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The anatomy of corporate securitizations and contract design

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ABSTRACT

Collateralized loan obligations (CLOs), intermediaries situated between investors and traditional banks, play an increasingly central role in the provision of credit to constrained corporations, holding as much as 75% of all new institutional leveraged loans. Despite their ascendancy in the risky corporate credit market, there has been little academic research on the CLO market. This paper provides a comprehensive overview of the design and structure of the CLO market, describing the general macroeconomic milieu that has facilitated the rapid growth of the market, the mechanics therein, as well as recent risks that have emerged. Understanding the anatomy and dynamics of CLOs is paramount for developing insights into the role of non-bank financial intermediaries in financial markets.

1. Introduction

Collateralized loan obligations (CLOs), intermediaries situated between investors and traditional banks, play an increasingly central role in the provision of credit to constrained corporations. The size of the CLO market has more than doubled in the past decade since the Great Financial Crisis of 2008. In 2021, CLOs purchased nearly 75% of all new institutional leveraged loans. Despite the ascendancy of CLOs in the risky corporate credit market, there is little academic research on the CLO market. This paper provides a dissection of the CLO market, deepening our understanding of how non-bank financial intermediaries affect the provision of credit to the segment of risky corporate borrowers.

In the aftermath of the Great Financial Crisis of 2008, extensive financial reforms were implemented to reduce vulnerabilities in the financial system and enhance overall stability. Despite the purported objectives of these reforms, the underlying leveraged loan market has experienced burgeoning development, with unclear risk ramifications. As banks have shifted from an “originate-to-retain” model to an “originate-to-distribute” model, their direct exposures to credit risk have declined. Liquidity and credit risks have been diversified to other investors – the largest group of which are CLOs. The substitution of direct bank exposures by non-bank financial intermediaries has diversified risk. However, it has also contributed to the complexity of interconnections and opacity of shock transmission channels, introducing new vulnerabilities (International Monetary Fund (2020); Kundu (2021a); Kundu (2021b)).

Study of the CLO market merits further investigation given the growth of global corporate debt and the increasing prevalence of non-bank financial institutions in the intermediation of credit. Recent reports claim that global speculative-grade (rating BB+ or lower) debt reached \$5.58 trillion in mid-2021. Of this total, the US's share of speculative-grade debt was reported as \$3.35 trillion, representing 60% of global speculative-grade debt. Moreover, 30% of total US corporate debt was comprised of speculative-grade debt, of which loans/revolvers constituted almost half (Kraemer et al. (2021)). As the largest purchasers of leveraged loans, CLOs are uniquely sensitive to the loan segment of speculative-grade debt. Thus, underlying changes in the leveraged loan market can substantially affect the CLO market.

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Analogous to how asset-backed securities facilitate the financing of residential real estate and automobiles, CLOs facilitate credit to the segment of constrained corporate borrowers. CLOs operate as *special purpose vehicles* (SPVs), with a manager who makes active trading decisions. The SPV issues tranching asset-backed securities or notes to investors, and uses the proceeds of these notes to finance the purchase of the underlying portfolio of leveraged loans. From a balance sheet perspective, CLO assets consist of leveraged loans. CLO liabilities are notes which are issued to investors. Principal and interest payments received from the leveraged loans are used to pay out noteholders, according to a principal and interest waterfall.

The financial interests of a CLO manager are most aligned with the equity class, as their compensation consists of a fixed fee and a series of subordinated fees that are proportional to the residual interest available to the equity class. This presents the canonical agency problem of corporate finance (Jensen and Meckling (1976)). It may be in the interest of a CLO manager to shift investment decisions in favor of the equity class to maximize revenue at the expense of debtholders. From the perspective of debtholders, a manager's effort provision is inscrutable and verifying incoming cash flows can be costly. Moreover, like in other closed-end funds in which capital is locked-in, investors cannot redeem their claims while the fund is in operation. For this reason, CLO indentures include clauses that are intended to align managerial incentives with debtholders' interests. In particular, managers must comply with quality and coverage covenants on a regular basis. These covenants serve as disciplining devices for managers to appropriately screen and monitor their investments.

This paper provides a comprehensive overview of the design and structure of the CLO market, describing the general macroeconomic milieu that has facilitated the rapid growth of the market, the mechanics therein, as well as recent risks that have emerged. The paper is organized as follows. Section 2 provides a comprehensive overview of fundamental aspects of the CLO market. Section 3 discusses the role of covenants in CLO contracts, explaining how the presence of covenants are designed to reduce the possibility of "tranche warfare" between debt and equity investors, and effectively allocate control rights in various states of the world through the diversion of cash flow. Section 4 describes the changes and development affecting the CLO market, post-2008. Section 5 surveys the existing literature on the CLO market. Section 6 describes the major data sources covering the CLO and leveraged loan markets. Section 7 discusses emerging vulnerabilities and unanswered questions. Lastly, Section 8 concludes.

2. Overview of CLO market

This section expounds on the fundamental mechanics of the CLO market. First, this section explains what a CLO is, how the market works, and how it differs from other related markets and securitizations. Then, this section surveys the major market participants and their roles in supporting the functioning of the market. Lastly, this section chronicles the major events that characterize a CLO's life.

2.1. Growth of leveraged finance

Leveraged finance has exhibited significant growth since the Great Financial Crisis of 2008. Leveraged finance refers to credit extended to corporate borrowers that have high levels of leverage, low credit ratings, or high spreads (Financial Stability Board (2019)). Leveraged finance primarily consists of leveraged loans and high-yield bonds. The US leveraged finance volume has doubled since the Great Financial Crisis of 2008, topping \$3 trillion in 2021 (Kakouris (2021)). Fig. 1 presents the US leveraged finance volume, including loans, unsecured/subordinated high-yield bonds, and secured high-yield bonds. The volume of loans, unsecured bonds, and secured bonds surpassed pre-crisis volumes and was reported to be nine, five, and 23 times higher in 2021, relative to the 2008 volumes. On average, more than half of leveraged finance consist of loans. Hence, loans are a salient source of credit to riskier corporations.

Fig. 2 presents the growth of leveraged finance, particularly, loans. Fig. 2a shows that the global institutional leveraged loan M&A and LBO volumes have increased dramatically since 2008. In 2009, the global institutional leveraged loan M&A and LBO volumes were \$15 billion and \$11 billion, respectively. 0% of LBO deals involved issuers with leverage greater than six times debt to EBITDA. In comparison, the global institutional leveraged loan M&A and LBO volumes were \$219 billion and \$230 billion, respectively, in 2021. Moreover, nearly 60% of LBO deals involved issuers with leverage greater than six times debt to EBITDA in 2021. Fig. 2b focuses on the US institutional loan volume backing acquisition activity. The figure disaggregates acquisition financing into financing by private equity-backed ("sponsored") borrowers (excluding LBOs), corporate M&A, and LBOs. Overall, the total volume of institutional leveraged loans funding M&A activity reached a record in 2021. Record amounts of financing were driven by sponsored borrowers and corporate borrowers.¹ LBO issuance also increased, albeit did not reach its 2007 peak. The surge in the institutional leveraged loan volume backing acquisition activity is attributed to high investor demand, ample private capital, and low funding costs (S&P Global (2021); International Monetary Fund (2021)). These factors also facilitated private equity activity, as evinced by the volume of dividend recapitalizations, shown in Fig. 2c and Fig. 2d. Fig. 2c shows that the growth in the dividend recapitalization institutional loan volume has been driven by sponsored borrowers. Fig. 2d shows that among sponsored borrowers, dividends funded by leveraged loan transactions reached a record high. Hence, the institutional leveraged loan market and private equity activity exhibit synergistic growth.

¹ Sponsor-backed LBO volumes for smaller middle-market firms' deals accounted for almost two-thirds of all middle-market leveraged loan issuance (IMF, 2020).

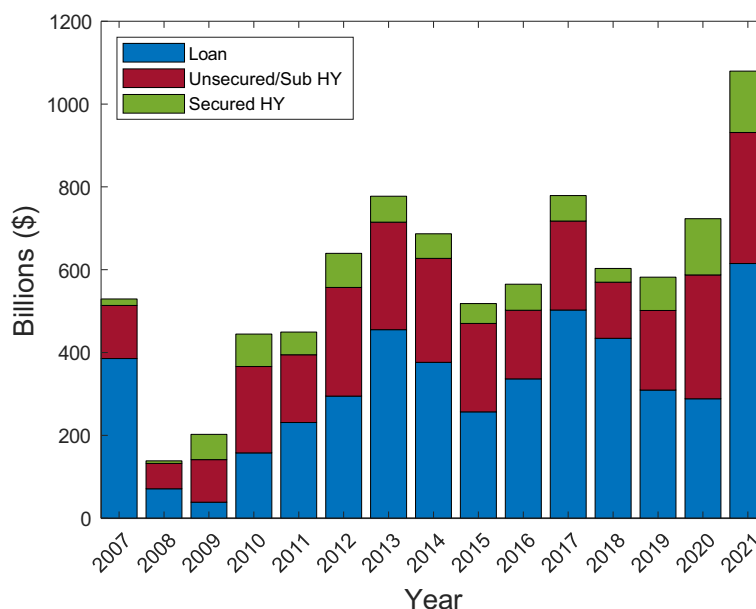


Fig. 1. US leveraged finance volume.

Notes: The figure presents the annual secured high-yield, unsecured/subordinated high-yield, and institutional loan issuance by year. Source: [S&P Global \(2021\)](#).

2.2. What is a CLO?

The CLO and leveraged loan markets are central in affecting corporate financing decisions and firm capital structure. This section explains what a CLO is and its relation to the leveraged loan market.

A (arbitrage) CLO operates as a *special purpose vehicle* (SPV) which issues tranchised asset-backed securities or notes, and uses the proceeds to finance the purchase of the underlying portfolio of leveraged loans.² CLO investors gain exposure to a diversified pool of senior secured loans through the purchase of notes. CLO liabilities consist of multiple debt tranches and an equity tranche. The higher-rated (lower risk) tranches pay out lower returns relative to lower-rated (higher risk) tranches. CLOs are managed by a manager. The manager uses principal and interest received from the pool of underlying leveraged loans to make distributions to investors, according to a principal and interest waterfall. Debt tranches are typically paid a fixed spread above the three-month LIBOR/SOFR benchmark rate based on seniority, while the equity tranche receives the remaining spread between the assets and liabilities, after adjusting for fees and costs. This excess spread provides a form of credit enhancement, as it may be used towards the purchase of new collateral.

The underlying portfolio of assets largely consists of risky syndicated bank loans known as “leveraged loans.” CLO portfolios generally consist of institutional term loans, as pro rata debt is typically retained by banks. The S&P Leveraged Loan index estimates the size of the global stock of leveraged loans to be \$1.3 trillion – a figure that has been cited by the Federal Reserve ([Kakouris \(2021\)](#); [Board of Governors \(2019\)](#)). However, after accounting for loans that are not in the index, revolving credit facilities, and amortizing loans, the Bank of England puts the total to be closer to \$3.2 trillion ([Financial Policy Committee \(2019\)](#)). The International Monetary Fund assesses the total to be even larger, at \$5.0 trillion ([International Monetary Fund \(2020\)](#)). While the taxonomy of leveraged loans is an inexact science as evinced by differing estimates of the size of the market, a loan is typically considered to be “leveraged” if the loan is secured by a first or second lien, and it meets one of the following criteria: (i) the issuing firm also issues high-yield bonds, i.e., is highly indebted (leverage greater than $4\times$ debt to EBITDA) (ii) the issuing firm has experienced an acquisition or will finance an acquisition, (iii) the firm or the loan has a borrower rating below investment grade, (iv) the loan has a private equity sponsor, or, (v) the loan spread is above a prespecified threshold, typically, LIBOR+125 bps ([Financial Stability Board \(2019\)](#)). Estimates of the total size of the leveraged loan market suggest that it is between 6 and 25% of the US GDP. Of this total, CLOs have a sizeable exposure to leveraged loans, assessed between \$700–\$870 billion ([Financial Policy Committee \(2019\)](#); [International Monetary Fund \(2020\)](#)).

[Fig. 3](#) presents CLO issuance and outstanding volume over time. [Fig. 3a](#) plots US and EU CLO issuance, as well as the CLO share of new issue loans over time. [Fig. 3a](#) indicates that the CLO market has exhibited rapid growth since 2008. In 2009, global issuance fell to

² Most CLOs are arbitrage CLOs. The objective of arbitrage CLOs is to maximize the excess spread between assets and liabilities. Among arbitrage CLOs, there are deals that are backed by loans to large companies (“broadly syndicated loans”), and deals that are backed by loans to smaller, and often privately rated, companies (“mid-market”). Mid-market CLOs comprise a small share of the overall CLO market. Aside from arbitrage CLOs, *balance sheet CLOs* are designed for banks and other financial institutions to fund loans on their balance sheet. The purpose of balance sheet CLOs is to diversify credit risk through tranching. Balance sheet CLOs sell the securitized assets to an SPV, while retaining the equity tranche.

