Asset Value (NAV) adj for X tranche	Next Q Cash on Cash - 2% Def Rate	Payments over NAV	IRR - 1.0% Default Rate	IRR - 2.0% Default Rate	IRR - 3.0% Default Rate	IRR - 2.0% Default Rate Reinvest current less 20bps	Default Rate for 0% IRR
10/31/2019	[redacted]		10.0	Secondary	[redacted]	46	44.5%	29.3%	7.00%	4.7	18.81%	14.15%	9.16%	13.19%	4.60%
10/31/2019			6.0	Secondary		52	52.0%	19.6%	5.60%	11.2	18.75%	12.81%	5.00%	14.48%	5.30%
10/31/2019			2.0	Secondary		68.5	68.5%	29.3%	5.90%	9.4	14.76%	9.68%	2.82%	9.55%	3.40%
10/28/2019			10.0	Secondary		50	49.0%	31.5%	6.30%	5.5	15.96%	11.65%	7.05%	10.49%	4.40%
10/21/2019			4.4	Secondary		36	36.0%	20.9%	5.60%	7.3	16.43%	10.32%	2.97%	6.85%	3.30%
10/21/2019			2.4	Secondary		61.5	61.5%	43.9%	5.00%	4.7	18.11%	13.71%	8.57%	12.79%	4.40%
10/21/2019			5.2	Secondary		36.5	36.5%	32.0%	3.02%	3.8	14.69%	9.48%	1.00%	8.74%	3.10%

Figure 30

The IRR in the 2% default rate column is our base case projected return. For the top CLO offered on 10/31/2019, the projected IRR is 14.15%.

The first column is the CLO manager; I discussed the criteria I use to evaluate the CLO manager above.

The amount offered will determine if it's a control position or not. Control of the equity tranche means owning more than 50%. This enables the CLO equity investor to decide when the CLO is liquidated and before that, when / if CLO tranches are refinanced or if the CLO is reset. A control piece of equity should command a price premium over a non-control piece. However, in a sale process there aren't that many people who have the capital to buy a control piece in the secondary market, so there may not be a premium.

I use price context to denote where an investment bank is offering to sell the CLO equity. But I use the implied price column above to denote the price I use to generate returns. The numbers can be different if I believe I'll be able to negotiate a lower price than the initial offer.

The next quarter cash on cash is the next projected equity payment divided by the purchase price. This is the CLO's initial yield. You can multiply by four if you think of yield as an annual rate.

I consider how high the purchase price is above the Net Asset Value. The first CLO's price is 2.1 payments above NAV; that means in a little over 2 quarters, you'll recover the premium to NAV. The NAV can be thought of as the floor value on what a CLO equity tranche should be worth, because the CLO could be liquidated if the CLO's non-call period has expired. I assume that all CLOs will be liquidated at some point. The high cash flows the CLO equity tranche enjoys are what justify a purchase price above NAV. The higher the projected cash flows, the higher the premium to NAV.

High base case returns in the 2% default rate scenario are what I optimize around but there are several secondary factors to consider. The first is the return in the 3% default rate

environment – this is our downside case. You can see above that the difference between the 2% default rate and 3% default rate varies dramatically by deal. One of the key drivers of the difference is whether the CLO has extra leverage through a single-B rated tranche. That extra leverage will be quite beneficial in a 1% default rate scenario but quite detrimental in the 3% default rate scenario.

Some of the loan portfolios have wider spreads than others. In the column titled "Default Rate Reinvests current less 20bps" instead of using our usual reinvest assumptions of L+3.25%, I assume that if the current loan pool has a weighted average spread of 3.60%, I model reinvests 0.20% lower or L+3.40%. This metric can show upside for high spread CLO managers.

I also consider the default rate required to get a negative IRR. This metric gives no credit to reinvesting in wider spreads in a market where the default rate picks up.

There are also other cases I model, including potential refinancings and resets that aren't shown above. I also have a recession case where defaults pick up for 1-2 years and the spreads on the underlying CLO loan assets increase. These cases are modeled based on what I view as the current market conditions.

I have a short checklist I use before investing in any CLO. While there might be some exceptions in rare cases, usually all the criteria are met:

- ✓ Is expected IRR >10%?
- ✓ Valuation is less than 4.5 payments above NAV?
- ✓ Manager has $2.0BN of CLO investments?
- ✓ Manager has business lines outside of CLOs?
- ✓ Manager has successful CLO pre-financial crisis track record?
- ✓ Deal has debt execution in line with recent comparable transactions?
- ✓ Deal has no non-standard terms unfavorable to the equity?
- ✓ Deal expected to be 2/3 ramped by closing?