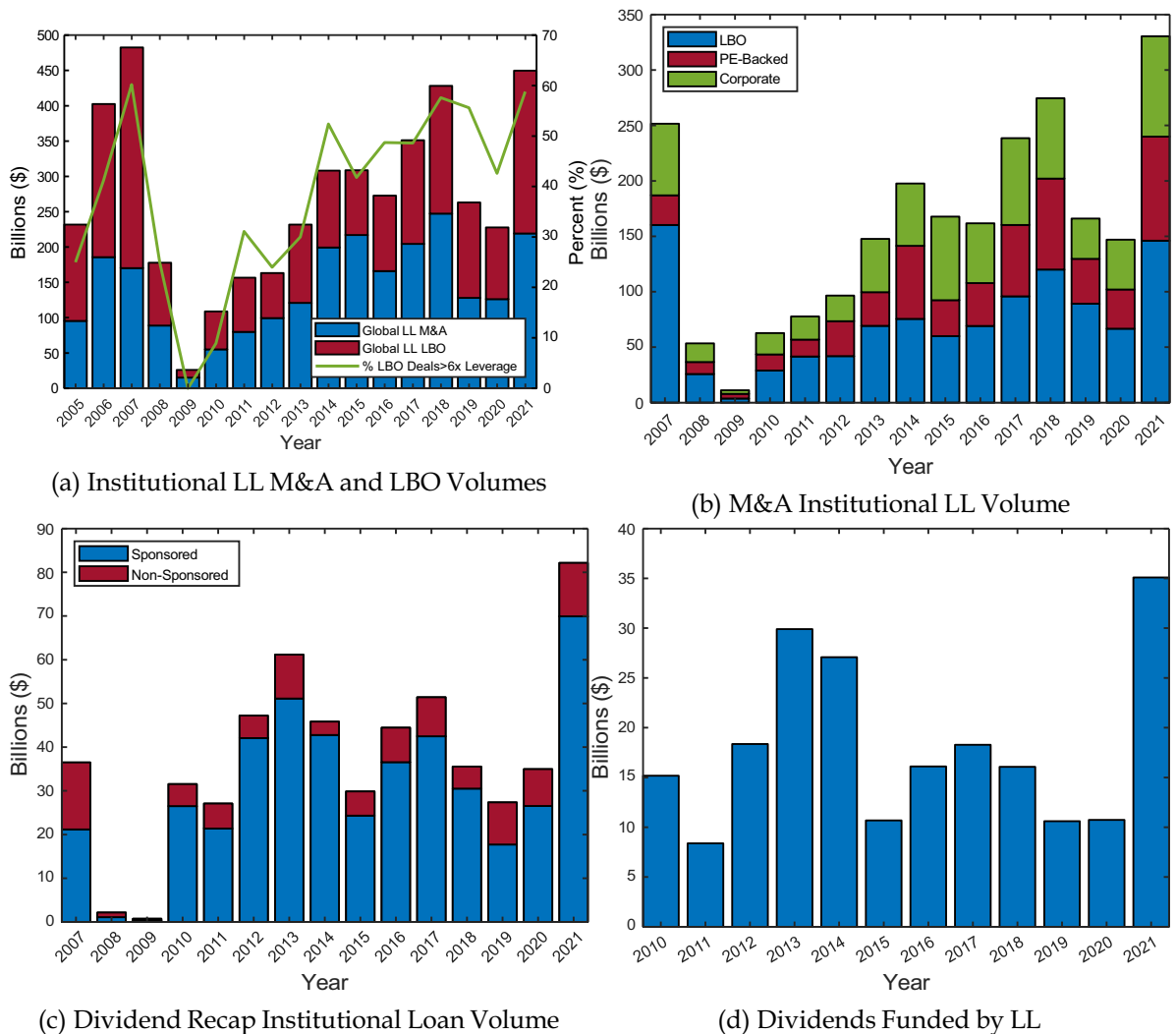


Fig. 2. Growth of leveraged finance.

Notes: The figure presents the growth of leveraged finance. Fig. 2a presents the global institutional leveraged loan M&A and leveraged buyout volumes. Fig. 2b presents the M&A institutional leveraged loan volume for LBOs, PE-backed (non-LBOs, “sponsored borrowers”), and corporate borrowers. Fig. 2c presents the dividend recapitalization institutional loan volume. Fig. 2d presents the volume of dividends funded by US leveraged loans. Sources: International Monetary Fund (2021); S&P Global (2021).

\$1.37 billion; in 2021, global issuance was \$185 billion. Further, almost 75% of new issue loans in 2021 were held by CLOs. Fig. 3b plots the total EU and US CLO assets under management (AUM). Fig. 3b indicates that US CLO AUM was reported to be over \$800 billion in 2021; EU CLO AUM was reported to be 165€ billion in 2021 – unprecedented volumes.

Table 1 and Table 2 present characteristics of CLO portfolios. As reported in Table 1, the average CLO size is \$440 million. There are 287 loans per CLO, on average. The average loan holding is \$1 million, and the interest rate on a loan is 5%, with a tenor of 56 months, on average. Table 2 presents the share of CLO holdings by issue type for each year. The share of term loans in CLO portfolios exhibits a secular increase from 2009. The mean share of term loans was 85% between 2009 and 2011; 87% between 2012 and 2014; 93% between 2015 and 2017; and 94% between 2018 and 2021. The remaining portfolio consists of bonds, credit default swaps, revolvers, equity, mezzanine debt, second lien, third lien, DIP financing, letters of credit, and other securities.

2.3. How do CLOs differ from other securitizations?

While new issuance of structured products including Collateralized Bond Obligations (CBOs) and Collateralized Debt Obligations (CDOs) dwindled after the financial crisis, CLOs flourished. Unlike other securitizations that are static, or replaced after investor redemption, CLOs are actively managed funds. Table 1 indicates that a CLO's monthly (annual) turnover is 6.38% (51.35%). Moreover,

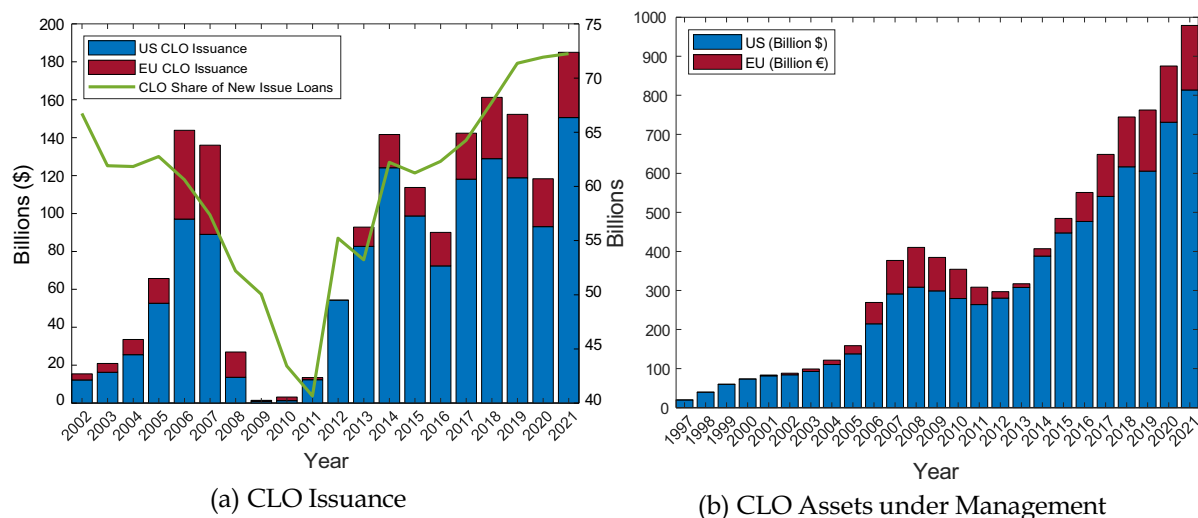


Fig. 3. CLO issuance and outstanding volume.

Notes: The figure presents CLO issuance and outstanding volume. Fig. 3a presents the global issuance of CLOs. Fig. 3b presents CLO assets under management Source: International Monetary Fund (2020); S&P Global (2021); Han and Pereira (2021); and author's calculations.

Table 1
Summary statistics.

N		Q1	Median	Q3	Mean	Std. Dev
CLO Characteristics						
Size (Millions)	107,532	341.9880	414.9621	513.2436	440.2287	210.7341
# Loans/CLO	107,532	181.0000	287.0000	407.0000	327.3188	241.4883
Monthly Turnover	91,598	0.0231	0.0450	0.0782	0.0638	0.0848
Annual Turnover	10,293	0.1500	0.4083	0.7209	0.5135	0.5643
Monthly Rebalancing	87,145	-0.0086	0.0096	0.0313	0.0067	0.1044
Annual Rebalancing	10,088	-0.0331	0.0646	0.2222	0.0812	0.3775
Weighted Average Rating Factor	102,503	2661	2836	3044	2823	641
Weighted Average Spread	106,750	3.3400	3.6100	3.9600	24.5494	167.4239
Weighted Average Life (Years)	98,453	4.1300	4.7306	5.0800	4.6207	1.6021
Monthly Transaction Volume (Millions)	106,557	8.2028	18.9298	35.6608	28.8181	45.3841
Monthly Net Purchase Volume (Millions)	106,557	0.2930	5.5920	13.0720	9.5011	37.5817
Issuer Characteristics						
Holdings Across CLOs (Millions)	2199	6.6032	105.3147	311.6104	239.2612	414.7171
# CLOs/Issuer	2204	2.0000	78.0000	198.5000	124.7087	150.6715
Monthly Transaction Volume (Millions)	150,292	2.3708	6.0744	16.0949	20.4320	74.2110
Monthly Net Purchase Volume (Millions)	150,292	-2.2287	0.8363	5.0000	6.7363	58.5563
Loan Characteristics						
Loan Holdings (Millions)	35,195,196	0.2944	0.9216	1.9678	1.3450	1.4321
Interest Rate	34,997,585	3.7500	4.6000	5.7100	4.7799	1.7442
Tenor (Months)	34,036,528	44.0000	58.0000	70.0000	56.0527	18.1092
Transaction Amount (Millions)	3,877,319	0.1778	0.4621	1.0000	0.7920	0.9453
Transaction Price	3,868,943	96.5000	99.1250	100.0000	96.1090	8.8634

Notes: The table reports the summary statistics at varying levels of granularity – CLO, issuer, and loan levels. The variables are listed in the first column. Turnover is defined as the ratio of the total amount transacted to the portfolio balance in the previous period. Rebalancing is defined as the ratio of the difference between the number of loans purchased and sold, and the number of loans held in the portfolio in the previous quarter. Transaction volume refers to the total amount of purchases and sales. Net Purchase Volume refers to the total net purchase. Tenor is defined as the remaining maturity. The second column indicates the number of observations. The third column indicates the value at the 25th percentile. The fourth column indicates the median value. The fifth column indicates the value at the 75th percentile. The sixth column indicates the mean. The seventh column indicates the standard deviation. Source: Creditflux's CLO-i database; and author's calculations.

a CLO transacts \$29 million or 6.59% of its deal size, on average. On average, \$20 million of an issuer's debt is transacted each month, representing 8.36% of its total CLO debt. Nearly one-third of the transaction volume consists of net purchases. At the loan level, the average transaction amount is \$0.79 million. The average transaction trades at 96 ¢/\$. Further, an issuer's monthly (annual)

Table 2
CLO composition (2009–2021).

Changes in Composition of CLOs (2009–2021)													
Issue Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	All
Term Loan A	2.84	3.72	4.10	4.62	4.60	3.30	1.62	1.29	1.27	1.03	0.84	0.75	1.69
Term Loan B	41.42	40.19	39.69	40.50	37.51	35.09	36.03	39.04	44.84	46.71	47.20	48.08	43.94
Term Loan C	10.76	10.53	9.54	9.45	7.29	3.50	1.84	1.46	1.55	1.07	0.87	0.64	2.92
Term Loan D	1.22	1.03	1.29	1.32	1.02	0.80	0.44	0.38	0.34	0.23	0.25	0.18	0.47
Term Loan (Other)	28.70	29.66	31.66	31.51	36.66	44.93	51.15	51.53	47.04	45.28	45.68	45.32	43.41
Bond	3.49	3.93	4.39	4.64	4.92	3.88	2.20	1.56	1.29	1.39	1.68	2.14	2.38
Credit Default Swap	0.15	0.04	0.03	0.04	0.00	0.00	0.16	0.20	0.00	0.00	0.00	0.00	0.04
DIP	0.45	0.13	0.02	0.04	0.05	0.12	0.15	0.15	0.07	0.02	0.06	0.15	0.11
Equity	0.06	0.46	0.68	0.50	0.42	1.01	0.73	0.57	0.50	0.47	0.42	0.50	0.52
Letter of Credit	2.01	1.90	1.26	0.60	0.39	0.23	0.11	0.03	0.01	0.00	0.00	0.00	0.29
Mezzanine	0.71	0.62	0.60	0.54	0.37	0.17	0.04	0.01	0.00	0.00	0.00	0.00	0.13
Revolver	1.40	1.08	0.85	0.52	0.41	0.28	0.17	0.12	0.13	0.11	0.08	0.14	0.29
Second Lien	3.78	3.24	2.88	2.53	2.14	2.86	3.72	2.81	2.55	3.52	2.74	1.90	2.68
Third Lien	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	2.99	3.46	3.00	3.18	4.21	3.81	1.63	0.85	0.40	0.17	0.18	0.19	1.13

Notes: The table reports the share of CLO holdings by issue type (rows) by year (columns). Issue types include: Term Loan A, Term Loan B, Term Loan C, Term Loan D, Term Loan (Other), Bond, Credit Default Swap, DIP, Equity, Letter of Credit, Mezzanine, Revolver, Second Lien, Third Lien, and Other. The column headers indicate the year. The “All” column reports the mean share of each issue type across all years. Source: Creditflux's CLO-i database.

rebalancing is 0.67% (8.12%).³

CLOs are distinct from other funds in four other key ways. First, CLOs are in operation for a fixed duration – upon maturity, the fund is liquidated, and investors retrieve their investment. Second, investors have limited redemption; a CLO can only be redeemed if equity investors vote after the “call date.” If investors need liquidity before the call date, their only option is to find a buyer to sell to. Third, CLOs are highly levered, as they take on debt to purchase their investments. This debt is committed for the duration of the CLO. Fourth, debtholders are largely protected from adverse contingencies. If a CLO experiences bears significant losses and breaches a coverage covenant, cash is diverted from junior debtholders and equity investors to senior debtholders or towards the purchaser of higher quality collateral – see [Section 3.2 \(Creditflux \(2020\)\)](#).

2.4. Who holds CLOs?

During the financial crisis, a compositional shift occurred in the investor base of CLOs, as investors created a lasting over-the-counter secondary CLO market to offload their exposures. The secondary market attracted new investors, such as hedge funds, private capital investors, and private equity firms. This introduction altered the perception of CLOs from being exclusively long-term investments to quasi-short-term trading instruments as well.⁴ This section investigates the ownership of CLOs. First, this section documents the structure of CLO notes by rating and by tranche. Then, this section investigates the overall ownership of CLOs. Lastly, this section examines CLO holdings by tranches and investor type.

The structure of CLO notes is presented in [Fig. 4](#). [Fig. 4a](#) presents the rating distribution of CLO notes. Notably, more than 60% of CLO tranches have a rating between Aaa and A. The remaining 40% are rated Baa, Ba, B, C, NR, or other. [Fig. 4b](#) presents the tranche distribution of CLO notes. The average CLO has 5–6 debt tranches and an equity tranche. 62% of CLO notes are in the AAA tranche, 13% are in the AA tranche, 8% are in the A tranche, 6% are in the BBB tranche, 3% are in the BB tranche, and 8% are in the equity tranche. Larger subordinated tranches offer better protection to senior debtholders under adverse contingencies, as discussed in detail in [Section 3](#).

CLO investors represent a wide spectrum of financial institutions. According to the Bank of England, 36% of CLO investors are banks, 20% are insurance companies, 10% are hedge funds, 6% are open-ended funds, 4% are CLO managers, 4% are structured credit funds, 3% are separately managed accounts, 1% are pension funds, and 15% are unallocated (international) ([Financial Policy Committee \(2019\)](#)). In contrast, the IMF reports that 37% of CLO investors are banks, 17% are insurers, 10% are pension funds, 9% are mutual funds, 6% are hedge funds, 5% are CLO managers, and 15% are unallocated. The Financial Stability Board reports that 28% of CLO investors are banks, 18% are insurance companies, 17% are investment funds, 8% are pension funds, 7% are financial organizations in the US, 7% are non-financial organizations in the US, and 14% are unallocated ([Financial Stability Board \(2019\)](#)). There is ambiguity in the share of CLOs held by more opaque institutions such as non-bank financial institutions.

[Fig. 5](#) provides a breakdown of CLO holdings by tranche and investor type. While asset managers and mutual funds invest across the entire capital structure, regulated institutions such as banks and pension funds, almost exclusively purchase AAA notes. [Fig. 5a](#)

³ I refer readers to [Kundu \(2021a\)](#) for additional details.

⁴ In comparison to the total volume of outstanding CLOs, trading volumes of secondary CLOs are still meager. Many have not been traded since issuance. CLO notes are sold through first-price sealed bid auctions known as *BWICs* or bids-wanted-in-competition.

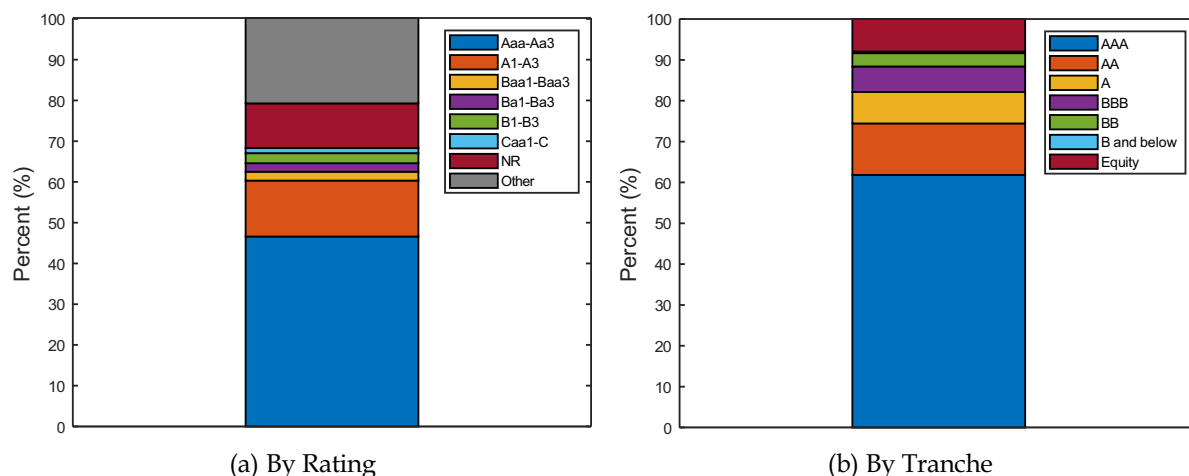


Fig. 4. Structure of CLO notes.

Notes: The figures present the structure of CLO notes. Fig. 4a presents the Moody's rating distribution of CLO notes by volume. Fig. 4b presents the tranche distribution of CLO notes by volume. Source: DeMarco et al. (2020); Creditflux's CLO-i database; and author's calculations.

disaggregates CLO holdings by investor type. Over 95% of banks' CLO holdings are in senior notes. Over 75% of pension funds' CLO holdings are in senior notes. Over two-thirds of mutual funds' CLO portfolios are comprised of senior notes. In contrast, insurers' CLO portfolios are equally comprised of senior notes and mezzanine and junior notes. Other funds – financial and non-financial organizations, invest across the capital structure. Fig. 5b disaggregates CLO tranches by investor holdings. Notably, the senior notes are mostly purchased by banks – 28% of senior notes are held by banks, 26% by insurers, and 19% by mutual funds. The mezzanine tranche is held mostly by insurers – 54% of mezzanine and junior notes are held by insurers. The equity tranche is the most diverse tranche – 29% of equity notes are held by mutual funds, 27% by other funds, 20% by nonfinancial organizations (including households), and 17% by other financial organizations (including BHCs).

2.5. Major CLO participants

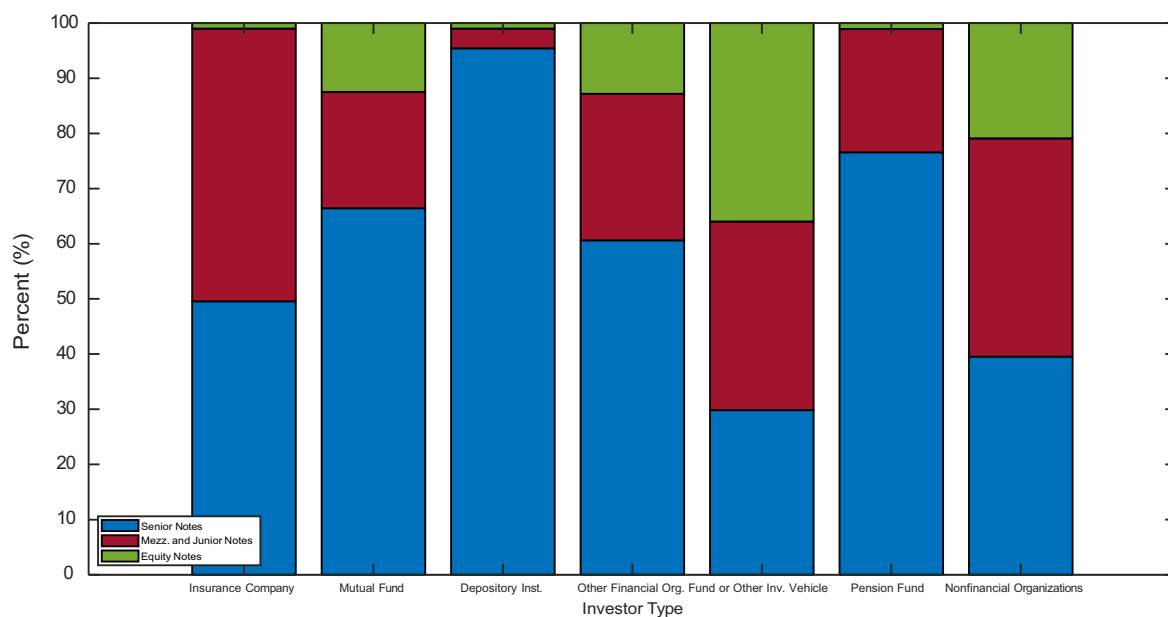
This section describes the key participants of CLOs. The three central players are the manager, arranger, and trustee. Legal counsels and rating agencies also play important roles in influencing the structure of CLOs.

The CLO manager administers the CLO portfolio. Managers are responsible for making investment and trading decisions in accordance with the covenants in their managerial indentures. According to Fitch Ratings data, the largest 30 managers represented 60% of all CLO issuance in 2018 (Johnson (2018)). Fig. 6 presents the most active managers of CLOs. The most active CLO managers include Blackstone Credit, Credit Suisse Asset Management, Carlyle Group, PGIM, Ares Management, CIFC Asset Management, Golub Capital, KKR, Apollo Global Management, and Octagon Credit Investors. Many CLO managers are affiliated with private equity firms or investment banks.

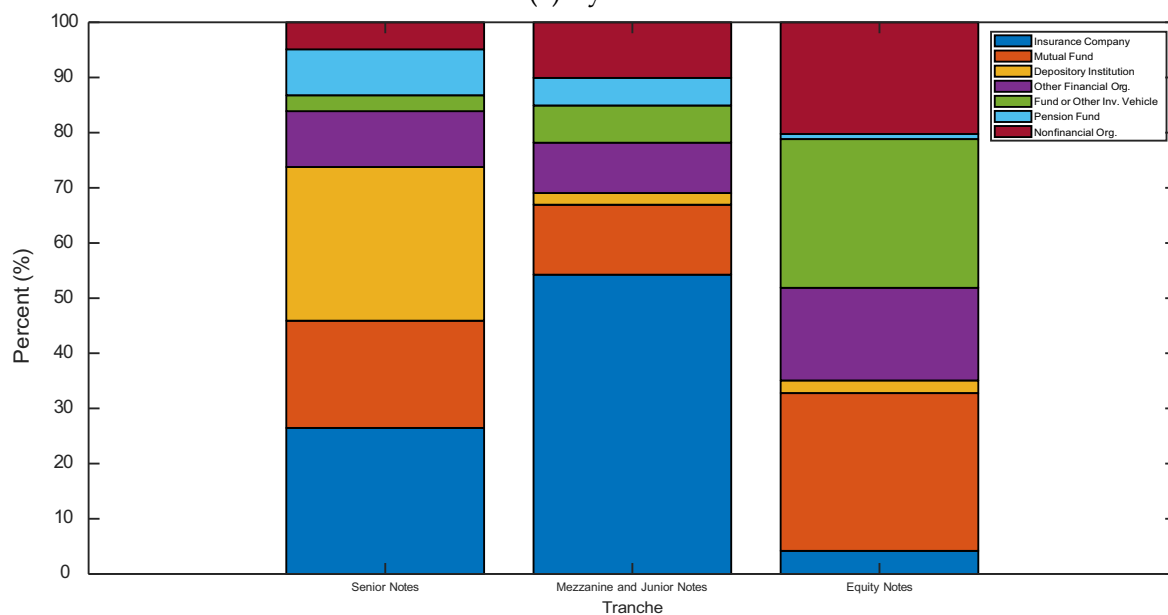
Arrangers or underwriters are tasked with structuring the CLO and selling notes to investors. Often, the arranging bank is also responsible for providing warehouse funding for the deal and may act as the initial legal purchaser of the notes at the closing or settlement date. If CLO investors experience unforeseen demand shocks, the arranging bank may end up retaining the unsold notes – a potential source of risk. Further, arrangers may serve as market makers in the secondary CLO market as they have knowledge regarding the original investors of the notes. They may also retain the notes, themselves, facilitating the match process between interested investors and potential buyers. Fig. 7a indicates that the top five arranging banks are Citigroup, Bank of America Merrill Lynch, Barclays, JP Morgan, and Morgan Stanley.

The contract that governs the management of a CLO is a legal indenture – a contract executed by the CLO and the trustee. The trustee acts as a fiduciary representative of the CLO investors and is typically a commercial bank. The trustee administers collateral, maintains custody of the cash accounts, settles trades daily and remits funds to investors on payment dates. Additionally, the trustee is responsible for calculating whether the CLO is in compliance with the covenants and circulating trustee reports to investors on a regular basis. If a disagreement arises between the manager and investors, the trustee acts on behalf of the investors. For example, if a CLO defaults, the trustee seizes control of the CLO at the behest of the controlling class of debtholders – typically, the most senior debtholders. Fig. 7b indicates that the top two trustees are US Bank and BNY Mellon.

In addition, there are a number of law firms, employed by the arranger, manager, and trustee to negotiate the terms of the legal indentures. The majority equity arranger may also employ a law firm to negotiate contractual clauses on their behalf. A CLO is associated with four main legal documents. The most significant of these contracts is the managerial indenture, which is signed between the manager and the trustee. The importance of this indenture is discussed in Section 3. Additionally, there are collateral management agreements between the manager and issuers, a prospectus designed for investors, and interest rate hedge agreements between issuers and a swap counterparty for hedging interest rate mismatch. New contracts are typically amended from previous deals



(a) By Investor



(b) By Tranche

Fig. 5. Holdings of CLOs by tranche and investor type.

Notes: The figure presents a breakdown of holdings of CLOs by tranche and investor type. Fig. 5a shows the domestic holdings of CLO securities, by investor type. Fig. 5b shows the domestic holdings of CLO holdings by tranche. The investor types include insurance company, mutual fund, depository institution, other financial organizations including BHCs, fund or other investment vehicle, pension fund, and nonfinancial organizations including households. Tranches are categorized into: senior notes, mezzanine and junior notes, and equity notes. Source: DeMarco et al. (2020); and author's calculations.