One thing that makes investing in CLOs interesting is that each market participant is using different assumptions for their projection models. If someone tells me they recently bought a CLO equity tranche at a 14% IRR, I wouldn't have any idea if they got a good or bad price. I would need to run the position through my standardized modeling assumptions.

CLO Formation & Reporting

On the CLO's pricing date, the investment bank sells the CLO's note liabilities and equity to investors. Usually the CLO's closing will occur around a month later; that's when the CLO's investors pay for their securities. The delay between the pricing and closing dates will give the CLO additional time to ramp up its CLO loan assets without paying interest to the CLO's note liabilities in the interim. After the CLO closes, but before the first payment, the CLO goes effective. That means enough CLO loan assets have been acquired that all the rating agency tests are passed. The CLO's first distribution is usually 3-6 months after closing, depending on how many CLO loan assets have been ramped during the warehousing period (described below). After that, the CLO will pay quarterly distributions.

At closing the CLO investors will have an indenture and a CLO modeled using third party software that has some placeholder CLO loan assets in it because the portfolio isn't fully purchased. At the effective date, the CLO will report extensive detail on the underlying loans including par balance, purchase price, spread over libor, maturity date, and industry classification, among others.

On a quarterly basis, the CLO will also report its payment waterfall. The interest on the CLO loan assets is used to pay a small amount of operating expenses, fees to the CLO manager and interest on the CLO's note liabilities (by seniority). The CLO's equity investors are the last to get paid, but the cash flows are usually high, as the interest rate on the CLO's loan assets is well in excess of the CLO's note liabilities.

The CLO will file tax reporting information on an annual basis. This could be on form K1 or a PFIC (Passive Foreign Investment Corporation) for CLOs domiciled outside the US (the substantial majority).

CLO Warehousing

Several months prior to the formation of a CLO, a CLO warehouse may form. The CLO warehouse is used to acquire loans prior to the formation of a CLO. After the CLO's closing date, the CLO's note liabilities begin accruing interest. To avoid the negative drag associated with owning cash in the CLO, the manager will want to get fully invested as soon as possible. While the CLO manager can always identify loans to acquire in the secondary market, the best way to acquire loans is slowly over time. That allows the CLO manager to be as selective as possible. The investment banks that arrange the broadly syndicated loans often sell them so that a primary issuance results in a more favorable purchase price than buying the same loan in the secondary market. As a result, CLO managers usually try to buy most of their CLO loan assets in the primary, and this takes

time. The goal is to deliver a portfolio of pre-purchased loans to the CLO, at a cost lower than if the loan assets were purchased in the secondary market. For example, if the CLO's warehouse can save 0.5% on the cost of the CLO loan assets, that could be worth 5% to the CLO's equity tranche given the 10.0x embedded leverage in the CLO.

Around 60-70% of the CLO's loan assets are bought in the CLO warehouse. However, it's not a good idea to buy 100% of the CLO's loans in a warehouse. Let's say the interest costs for new CLO note liabilities begins to increase prior to the CLO's pricing date. In this case, having CLO loan assets remaining to be purchased is probably positive, as these loans may be purchased at discounted levels as the interest rates on CLO loan assets and CLO note liabilities tend to move together. Said another way, the unbought loans are a natural hedge against potential increases in the costs of the CLO note liabilities.

The CLO warehouse is financed with ~20% equity, usually from the same investors that will be buying the CLO's equity. The remainder of the financing is debt from the bank that is underwriting the CLO. The warehouse debt financing is done as a revolver, so the warehouse debt only funds when loans are purchased. Warehouse equity returns can be in the mid-teens area. Because the warehouse is short-term in nature, it doesn't incur fees paid to the manager, underwriter, law firms, or rating agencies. The CLO will buy the loans in the warehouse at their initial cost, so that the return to the CLO warehouse investor is the difference between the interest earned on the loans and the interest owed on the CLO warehouse debt.

Warehouse returns are increased during the one-month period between CLO pricing and CLO closing. During that time, the investment bank knows the CLO will form, and it allows for the leverage to increase from 80% loan to value to 90%, the same leverage level as the CLO.

The primary risk of investing in a CLO warehouse is that a newly bought loan defaults before the CLO closes. In that case, the loan will be ineligible for purchase into the CLO, and the warehouse equity will incur the loss. The probability of this happening is quite low, since the CLO warehouse is short-term and the manager diligences the loans before they are purchased.