(Creditflux (2020)). Fig. 7c indicates that the top manager counsels are Milbank and Dechert. Fig. 7d indicates that the top arranger counsels are Paul Hastings and Cadwalader, Wickersham & Taft.

Further, rating agencies can influence the structure of CLOs by affecting the composition of assets and liabilities. Rating agencies monitor CLO notes and, correspondingly, upgrade and/or downgrade the ratings. Before a CLO comes into legal existence, arrangers solicit ratings from the rating agencies for assurance of the ratings. Rating agencies have the discretion to alter the structure of CLOs through different ratings assignments. These changes have direct effects on the composition of the investor base which faces varying

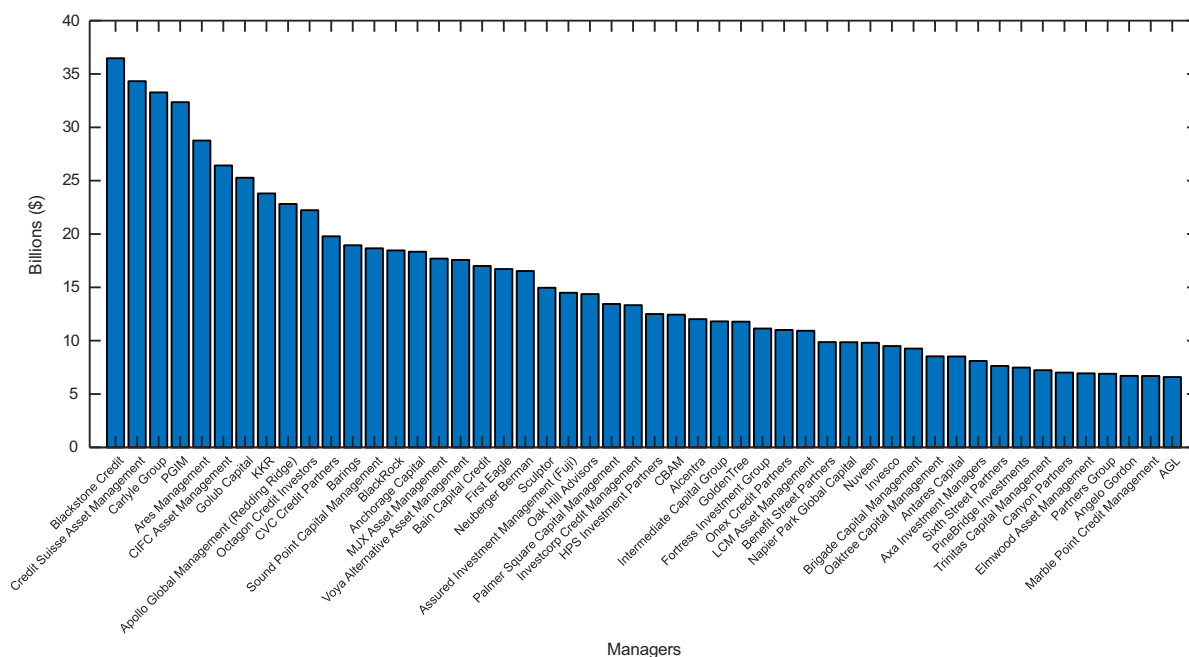


Fig. 6. Most active CLO managers.

Notes: The figure shows the most active CLO managers by the total amount managed. The x-axis presents the managers, and the y-axis represents the total amount managed in billions USD, as of Q3 2021. Source: Creditflux's CLO-i database.

sensitivities to different credit ratings. On the assets side, ratings are particularly important for CLO managers in satisfying the quality and concentration limits stipulated in their indentures. Fig. 8 presents a comparison of the ratings of leveraged loans held in CLOs and the overall leveraged loan market. The figure indicates that the ratings distributions of leveraged loans held in CLOs and the underlying leveraged loan market are similar. However, there is a greater share of nonrated loans in the CLO market, compared to the leveraged loan market.

2.6. Timeline of a CLO's life

The average life of a CLO spans seven years. There are six main events that occur in the life of a CLO, starting from the planning until call/redemption. Below, I describe the major episodes in a CLO's life. These events are marked in Fig. 9.

The first phase of a CLO's life is the planning phase. During the planning phase, a CLO manager solicits information on the possible terms of a CLO. This entails meeting with various arranging banks and gathering information on the potential size of the CLO, management fees, note prices, and debtholders. Managers may also contact potential equity investors, who may constitute the "control equity investor." This planning phase is completed roughly six months before a CLO comes into operation.

After completing the planning phase, the manager enters the "warehouse" phase. The warehouse phase involves the acquisition of assets. To fund the purchase, a CLO requires both equity capital and debt financing. Equity capital is provided by the control equity investor. It can also be provided by the CLO manager through another fund. Regardless of the source, the total amount of equity capital is usually insufficient to cover the total cost of acquisition. As a result, managers require debt financing to make up the difference. Debt financing can be obtained from a warehouse facility – typically, the CLO arranger – to complete the acquisition. Warehouse financing has a two-year maturity because CLO managers are expected to repay the proceeds of the note issues within two years. Unlike term funding for CLOs, warehouse lines of credit are provided against the portfolios' market values. If the value of the investments falls below a certain threshold, the arranging bank may require equity investors to contribute additional capital, analogous to purchasing investments on margin. If equity investors are unable to post additional capital, the CLO may be unwound in the warehouse phase, and arrangers may seize the collateral (Creditflux, (2020)).

While the manager is acquiring loans for the portfolio, the arranger markets the CLO notes to investors across the country through a roadshow and ensures that there are sufficient buyers for the notes. Because not all tranches are in equal demand, arrangers syndicate CLO notes, assess total demand by tranches, and alter features of the tranches to secure buyers, during bookbuilding. The size and price, among other note terms, are confirmed with investors on the pricing date, a month before the CLO comes into existence. Once the note terms are confirmed, investors commit to purchasing the notes at the settled price. A CLO comes into existence on the closing or settlement date. On this date, the investors pay for the notes. The time from planning to closing is typically six months.

After closing, the CLO manager begins receiving management fees. The manager's responsibility is to ensure that there is sufficient cash from the assets to fund the liabilities on the payment dates. A CLO becomes *effective* after it is fully "ramped up," nearly four

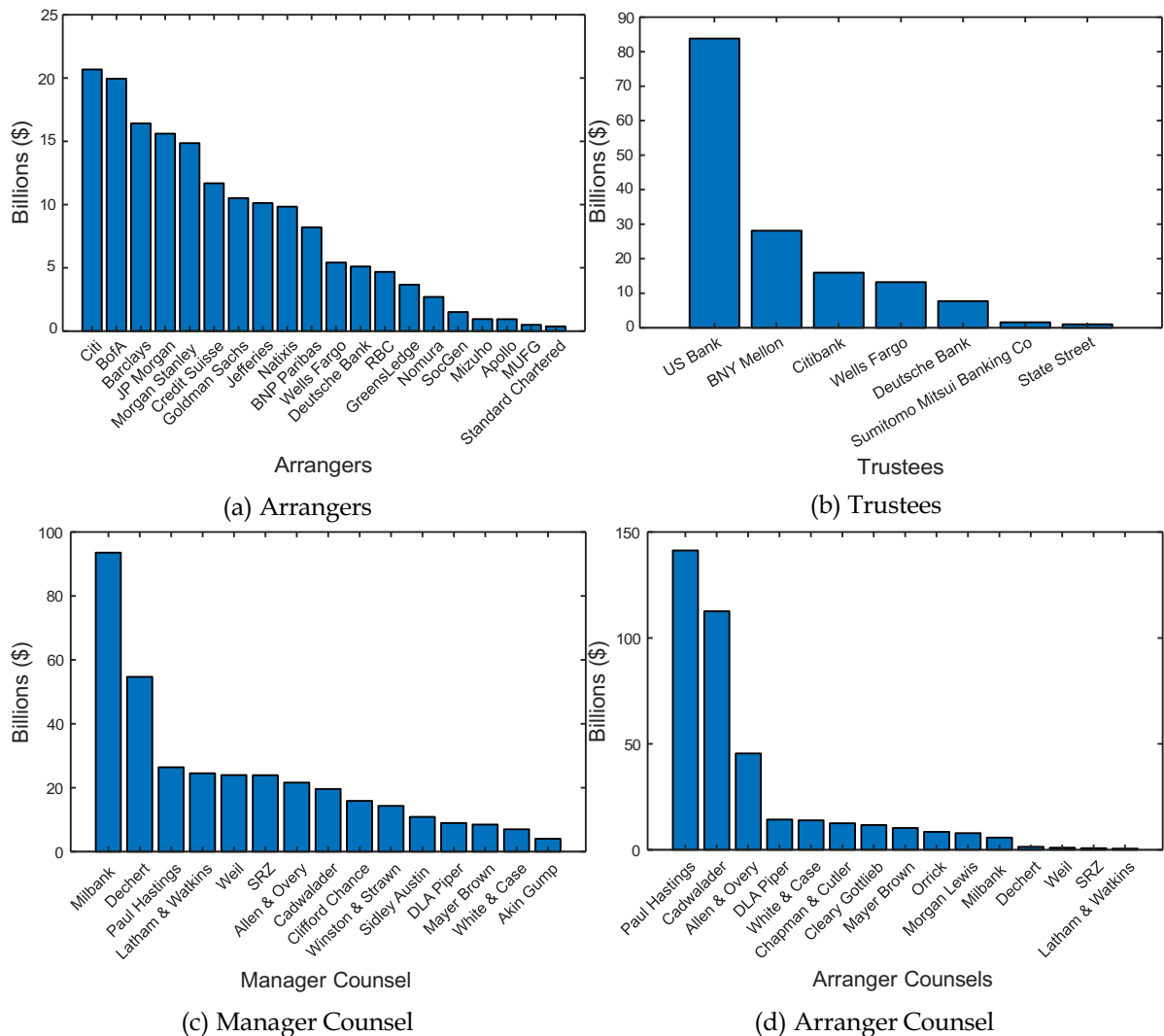


Fig. 7. Active CLO participants.

Notes: The figure shows the most active CLO arrangers (Fig. 7a), trustees (Fig. 7b), manager counsels (Fig. 7c), arranger counsels (Fig. 7d) by the total amount managed. The x-axis presents the institution, and the y-axis represents the total amount managed in billions USD, as of Q3 2021. Source: Creditflux's CLO-i database; and author's calculations.

months after closing. At this point, the covenants start applying and the rating agencies confirm the ratings of the notes.

The CLO enters the *reinvestment period*, which allows the manager to conduct trades and reinvest the proceeds. During the first two years of the reinvestment period, equity investors cannot call the CLO. The reinvestment period lasts approximately four years. At the end of the reinvestment period, the CLO starts paying its most senior debtholders. After at least 50% of debtholders have been paid, equity investors may vote to redeem the CLO if its net asset value (NAV) is large enough to pay out all debtholders. If the NAV is not sufficiently large, the CLO will run until its legal maturity, at which point, the trustee will liquidate the collateral to repay the notes. If the CLO is called, the CLO may auction off the collateral and use the proceeds to repay the notes and distribute the excess proceeds to the equity investors. Alternatively, a CLO may be called and the collateral may roll into a new CLO (Creditflux, (2020)). Redemption often occurs before the maturity date.

If a firm experiences default, a CLO may receive equity shares of the defaulted firm. In this case, CLO equity investors are unlikely to liquidate the illiquid shares until the defaulted assets rebound in price to avoid losses. In this case, the CLO may continue to run even after redemption, as an unlevered fund (Creditflux, (2020)). If the CLO, itself, experiences default, the controlling class will decide on the appropriate course of action.

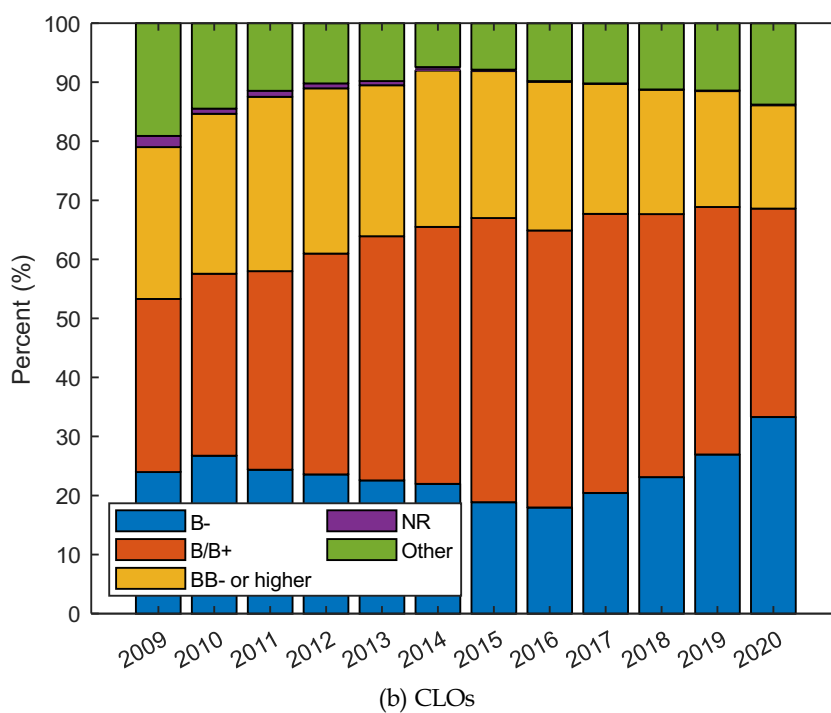
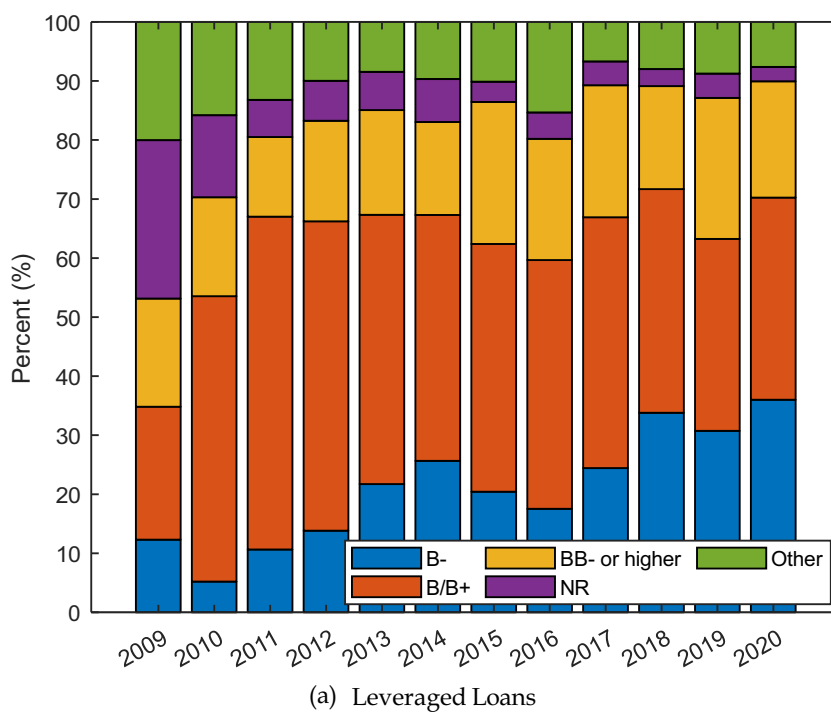


Fig. 8. Ratings of Leveraged Loans and CLO Assets (2009–2020).

Notes: The figure presents the ratings of leveraged loan and CLO assets. Fig. 8a shows the borrower ratings of leveraged loans. Fig. 8b shows the borrower ratings of CLO assets. The x-axis indicates the year. The y-axis indicates the share (%). Source: S&P Global (2021); Creditflux's CLO-i database; and author's calculations.

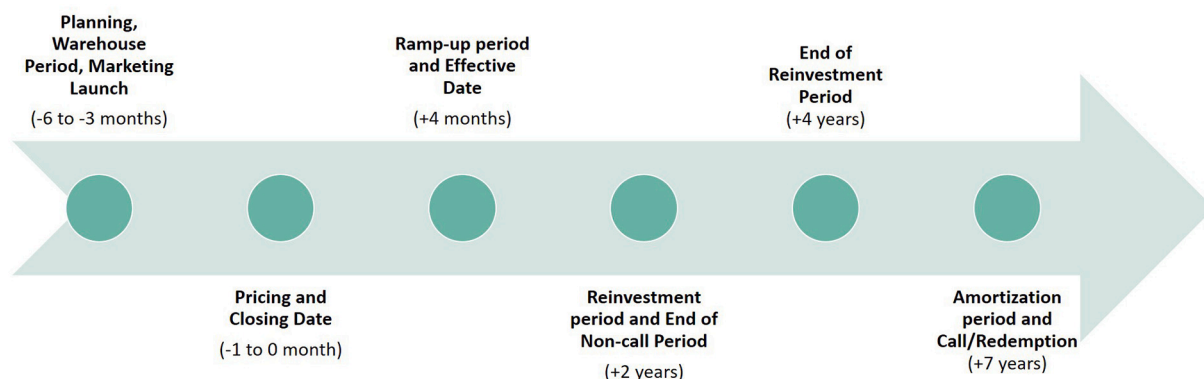


Fig. 9. Timeline of a CLO.

Notes: The figure shows the timeline of a CLO from planning to redemption. There are four main phases in a CLO's life: warehousing phase, effective phase, reinvestment period, and amortization. The figure above marks the six most salient events in a CLO's lifetime from planning to redemption.

3. Covenants and cash flow

Covenants influence the incentives of CLO managers. This section examines the objectives of covenants and how managers fulfill these requirements.

3.1. Why are there covenants at all?

As previously described, the underlying portfolio of leveraged loans serves as collateral for the CLO debt and equity tranches. Debt tranches provide leverage and risk premia benefits to equity investors. Debt is issued up until the point at which the default risk from higher leverage increases the debt credit spread by enough to decrease equity returns. In the absence of any covenants or payout policies, upon experiencing default, managers may gamble for resurrection and risk-shift given the option-like structure of their payoff. The financial interests of the CLO manager are most aligned with the equity class, hence, compensation takes the form of a European call option where the exercise price equals the face value of debt. By increasing the risk or volatility of potential outcomes, the value of the call option increases. As greater risk may materialize as greater losses to debtholders, there is a divergence of interests between the manager and investors of various CLO tranches ("tranche warfare").

There is historical evidence of managerial mismanagement from the CDO market – a close cousin of CLOs. From 1998 through 2002, CDOs were inundated with a deluge of corporate defaults. According to [Garrison \(2005\)](#), a paper focused on managerial incentives in CDOs, the five-year investment grade cohort experienced the worst financial performance during this period – 32% worse than the second worst cohort from 1982 to 1986, and 328% worse than the average. In 2003, it was reported that 63% of all CDO tranches collateralized by high-yield bonds had experienced downgrades while 41% of CDO tranches collateralized by investment-grade bonds experienced downgrades. A 2002 Moody's case study found that: (1) CDO investors could have avoided 13 out of 27 debt downgrades if the manager of a typical 1998 high-yield bond CDO held market collateral, (2) an additional 8 downgrades could have been avoided if the manager appropriately managed risk after stress befell the market, and, (3) "managers [introduced] risk" and "deviate[d] from the spirit of the indenture" ([Garrison \(2005\)](#)). Hence, managers exploited structural weaknesses, as the collateral held by corporate CDOs experienced greater defaults than the overall corporate debt market at every rating level.

CLO managers' financial interests are aligned with the equity tranche. Managers' compensation is based on a fixed senior fee, a junior fee proportional to the proceeds available for the equity class, and a performance fee for returns beyond a hurdle rate. If managers have skin in the game, they may have greater incentives to maximize the equity value. Changes in the junior and senior fees from 2009 to 2020 are detailed in [Table 3](#). In the post-crisis period, the median senior fee has been 15 bps and the median junior fee has been 25–30 bps. The variation in fees declined from 2009 through 2020.

Debtholders are naturally averse to riskier projects as debtholders do not benefit from greater returns; compensation is fixed above a benchmark rate, based on seniority. Hence, CLOs are structured to include additional features and indenture restrictions that place limits to risk-taking. These enhancements are analogous to dividend payout policies and debt covenants in alternate contexts (e.g., [Stulz \(1990\)](#); [DeAngelo et al. \(2006\)](#); [Zwiebel \(1996\)](#)). As neither effort provision, risk-shifting tendencies, nor incoming cash flow are directly contractible, debt-focused covenants are used as a tool to allocate control ([Aghion and Bolton \(1992\)](#)).

In CLOs, coverage and quality covenants, as well as concentration limits are designed as the remediation to the agency problem within the closed-end fund structure. CLOs are a type of closed-end fund – capital is locked-in for the duration that the fund is in operation. Unlike their open-end counterparts, investors cannot redeem their claims and deprive "management of control over assets," effectively addressing the agency problem ([Fama and Jensen, 1983](#)). Research on the closed-end puzzle has shown that closed-end shares trade at a discount relative to NAV because of the agency costs (e.g., [Boudreaux \(1973\)](#), [Barclay et al. \(1993\)](#), [Ross et al. \(2002\)](#), [Berk and Stanton \(2007\)](#), [Cherkes et al. \(2008\)](#), [Bradley et al. \(2010\)](#), [Wang and Nanda \(2011\)](#)). Hence, CLOs are susceptible to agency problems like in other closed-end funds. CLO covenants operate as disciplining devices for managers to appropriately screen

Table 3

Fee structure changes (2009–2020).

Senior Fee	Junior Fee
<ul style="list-style-type: none"> • Senior fees exhibited greater variation before the financial crisis, compared to after. • From 2002 to 2007, the 25th percentile of the senior fee ranged from 10 to 15 bps, the median ranged from 10 to 20 bps, and the 75th percentile ranged from 15 to 25 bps. • From 2012 to 2018, the 25th percentile of the senior fee was 15 bps, the median was 15 bps, and the 75th percentile was 20 bps. • In recent years, 2019–2020, the 75th percentile of the senior fee has fallen to 15 bps. • Senior fees, along with the number of new deals, decline during crises. 	<ul style="list-style-type: none"> • Junior fees exhibited greater variation before the financial crisis, compared to after. • From 2002 to 2007, the 25th percentile of the junior fee ranged from 27.5 to 35 bps, the median ranged from 37.5 to 40 bps, and the 75th percentile ranged from 40 to 55 bps. • From 2012 to 2018, 25th percentile of the junior fee ranged from 23.5 to 30 bps, the median was 30 bps, and the 75th percentile was 35 bps. • In recent years, 2019–2020, the 25th percentile of the junior fee has fallen between 20 and 20.6 bps, and the median junior fee has fallen between 25 and 26.5 bps. • Junior fees, along with the number of new deals, decline during crises.

Notes: The table summarizes senior and junior fees from 2009 to 2020. Senior Fees are tabulated in the left column. Junior Fees are tabulated in the right column. Source: Creditflux's CLO-i database; and author's calculations.

and monitor their investments within the closed-end structure. These covenants are intended to protect debtholders and minimize risk.⁵ The covenants allocate control rights between the manager and investors in various states of the world, through the diversion of cash flow (see Section 3.3). Aside from the actual diversion of cash flow, a covenant breach may signal managerial incompetence to investors and hurt managers' reputations. Reputational signals conveyed by covenants may also prevent risk-shifting and force managers to exert greater effort (e.g., Hirshleifer and Thakor (1992); Diamond (1989)).

3.2. CLO coverage and quality covenants

There are several covenants that CLOs must regularly comply with. These covenants can be classified into two different categories: quality covenants and coverage covenants. Quality covenants are maintain-or-improve covenants, preventing managers from making trades that may further tighten these covenants. Coverage covenants are directly punitive. In the event of a coverage covenant breach, proceeds are diverted from junior tranches to pay down senior liabilities, preemptively, or, towards the purchase of "higher-quality" collateral. Covenant breaches may cause investors to lose confidence in the performance of a CLO and hurt the manager's reputation. In addition, under more extreme circumstances, covenant breaches may lead to downgrades of CLO tranches. In the subsequent section, the coverage covenants and quality covenants are described.

3.2.1. Coverage covenants

The **Overcollateralization** (OC) and **Interest Diversion** (ID) covenants ensure that there is a specific level of subordination and coverage at all times, relative to the triggers for each tranche. The purpose of the ID/OC covenants are to create first-loss tranches. The presence of first-loss tranches creates a cushion for principal losses that are borne by more senior tranches.

$$ID/OC = \frac{\text{Par value of collateral} + \text{Defaulted collateral value} + \text{Purchase price of discounted collateral} - \text{"CCC" excess adjustment}}{\text{Principal balance of tranche and all senior tranches}} \quad (1)$$

The equation above indicates that the covenant relies on both realized and unrealized losses of collateral. Unless an asset experiences default, is downgraded to CCC/Caa1+, or is a discount obligation, CLO assets are marked to par value and are not subject to market fluctuations. Defaulted assets are marked to the lower value of the market value or recovery value. Assets in excess of the stipulated CCC/Caa1+ limit are marked to the lowest market value among the loans in the "CCC" bucket. Discounted obligations are marked to the purchase price until they trade above a specific threshold (typically 90 ¢/\$) for more than 30 days. The thresholds are graded so that the ID covenants fail before the Junior and Senior OC covenants.

Fig. 10 presents the annual share of risky loans across all CLOs. The figure indicates that the share of CCC/Caa1+ loans hovered between 3 and 6% between 2010 and 2018. The share of CCC/Caa1+ loans was 9–10% during the Great Financial Crisis in 2009, and during the COVID-19 pandemic in 2020–2021. The share of defaulted loans declined from 2009 through 2019, and exhibited an uptick in 2020 and 2021. Regardless of the year, CLOs' share of defaulted loans is significantly lower than the share of defaulted loans in the leveraged loan market.⁶

A CLO can violate the tranche-specific OC/ID covenant if the adjusted assets-to-liabilities threshold falls below a prespecified threshold, indicating that the adjusted par value of assets is low relative to the principal balance of that particular tranche and all

⁵ The protection conferred by covenants may increase the amount of capital committed to CLOs, ex ante. The welfare implications of covenants provide a potential area of future research.

⁶ See Kundu (2021a) for further discussion.