A secondary risk to CLO warehouse investing is that the timing of the actual CLO formation is unknown – it depends on market conditions and how long it takes the CLO manager to ramp the portfolio of loans. Since the CLO's note liabilities are locked in place during the initial non-call period, the buyer of the CLO's equity will want the CLO to form when the CLO note liability rates are favorable.

Below is a model I used to analyze a warehouse opportunity:

Warehouse Pre Pricing CLO											Warehouse Post CLO Pricing		
Date	9/30/2019	10/14/2019	10/28/2019	11/11/2019	11/25/2019	12/9/2019	12/23/2019	1/6/2020	1/20/2020	2/3/2020	2/17/2020	3/2/2020	3/16/2020
Contributed Equity	10.00	10.00	14.00	18.00	22.00	26.00	30.00	34.00	38.00	42.00	42.00	42.00	42.00
Loans Owned		50.00	70.00	90.00	110.00	130.00	150.00	170.00	190.00	210.00	294.00	357.19	420.00
Leverage		5.00x	5.00x	5.00x	5.00x	5.00x	5.00x	5.00x	5.00x	5.00x	7.00x	8.50x	10.00x
Projected Spread on Loans		3.35%	3.35%	3.35%	3.35%	3.35%	3.35%	3.35%	3.35%	3.35%	3.35%	3.35%	3.35%
Libor		2.00%	2.02%	2.04%	2.06%	2.08%	2.10%	2.12%	2.14%	2.17%	2.19%	2.21%	2.23%
Total Loan Coupon		5.35%	5.37%	5.39%	5.41%	5.43%	5.45%	5.47%	5.49%	5.52%	5.54%	5.56%	5.58%
Debt from Investment Bank		40.00	56.00	72.00	88.00	104.00	120.00	136.00	152.00	168.00	252.00	315.19	378.00
Debt Spread		1.15%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%	1.15%
Interest Income		0.10	0.12	0.17	0.21	0.25	0.29	0.34	0.38	0.42	0.54	0.69	0.83
Debt Costs		(0.05)	(0.07)	(0.09)	(0.11)	(0.13)	(0.15)	(0.17)	(0.19)	(0.21)	(0.32)	(0.41)	(0.49)
Management Fees		-	-	-	-	-	-	-	-	-	-	-	-
Other Expenses		-	-	-	-	-	-	-	-	-	-	-	-
Profit (Retained until the end)		0.05	0.06	0.08	0.10	0.12	0.14	0.17	0.19	0.21	0.21	0.29	0.34
Total Equity Cash Flows													
Warehouse Cumulative Profitability													1.95
Warehosue Principal Payme	(10.00)	-	(4.00)	(4.00)	(4.00)	(4.00)	(4.00)	(4.00)	(4.00)	(4.00)			42.00
Total Warehosue Cash Flow	(10.00)	-	(4.00)	(4.00)	(4.00)	(4.00)	(4.00)	(4.00)	(4.00)	(4.00)	-	-	43.95
Total Equity IRR	16.34%												

Figure 31

Initially, $10M of equity and $40M of debt was used to acquire $50M of loans. As additional loans are purchased, equity is called so that the equity amount is 20% of the cost of the loans. After the CLO has its pricing date, the leverage is increased to 10% equity. The CLO buys the loans at the price paid by the CLO warehouse, so the return to the CLO warehouse equity is the interest earned on the loans less the interest paid on the debt from the investment bank. The warehouse does not make any distributions to the equity until the day the CLO closes and the warehouse terminates.

CLO Refinancing & Reset

Most new CLOs issued in 2019 have a five-year reinvestment period and a two-year non-call period on the CLO's note liabilities. After the non-call period, the CLO's note liabilities can be refinanced or reset if a majority of the equity tranche is in favor.

The refinancing is straight forward and can be done by tranche, meaning some tranches can stay in place with the current spread while others are refinanced at lower spread levels. Since the AAA-rated note is ~65% of the CLO's financing, that's the biggest potential area to save on interest expense. The cost of the AAA-rated note varies with overall market conditions and investor demand, especially from Japanese banks.

Imagine that a new CLO has a AAA cost of Libor + 1.35%. In two years, if the market for new issue AAA spreads hasn't moved, it may still be possible to refinance the AAA at a lower rate. That's because the CLO will be seasoned. At that point the CLO will have a shorter life which implies lower risk for the AAA-rated liability note holder.