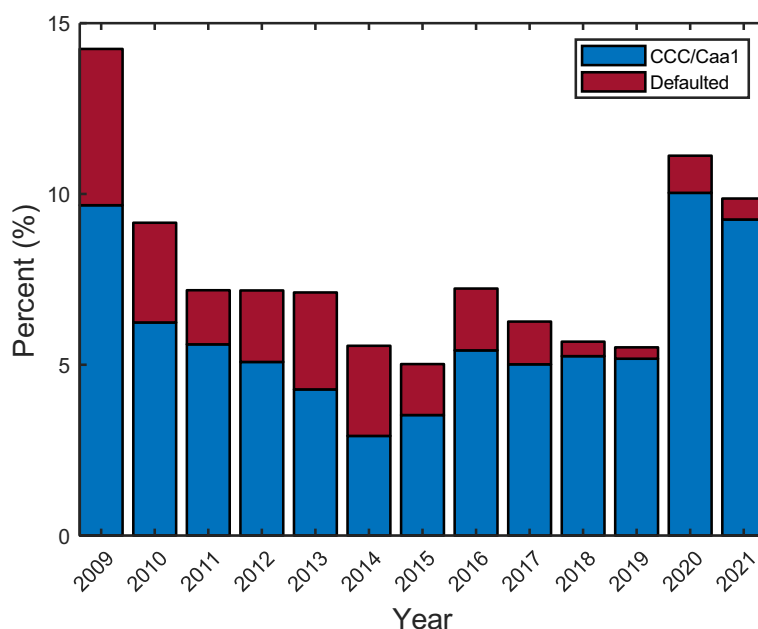


Fig. 10. CLO risky share of loans (2009–2021).

Notes: The figure presents the CLO share of CCC/Caa1+ and defaulted loans by year. The mean share of CLO CCC/Caa1+ loans by year are shaded in blue. The mean share of CLO defaulted loans by year are shaded in red. The x-axis indicates the year. The y-axis indicates the share (%). Source: Creditflux's CLO-i database; and author's calculations. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

tranches senior to it.

If a CLO breaches an OC covenant for a particular tranche, all interest payments are diverted from tranches junior to that tranche to pay the principal of more senior tranches; payments are diverted in rising order of seniority, hence, the most senior tranches are the most secure. Proceeds are diverted until the CLO is no longer breaching the covenant. For example, if the Junior OC covenant is violated, the CLO cannot make distributions to the equity investors nor collect junior management fees until the covenant is satisfied. Diversion decreases the denominator of the ID/OC ratio, thereby loosening the covenant. Hence, covenant breaches can be punitive.

The ID covenant is similar to the OC covenants as the ratios are computed identically. As stated before, the ID covenant is triggered before any of the OC covenants, as it has a lower threshold. In case of an ID covenant breach, interest proceeds are diverted towards the purchase of collateral in order to increase the numerator of the ID/OC covenants. The ID covenant effectively removes opportunities for asset substitution by forcing managers to purchase high-quality, value-increasing assets.

The **Interest Coverage (IC)** covenants are similar to the OC covenants, as they can also cause the CLO manager to pay down liabilities early. The IC covenants ensure that there is a specific level of coverage for interest due on tranches relative to the IC triggers for each tranche.

$$IC = \frac{\text{Interest from collateral}}{\text{Interest due on tranche and senior tranches}} \quad (2)$$

If the IC ratio falls below the corresponding threshold on a tranche, principal and interest proceeds are diverted to pay down liabilities until the covenant is no longer breached. A CLO may violate the tranche-specific IC covenant if the interest received from the underlying collateral is too low relative to the interest that is owed on that particular tranche and all tranches senior to it. Coverage covenant breaches force the diversion of proceeds, reducing the likelihood of additional losses. Hence, the covenants make risk-shifting less profitable, and set limits to CLO leverage.

Unlike many debt contracts, these covenants cannot be renegotiated.

3.2.2. Quality covenants

There are a number of maintain-or-improve covenants, known as “quality covenants.” These covenants are not directly punitive, as they do not siphon off proceeds intended for management fees or equity distributions. However, the covenants stipulate that in the event that they are triggered, the manager must maintain the portfolio credit quality and cannot make trades that will tighten the covenants. These covenants include the **Weighted Average Spread**, **Weighted Average Life**, **Weighted Average Rating Factor**, **Minimum Weighted Average Recovery Rate**, **CCC-bucket**, as well as **Concentration Limits**. The Weighted Average Spread covenant stipulates that the collateral has sufficient interest proceeds to pay interest on the rated notes and equity; the Weighted Average Life covenant stipulates that the collateral is amortizing (limiting portfolios with high WAL exposed to downturn and default);

the Weighted Average Rating Factor covenant stipulates that the average loan rating of the portfolio is above the specified threshold; the Minimum Weighted Average Recovery Rate covenant stipulates that assets meet a minimum level of recovery expectations in case of default. The concentration limits are additional CLO-specific covenants that can limit exposures to various ratings, industries, second-lien loans, covenant-loans, and specific corporate borrowers. For example, the CCC-bucket places limits to the amount of loans that are rated CCC/Caa1+ (typically, 5–7.5%).

Summary statistics on the eight salient covenants are reported in Tables 1 and 4. Table 1 indicates that the median Weighted Average Rating Factor is 2836, corresponding to a Moody's credit rating of B2 to B3, the median Weighted Average Spread is 3.6%, and the median Weighted Average Life is 4.7 years. Table 4 presents the distances to the quality and coverage covenant thresholds. CLOs operate closest to the capital (OC/ID) covenant thresholds. Specifically, CLOs operate within 3% of the Interest Diversion threshold, 4% of the Junior OC threshold, and 8% of the Senior OC threshold – consistent with the pecking order described above. The inter-quartile range of the capital covenants is <3%. The liquidity (IC) covenants exhibit greater variation. CLOs operate farther from the liquidity thresholds.

3.3. Covenants and cash flow distribution

CLOs distribute cash flow from the underlying loan portfolio according to two waterfalls: an interest waterfall and a principal waterfall. The interest and principal waterfalls specify the conditions for the distribution of interest and principal payments to specific classes of debtholders, based on priority. Junior debtholders are paid after senior debtholders are paid in full, subject to the availability of cash.

Fig. 11 shows the sequence of actions according to the interest and principal waterfall. Consider a simplistic setting in which the manager is bound to only two sets of covenants associated with two debt tranches: AAA-A and BBB-B tranches, respectively. First, the CLO pays tax and administration fees to the trustee who represents the investors, using the interest proceeds from the underlying pool of assets. Next, the CLO pays its manager a management fee. Then, the CLO pays interest on the AAA-A tranche. If the CLO passes all of its coverage covenants associated with the AAA-A tranche, it progresses down the waterfall to make interest payments on the BBB-B tranche. If the CLO satisfies all the triggers after paying the BBB-B tranche, the manager progresses forward and receives the junior management fee. After this step, the equity tranche receives the remaining proceeds up to a prespecified hurdle rate, at which point the manager receives a performance fee and the remaining interest is split between the manager and the equity class. The principal cascade involves fewer steps. When principal is received, the CLO manager first makes any outstanding payments to debtholders. If the CLO has been called, reached maturity, is past the reinvestment period, or has failed a coverage covenant, the manager pays debtholders in order of seniority. The subordination of tranches creates a hierarchy for losses.

Fig. 12 shows an example of the sequence of events that occur if the CLO fails its covenants. If the CLO breaches an IC or OC covenant, the CLO is forced to delever. First, the CLO must pay back the principal on the AAA tranche in full before proceeding. If the CLO still breaches an IC or OC covenant, even after paying down the AAA tranche, the CLO must pay back the principal on the AA tranche, and continue paying the subsequent tranches in full, in order of seniority, until the CLO is in compliance with the breached covenant. Similarly, if the CLO breaches the ID covenant, the manager must use proceeds from the underlying pool of assets to purchase new collateral until the CLO is in compliance with the covenant. The manager cannot proceed according to the waterfall until the covenant triggers associated with each tranche are satisfied.

3.3.1. Equity distribution

Covenant breaches affect the equity distribution. Fig. 13 presents the equity tranche returns and cumulative losses as a function of portfolio losses. The x-axis plots the distribution of portfolio losses from lowest to highest. The left y-axis plots the equity return in percent. The right y-axis plots the cumulative loss as a percent of principal balance. The equity distribution is defined as follows:

Table 4
Summary statistics: distance to CLO covenant thresholds.

	N	Q1	Median	Q3	Mean	Std. Dev
Interest Diversion	41,292	1.0180	1.0309	1.0372	1.0263	0.0313
Junior OC	103,023	1.0258	1.0414	1.0531	1.0418	0.1059
Senior OC	105,116	1.0673	1.0795	1.0965	1.1718	0.3748
Junior IC	86,285	1.6383	2.1472	3.2490	2.6170	1.3847
Senior IC	96,671	1.7450	2.4510	3.9963	3.6573	3.9766
WARF	102,503	0.9140	0.9735	1.0485	1.0012	0.1642
WAS	106,750	1.0265	1.0892	1.2469	1.1700	0.2462
WA Life	97,600	0.6423	0.7664	0.9642	0.9803	1.0707

Notes: The table reports the summary statistics of the distance to the CLO covenant threshold, measured as the ratio of covenant result to the covenant threshold, by covenant. The covenants are listed in the first column. OC denotes the overcollateralization covenant; IC denotes the interest coverage covenant; WARF denotes the weighted average rating factor; WAS denotes the weighted average spread; and WA Life denotes the weighted average life. The second column indicates the number of observations. The third column indicates the value at the 25th percentile. The fourth column indicates the median value. The fifth column indicates the value at the 75th percentile. The sixth column denotes the mean. The seventh column indicates the standard deviation. The frequency of observations is monthly. Source: Creditflux's CLO-i database; and author's calculations.

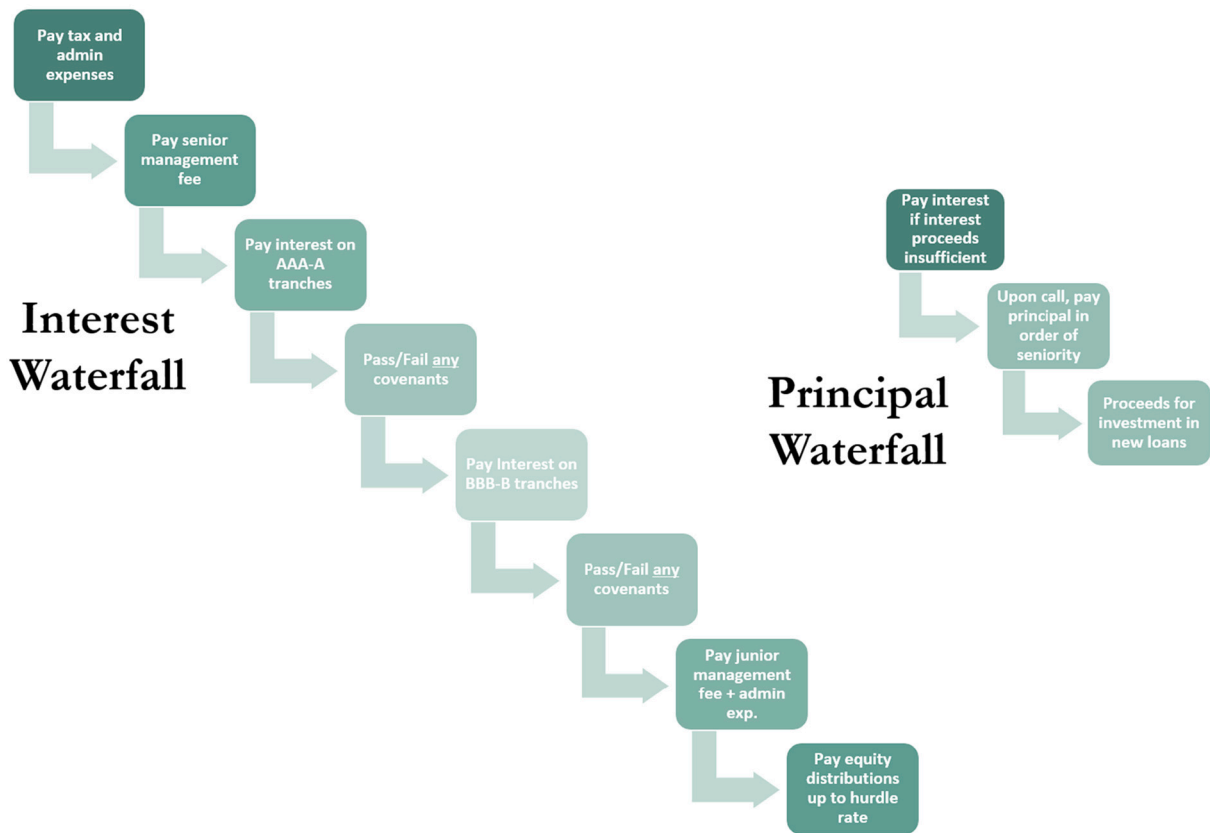


Fig. 11. Cash flows and covenants: sequence of events.

Notes: The figure shows the sequence of cash flow distributions from interest proceeds (left) and principal proceeds (right). Source: [Creditflux. \(2020\)](#); and author's analysis.

$$\text{Equity Distribution} = \frac{\text{Interest payment} \times \frac{12}{\text{Payment frequency}}}{\text{Par value of equity}} \quad (3)$$

The equity distribution decreases monotonically in the level of portfolio losses from lowest to highest. After the returns to equity are “wiped out”, subsequent tranches in ascending order of seniority are affected; tranches rated below BBB experience losses before the BBB tranche, A tranche, and AA tranche. [Fig. 14](#) shows the historical realized equity distribution. The equity distribution increased from 8% in 2009 to nearly 25% in 2013. Since then, the equity distribution has declined and hovers around 14%. Equity distributions exhibit high volatility, within and across years.

[Kundu \(2021a\)](#) and [Kundu \(2021b\)](#) demonstrate how CLO covenants can produce externalities and induce fire sales. [Kundu \(2021a\)](#) shows that covenant breaches can substantially reduce management fees and detrimentally affect managers' career prospects; managers who breached a coverage covenant are less likely to launch new deals, face stringent covenants in the future, and administer smaller portfolios. [Kundu \(2021b\)](#) examines the externalities of fire sales, illustrating how distress can propagate to other unrelated firms in CLO portfolios, through capital markets.

4. Changes and developments

This section details the structural and regulatory changes, affecting CLOs.

4.1. CLO 1.0 vs. CLO 2.0

CLOs experienced significant changes since the Great Financial Crisis of 2008. Post-crisis deals, *CLOs 2.0*, differ from pre-crisis deals, *CLOs 1.0* in several ways. First, the reinvestment period of *CLOs 2.0* is four years – shorter than the seven-year reinvestment period of *CLOs 1.0*. Second, the non-call period of *CLOs 2.0* is two years, compared to two to four years for *CLOs 1.0*. Third, *CLOs 1.0* permit managers to continue investing even after the end of the reinvestment period. This is usually not permitted with *CLOs 2.0*. Fourth, *CLOs 1.0*, historically, had high leverage as debt tranches were 10× larger than the equity tranche. The earliest *CLOs 2.0* had lower leverage with debt tranches that were 4–6× larger than the equity tranche; newer *CLO 2.0*s have surpassed the leverage of *CLOs*

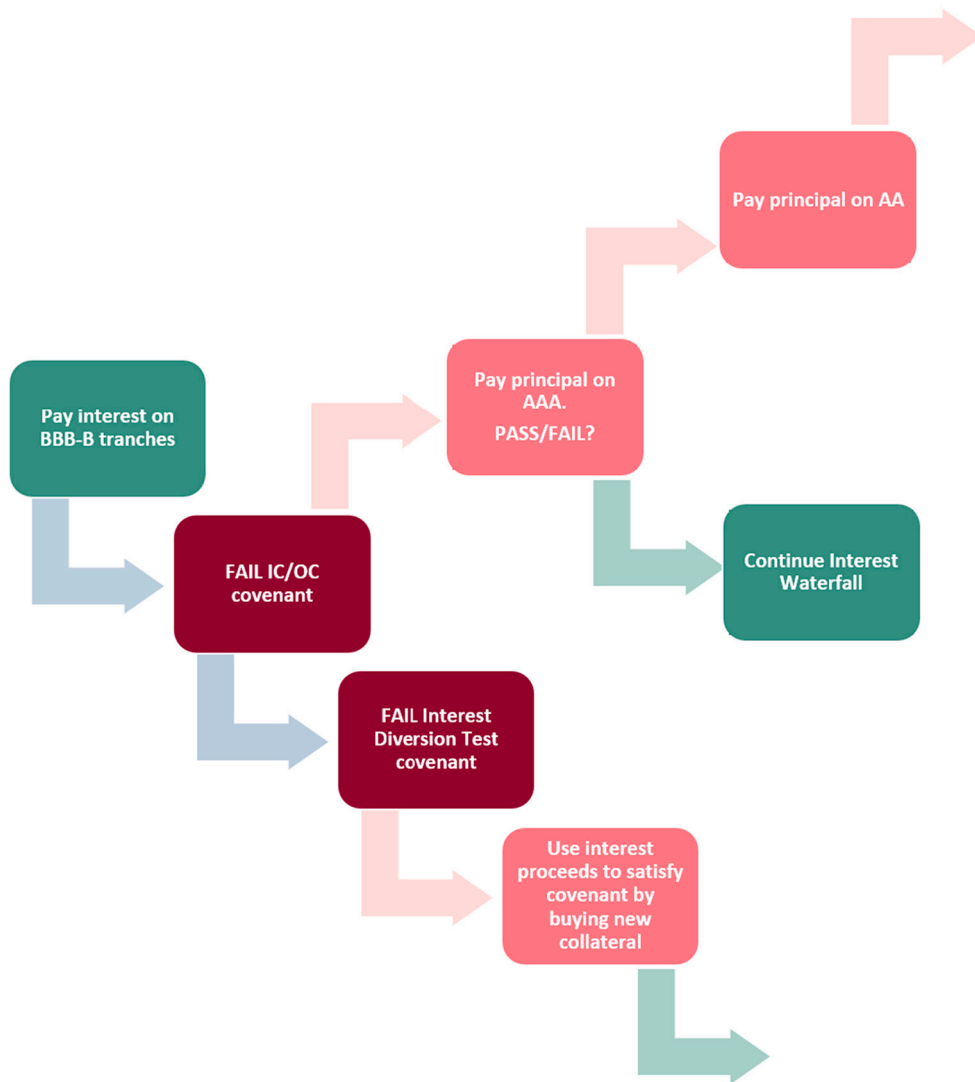


Fig. 12. Cash flows and events: covenant failures.

Notes: The figure shows the sequence of events prescribed to managers in event of coverage covenant breaches. Source: [Creditflux. \(2020\)](#); and author's analysis.

1.0. Fifth, CLOs 2.0 allow for tranche-by-tranche refinancing and repricing, which is not permitted under the structure of CLOs 1.0; the entire CLO must be redeemed before an individual tranche is repaid with CLOs 1.0 ([Creditflux. \(2020\)](#)). In summary, CLO 2.0 s have shorter reinvestment and non-call periods, higher levels of subordination, and more rigorous collateral eligibility requirements. In recent years, CLOs 3.0 have emerged, characterized by their adherence to new regulatory guidelines.

CLO AUM by vintage is shown in [Fig. 15](#). In 2021, CLOs issued in 2017 or after, comprised 73% of active AUM; CLOs issued between 2014 and 2016 held 21% of assets under management ([Han and Pereira \(2021\)](#)).

4.2. Treatment of securitization under Basel and Dodd-Frank

Regulation has affected the capital structure of CLOs. Under the Basel regulatory framework, banks are required to maintain a minimum total capital ratio of 8%. Exposure to securitized assets affects the total value of credit risk-adjusted assets, the denominator of this ratio.

The treatment of securitization in the calculation of the total value of credit risk-adjusted assets is two-pronged. Banks with the ability to carry out complex analyses may use the *internal ratings-based approach* and apply risk-weights based on internal modeling. Other banks may utilize the *standardized approach* and apply risk-weights based on the broad ratings categories. Typically, the risk-weights under the standardized approach are based on the ratings of the tranches and carry larger capital charges than the internal ratings-based approach. However, banks may circumvent paying the full capital charge by employing the “look-through” approach, in

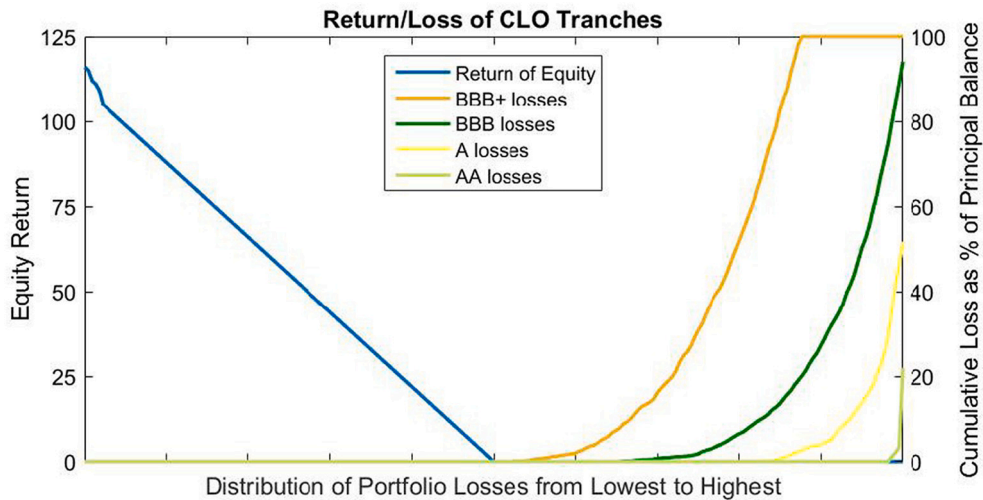


Fig. 13. Return/loss of CLO tranches.

Notes: The figure shows the return of the equity tranche and cumulative losses as a function of portfolio losses. The x-axis indicates the distribution of portfolio losses from lowest to highest. The left y-axis indicates the equity return in percent. The right y-axis indicates the cumulative loss as a percent of principal balance. The equity distribution is defined as follows: $\text{Equity Distribution} = \frac{\text{Interest payment} \times \frac{12}{\text{Payment frequency}}}{\text{Par value of equity}} \times 100$. Source: International Monetary Fund.

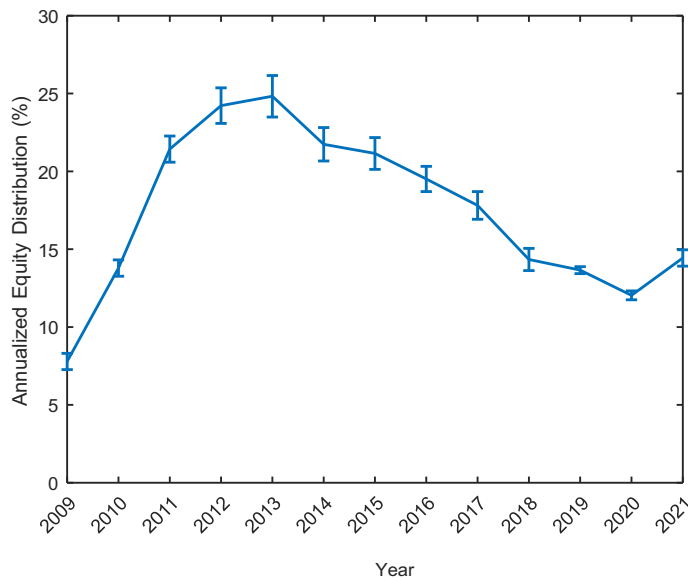


Fig. 14. Equity distribution (2009–2021).

Notes: The figure shows CLOs' annual distribution to equity. The annual mean equity distribution is plotted, along with the 95% confidence interval (errorbar). The equity distribution is defined as follows: $\text{Equity Distribution} = \frac{\text{Interest payment} \times \frac{12}{\text{Payment frequency}}}{\text{Par value of equity}} \times 100$. The x-axis indicates the year. The y-axis indicates the annualized equity distribution. Source: Creditflux's CLO-i database; and author's calculations.

which they may apply the weighted-average risk weight of the entire pool, and adjust the capital charge associated with each tranche by the “concentration ratio” which reflects how junior the tranche sits relative to the other tranches. With the internal ratings-based approach, banks may apply their own model to determine the appropriate risk-weight for an unrated position. Generally, the tranches with lower ratings experience high risk weights; unrated positions are subject to a capital charge on the full exposure.

However, the securitization frameworks of the Basel accords are not applicable in the US. Section 939A of the Dodd-Frank Act prevents a ratings-based approach to securitizations. Instead, securitizations are treated according to a “supervisory formula approach” (SFA). The treatment of securitizations under SFA is analogous to the treatment of unrated tranches under Basel II. However, because banks do not actually hold the underlying pool of CLOs, they do not have sufficient data to follow the exact SFA. For this reason, banks

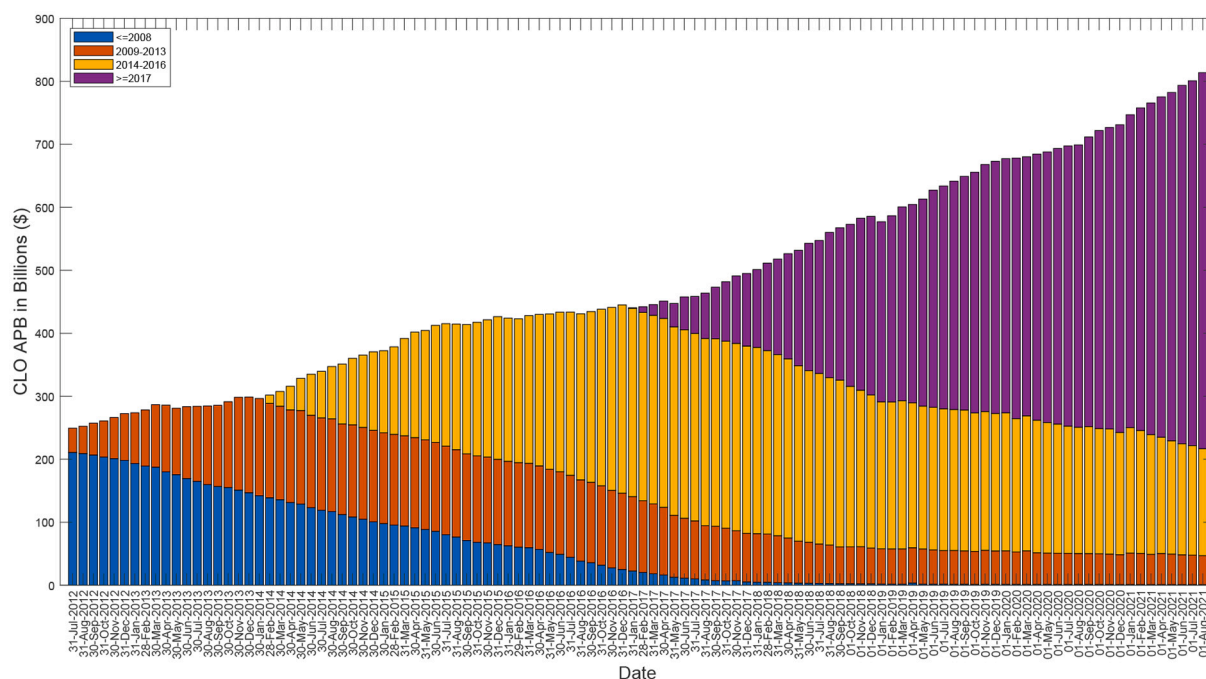


Fig. 15. AUM by CLO Vintage (2012–2021).