Usually the AAA refinancing viability will determine if any tranches are refinanced, and the AA-BB tranches are refinanced if it's economically beneficial. It's not an issue for some tranches to stay in place at the same spread.

A refinancing is arranged by an investment bank that usually charges ~5bps of the amount of the refinanced CLO note liabilities. In a refinancing the weighted average life test can also be modified to effectively extend the life of the CLO.

A reset is a more fulsome process that involves paying off all the CLO's note liabilities except for the equity. With a reset, the CLO can make additional changes to the indenture, including extending the maturity, reinvestment period, weighted average life test and other collateral quality tests. At the end of a reset, the CLO may look very similar to a totally new CLO, just with the existing collateral pool. Fortunately for the investors in CLO equity, the fees associated with a reset are significantly lower than doing a new CLO from scratch.

A reset is a good option when a CLO is nearing the end of its life and the equity can obtain lower costs for the CLO's note liabilities. However, it may make sense to do a reset even if the cost of the CLO's note liabilities goes up, as the extension of the CLO's life can meaningfully increase the net present value of the CLO equity's future cash flows.

CLO Documentation

When a new CLO is formed, the arranging investment bank will help negotiate the main terms of the indenture. The indenture has all the rules that the CLO will follow, both material business points as well as extensive legalize. The indenture is written with great care as it is designed to last the entire life of the CLO without any amendments. Indeed, amending a CLO's indenture is quite tricky given the number of CLO stakeholders that have different objectives and interests. For many CLOs the indenture could run 350 pages or more. Fortunately, there are some sections that are more important than others to understand from an investment perspective. Some of the sections I focus on relate to:

- How the Indenture can be amended
- Whose consent is required for things like a refinancing or a reset of the CLO
- CLO payment waterfall

- Manager's ability to swap / trade underperforming CLO loan assets
- Ability to reinvest after the reinvestment period ends, discussed below
- Ability to par flush, discussed below

Reinvestment after the Reinvestment Period Ends

When analyzing a new CLO, I usually do a word search for "after the reinvestment period." This phrase will usually take me to the CLO's indenture section 12. While a CLO has a defined reinvestment period of up to five years, usually there is some flexibility to reinvest after that. When the CLO experiences an unscheduled principal amortization payment after the reinvestment period, the collateral manager may use that principal to invest in a new CLO loan asset. Because the loans have very limited scheduled amortization (1% to 5%) per year, almost all the prepayments are unscheduled. The longer the collateral manager can keep the CLO close to fully invested, the better for the equity. That's because the CLO's upfront costs are amortized over a longer life. Also, if it wasn't accretive to the equity to reinvest the unscheduled principal proceeds, the equity would simply call or liquidate the CLO.

The CLO indenture will put some restrictions on what can be bought with unscheduled principal prepayment proceeds. For example, the newly purchased loan probably needs to have a final maturity shorter than the loan that was just prepaid. Also, it may need to have the same or better rating and par balance.

These terms are highly negotiated and the more flexibility the Indenture gives, the better for the equity. Conversely, this potential extension of the CLO's life isn't favorable for the CLO's liability note holders as they prefer a more defined life.

When modeling CLOs, I frequently assume that after the reinvestment period ends, the CLO will be able to reinvest 100% of unscheduled principal proceeds for three to six months, and nothing thereafter, as the CLO's reinvestment restrictions become harder to manage. While this may seem like a technicality, reinvesting after reinvestment period end can be quite beneficial for equity returns.

The typical lifecycle for a CLO with a five-year reinvestment period looks like this:

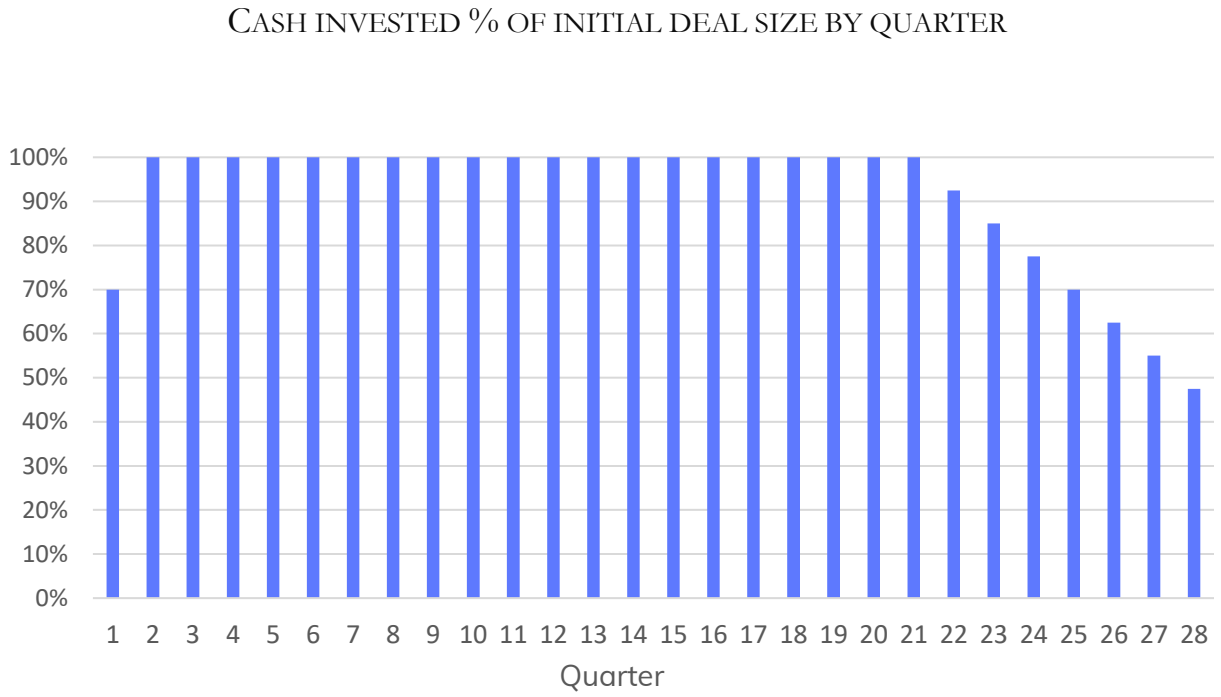


Figure 32

The CLO is still ramping its assets in the first quarter. And the CLO remains fully invested through the reinvestment period. Then the CLO maintains full investment for one quarter after the reinvestment period ends by reinvesting unscheduled principal proceeds into new CLO loan assets. After quarter 21, the CLO begins to amortize as prepayments of CLO loan assets are used to repay the CLO's note liabilities, with the senior-most tranche receiving all the prepayments until it is fully retired. The CLO gets liquidated in year 7, as the profitability in the CLO is reduced when the lowest cost CLO rated liabilities have been retired.

THE PAR FLUSH

New issue CLOs usually allow for what's called a "par flush" on the first and maybe the second payment date. The cap on the par flush is usually equal to 0.5% or 1.0% of the total CLO loan assets; this is a negotiation between the CLO's equity investors and the CLO's note liability investors. If a CLO has a required par balance of $500M, the CLO manager may find that on the first payment date it has $505M of par loans. That happens if the CLO manager bought loans cheaper than initially expected. The $5M excess par in the CLO can be distributed to the equity. Not all CLO managers will distribute the maximum amount of the par flush the indenture allows. One reason is that the CLO manager may be

concerned about the default probabilities of some of the CLO loan assets it recently bought. Another reason is that the CLO manager may want to stay in the good graces of the CLO note liability owners, to make it easier to get these investors to participate in the CLO manager's new deals. The CLO note liability holders would obviously prefer no par flush since it represents collateral that would otherwise secure their CLO note liabilities. The par flush can be material, depending on market conditions for the CLO loan assets. This optionality is a reason why some CLO equity investors prefer the primary CLO market to the secondary CLO market, where the par flush is no longer an option.

CLO Self-Healing Mechanism

Below is a summary of what I call the self-healing mechanism for CLOs. When loss rates on the CLO loan assets are higher than expected, it's also likely that the CLO will be able reinvest its loan prepayments into higher yielding collateral, thereby increasing the cash flows to the CLO's equity tranche. Here is an example:

RETURN DRIVER	BASE CASE	RECESSION CASE
Yield on Loans	5.50%	6.00%
Cost of Debt	-4.00%	-4.00%
Operating Expenses	-0.40%	-0.40%
Credit Losses	-0.60%	-1.20%
Projected Return	14.00%	10.20%

Figure 33

- When loan spreads widen by 50bps, cash on cash returns increase by 5.0%. Of course, this happens over time.
- Cost of debt is locked for the life of the CLO unless the equity elects to refinance at more favorable rates (market conditions permitting).
- Increased spread can partially compensate for increased losses on CLO loans.
- In the case above, modeled returns are still double digit, despite the doubling of losses on the underlying loans.

LIBOR AND ITS REPLACEMENT

One of the challenges of modeling CLOs is that all the interest payments on the CLO's loan assets and debt payments on the CLO's note liabilities are based on a floating rate of interest, Libor. Future rates of Libor are unknown, but I do have a Libor curve which has the market's implied rates for future dates.

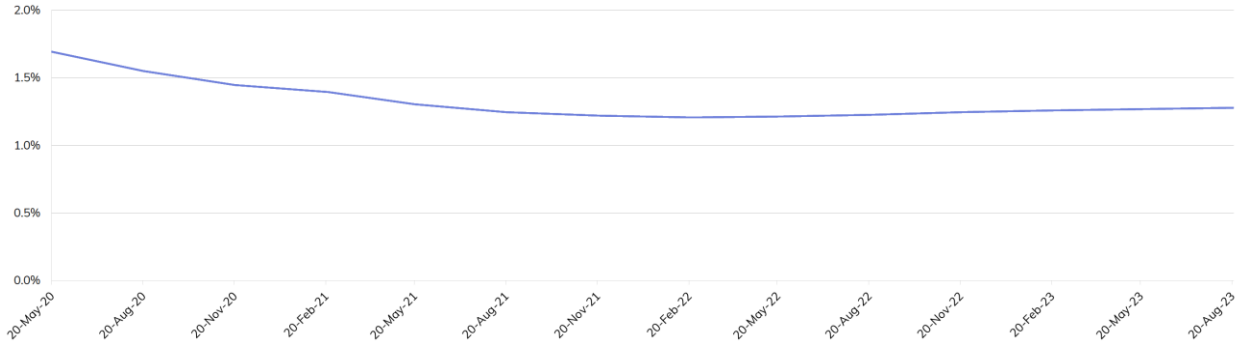


Figure 34

Higher Libor should lead to higher returns for the CLO's equity tranche. That's because the CLO has more CLO loan assets than CLO note liabilities, making CLO equity a floating-rate product. However, when the Federal Reserve is cutting interest rates as we've seen in 2019, investors in loan mutual funds and ETFs redeem their shares. That puts downward technical pressure on loan prices and provides CLOs in their reinvestment periods with more attractive investment opportunities. At the same time, lower Libor means lower interest payments for the borrowers in a CLO, potentially leading to lower defaults. If, in the future, Libor rises, it should be a sign that the economy is doing well; in that scenario presumably the default rate would be expected to be low. A mixed bag for sure!

Several investment banks have been sued and fined for rigging the Libor market. After 2021, it's expected that these banks will no longer quote Libor and the rate will cease. Since both the CLO loan assets and CLO note liabilities are Libor based, this is an issue. In CLO indentures today, there is the concept of a fallback reference rate, where the CLO's note liabilities will likely be moved to whatever the reference rate is for the majority of the CLO's loan assets. The Secured Overnight Funding Rate (SOFR), or some variation thereof is the leading candidate to replace Libor.

MIDDLE MARKET CLOS

Middle Market CLOs represent less than 10% of overall CLO issuance today and have some unique aspects that differentiate them from the broadly syndicated CLOs I discussed above.

Item	Broadly Syndicated CLO	Middle Market CLO
CLO loan asset formation	Loans arranged by the largest US banks that also make secondary markets	Loans arranged by a middle market investor who plans to own the loan to maturity
Borrower Size	Companies with more than $400M of revenue	Companies with $200-400M of revenue
Financial Covenants	Around 20% of borrowers	Around 100% of borrowers
Spread on Collateral Loan Assets	Libor + ~3.5%	Libor + ~5.0%
AAA-rated note increased cost over Broadly Syndicated CLOs	N/A	~0.5%
CLO Leverage	10X Assets / Equity	7.5X Assets / Equity
Historical Returns	Comparable to middle market CLOs	Comparable to broadly syndicated CLOs
CLO Equity liquidity in secondary market	Relatively liquid	Not liquid

Figure 35

CONCLUSION

I hope this has given a helpful introduction to an asset class I believe has attractive risk adjusted return characteristics. As the CLO market continues to grow, it's important that investment professionals who work outside of CLOs have a basic understanding of this market. If, after reading this, you don't find CLO equity to be a compelling investment, you may be interested in buying one of the other CLO note liabilities. In CLOs there is a trade for everyone.