Notes: The figure shows the CLO AUM by vintage. The x-axis indicates the month-year. The y-axis indicates the CLO AUM. The shading indicates the vintage; blue indicates CLOs issued before or in 2008; red indicates CLOs issued between 2009 and 2013; yellow indicates CLOs issued between 2014 and 2016; purple indicates CLOs issued in 2017 or later. Source: [Han and Pereira \(2021\)](#). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

often opt for the “simplified supervisory approach” (SSFA) or “gross-up approach.” Under the SSFA, banks are tasked with gauging the total amount of expected credit losses of their exposures, using data on loan delinquency rates, as well as the tranche structure of the securitizations. Under the gross-up approach, banks are first tasked with “enhancing” their exposures, by adding their raw exposures to the product of the bank’s share of each tranche and the par value of all tranches senior to it, and then, applying the weighted-average risk weight of the underlying pool to the enhanced exposure. Regardless of the exact approach, the capital charges associated with both the SSFA and gross-up approaches are similar to that produced by the Basel II ratings-based approaches.

Hence, bank regulatory capital is sensitive to the capital structure of CLOs and can influence CLO assets and liabilities.

4.3. US risk-retention regulation

Theories of financial intermediation suggest that securitization can affect intermediaries’ due diligence. The securitization of loans allows banks to shift credit risk to the securitizers. The incentives to properly monitor and screen borrowers may be contingent upon the amount of risk retained by the manager who is tasked with the monitoring. In the absence of any risk-retention, informational asymmetries between end investors and earlier participants in the securitization chain may cause a “lemons” problem. The aim of risk-retention is to bring the incentives of securitizers closer to traditional portfolio lending, so that securitizers and originators appropriately evaluate borrowers and underwrite loans judiciously. If securitizers have “skin in the game” or retain a portion of their securitizations, they may internalize the costs and rewards of the risk they bear; informational asymmetries may be reduced as securitizer compensation is sensitive to risk.

In 2014, pursuant to section 15G of the Securities Exchange Act 1934, added by section 941 of the Dodd-Frank Act, six federal agencies stipulated that the securitizer of a CLO (manager) issued after December 24, 2016 must retain 5% of the economic risk. The intent of this act was to align the interests of the securitizers with end investors and prevent securitizers from packaging and selling risky loans to end investors who would bear the losses. There was wide latitude in how securitizers could satisfy this. Securitizers could satisfy the retention provision by holding vertical interest (interest in equal proportions of each class of notes), horizontal interest (within a tranche), or any combination that constituted at least 5% of the economic risk of the CLO. Securitizers could also transfer their retained interest upon approaching the “sunset” period, whereby either the balance of the pool was 33% of the closing balance, the notes amortized down to 33% of their original principal, or two years after the closing date ([Creditflux. \(2020\)](#)). To comply with the act, some managers opted for employing various risk-retention strategies like establishing capitalised majority-owned affiliate (C-MOA) companies, majority-owned affiliate (MOA) companies, or capitalised manager vehicles (CMV).

Legal caveats of the risk-retention rule exempted some CLOs from abiding by the new regulation. Before the rule went into effect, the SEC announced that certain CLOs which refinanced before the ruling date, were not subject to the risk-retention regulation, in

response to a no-action request by Crescent Capital.

The risk-retention rule was reversed in the US in February 2018. Traditional (broadly syndicated loans) CLO funds no longer have to retain 5% interest in their funds. However, middle-market CLOs are still subject to the 5% risk-retention rule.

4.4. Volcker rule

The Volcker Rule, adopted in December 2013, prevented US banks and non-US banks with US branches and affiliates from sponsoring or owning interests in a wide range of covered funds, including CLOs. This is because the controlling class in a CLO has the right to dismiss a manager, hence, has an ownership interest. However, caveats applied. Banks could be exempted from the Volcker rule if they held positions for market-making, or, held positions to satisfy risk-retention stipulations under Dodd-Frank. Moreover, “loan securitizations” were excluded, thus, banks could hold an ownership interest in a CLO if the CLO exclusively invested in loans. After the implementation of the Volcker Rule, the composition of CLOs evolved such that they became exclusively loan securitizations. Notably, bonds constituted almost 5% of a CLO's portfolio in the early 2010s and fell to almost 1% in, 2019 (see [Table 2](#)).

In 2020, the federal banking agencies, along with the SEC and CFTC published a *final rule* on the “covered funds” portion of the Volcker Rule, revising their interpretation of ownership interest. Specifically, the agencies clarified that a debt security is no longer considered an ownership interest, for its right to dismiss and institute a new manager. The final rule grants limited relief to CLO managers who own non-loan securities ([LSTA \(2020\)](#)). After the release of the Final Rule, the share of bonds in a CLO portfolio has grown (see [Table 2](#)).

5. Literature review

This section provides a survey of academic research on the CLO market. Past research on the CLO market has studied various aspects of the CLO market including: the implications of securitization for financial contracts, lender behavior, fire sale risk, trading and liquidity, and performance.

Several papers have used the CLO market as a laboratory to study the implications of securitization on financial contracts. [Shivdasani and Wang \(2011\)](#) investigate how the growth in structured credit affected corporate leverage by examining LBO transactions. The authors show that securitization fueled the LBO boom of 2004 to 2007. LBO loans underwritten by large CDO underwriters had lower spreads, looser covenants, and greater bank debt. Unlike the LBO boom of the 1980s and mortgage securitizations, loans financed through structured credit did not lead to worse LBO deals. [Ivashina and Sun \(2011\)](#) study whether demand for loans from institutional investors affected the mispricing of credit. The authors find that institutional demand pressure, defined as the number of days that a loan is in syndication, is negatively related to loan spreads. This effect is partially attributed to demand from CLOs. Relatedly, [Nadauld and Weisbach \(2012\)](#) investigate whether demand for securitizable loans lowers the cost of capital for firms. The authors find that loan facilities that are securitized experience lower spreads, relative to facilities that are not securitized. Facilities that are more likely to be securitized include Term Loan B facilities, facilities of B-rated firms, and facilities originated by banks that originate CLOs. Using the textual similarity of contractual definitions, [Bozanic et al. \(2018\)](#) show that syndicated loans securitized through CLOs have more standardized financial covenants relative to nonsecuritized institutional loans. CLOs that more frequently rebalance their portfolios purchase loans with standardized covenants, to reduce screening and monitoring costs. The authors show that loans with standardized covenants exhibit greater accordance in the credit ratings across agencies.

Another strand of the literature has examined the effect of CLOs on lender behavior. [Benmelech et al. \(2012\)](#) studies whether securitization leads to riskier lending in the corporate loan market. In contrast to adverse selection in mortgage securitization, the authors find that securitized loans were of similar quality as unsecuritized loans that were sold to institutional investors. They argue that originators' skin in the game, as well as the distribution of syndicated loans across investors, align incentives and reduce adverse selection. [Wang and Xia \(2014\)](#) find that loans originated by banks that are active in securitization have looser covenants than loans originated by banks that are less active in securitization. Firms that borrow from banks that are active in securitization take on more risk, after origination. Following covenant violations, the originating banks that are active in securitization are more likely to grant waivers without changing the loan terms, thereby, suggesting that securitization weakens banks' monitoring incentives. Consistent with this, [Bord and Santos \(2015\)](#) find that loans sold to CLOs at the time of origination underperform relative to matched unsecuritized loans originated by the same bank. This is attributed to differences in (1) banks' loan underwriting standards, and (2) skin in the game, between the two types of loans. The authors also find that non-CLO syndicate participants retain a lower stake in securitized loans, relative to non-securitized loans – interpreted as evidence that investors expect the securitized loans to perform worse. Further, [Peristiani and Santos \(2019\)](#) investigate the impact of the institutional affiliations of CLO managers on their trading activity. The authors find that bank-affiliated CLO managers are more averse to holding their own arranged distressed loans relative to holding distressed loans arranged by unaffiliated banks and trade such loans with different intensities.

Recent work has documented fire sale risk originating from CLOs. [Kundu \(2021a\)](#) and [Elkamhi and Nozawa \(2021\)](#) document fire sale risk in leveraged loans, originating from CLO constraints. When CLOs experience constraint, they fire sell distressed loans to loosen their constraints. This exerts price pressure in the leveraged loan market. [Elkamhi and Nozawa \(2021\)](#) show that CLOs' efforts to diversify their holdings can amplify fire sale risk. [Kundu \(2021a\)](#) investigates the motives of CLO fire sales and demonstrates that CLO managers avoid violating their constraints, because violations incur significant pecuniary and non-pecuniary costs, affecting CLO compensation, reputation and career prospects. [Kundu \(2021b\)](#) further documents how firm distress can propagate to other unrelated firms in CLO portfolios, through capital markets. When CLOs are subject to idiosyncratic shocks that push them closer to their constraints, they fire sell unrelated loans in the secondary loan market to alleviate their constraints. These fire sales generate price pressure

across security markets and can spill into real economic activity.

Recent work has also documented several facts about CLO trading and performance. [Liebscher and Mählmann \(2017\)](#) find that there is strong persistence in the heterogeneity in CLOs' equity tranche cash-on-cash return. [Loumrioti and Vasvari \(2019a\)](#) find that CLOs with restrictive tests, more actively manage their portfolios to avoid violating their constraints and reduce credit losses. [Fabozzi et al. \(2021\)](#) find that higher active turnover is associated with higher equity payments, lower portfolio default rates, and increased likelihood of closing a new deal. [Cordell et al. \(2021\)](#) exploit the risk-adjusted price differential between leveraged loan and CLO debt tranches, and show that CLO equity earns abnormal positive returns. They find that debt tranches have higher returns than similarly rated corporate bonds, but underperform CLO collateral on a risk-adjusted basis.

Lastly, there is recent work, analyzing liquidity in the CLO market during crisis and non-crisis periods. [Foley-Fisher et al. \(2020\)](#) study adverse selection dynamics, focusing on AAA tranches before and after the pandemic. The authors argue that CLO tranches became information-sensitive during the pandemic. During this period, the price of the securities plummeted because of adverse selection faced by uninformed investors, but the dispersion in prices increased because of informed investors. [Hendershott et al. \(2020\)](#) construct the true cost of immediacy for CLOs, which trade infrequently. The authors find that the effective bid-ask spread underestimates the true cost of immediacy because it does not capture the opportunity cost to investors of failed attempts to trade. They find that the true cost of immediacy in the CLO market is higher in lower rated CLOs and in stressful market conditions when the failure rate exceeds 50%.

6. Data sources

This section describes the major publicly available data sources that cover the CLO and leveraged loan markets.

The two main data sources for leveraged loan data are S&P Leveraged Commentary & Data (LCD) and Refinitiv's DealScan. S&P LCD provides data on the US and European leveraged loan, high yield bond, middle market, distressed debt and corporate markets. Data is available at the weekly, monthly, and quarterly levels, detailing the structure, price, yield, volume, and secondary market performance, along with LBO/private equity activity. Moreover, S&P LCD provides data on the S&P/LSTA index, which tracks the 100 largest loans in the S&P Global Leveraged Loan Index, as well as the European Leveraged Loan Index (ELLI). Refinitiv's DealScan offers extensive data on the global syndicated loan market, with the detailed terms and conditions for over 240,000 loan transactions. DealScan sources the data from regulatory filings, and directly from bank submissions and borrowers. DealScan data has been used extensively in finance research. The advantage of LCD is its granular focus on the leveraged segment of loans; DealScan provides information on both leveraged and non-leveraged loans at a coarser level.

The two main datasets used to analyze CLOs are CreditFlux's CLO-i Database, and Moody's Analytics Structured Finance database. CreditFlux's CLO-i Database provides information from over 35,000 trustee reports, prospectuses, covering over 1200 CLOs in the US and Europe. The CLO-i database reports CLO transactions, holdings, covenants, tranches, participants, and equity distributions. CreditFlux also provides auction data on bids wanted in competition (BWIC). The Moody's database draws from trustee reports and reports information on tranche, deal and loans, in addition to data on CLO performance, management and structure. Moody's Analytics CLO data covers \$872 billion in total CLO assets. [Benmelech et al. \(2012\)](#); [Liebscher and Mählmann \(2017\)](#); [Bozanic et al. \(2018\)](#); [Loumrioti and Vasvari \(2019a\)](#); [Loumrioti and Vasvari \(2019b\)](#); [Elkamhi and Nozawa \(2021\)](#); [Hendershott et al. \(2020\)](#); [Fabozzi et al. \(2021\)](#); [Kundu \(2021a\)](#); [Kundu \(2021b\)](#) make use of CreditFlux data. [Nadauld and Weisbach \(2012\)](#), [Bord and Santos \(2015\)](#), [Peristiani \(2019\)](#) and [Foley-Fisher et al. \(2020\)](#) make use of Moody's Data. There are several other platforms that offer CLO data, including Intex, IHS Markit and Refinitiv LPC Collateral. These platforms provide data on CLO structure, holdings, transactions, and CLO performance over time. [Cordell et al. \(2021\)](#) use Intex data in their analysis. Further, data on secondary market over-the-counter CLO trading is available since 2011 from the Trade Reporting and Compliance Engine (TRACE), created by the Financial Regulatory Authority (FINRA).

7. Emerging vulnerabilities and unanswered questions

This section discusses some emerging vulnerabilities in the leveraged loan and CLO markets. Understanding the potential sources of stress is crucial for developing deeper insights into how shocks propagate across the financial system, and potential mechanisms of amplification. Below, I enumerate some general risks and areas for future investigation in the leveraged loan and CLO markets.

1. **Interconnections and Systemic Risk:** As suppliers of credit in the corporate loan market have become more diffuse in the spirit of greater risk-sharing, a large number of connections have formed between banks and non-bank financial institutions, potentially creating more opaque and convoluted avenues for the transmission of shocks. Direct and indirect institutional exposures to corporations may have broad implications for the functioning of financial markets and systemic risk. [Fig. 16](#) shows the financial plumbing of leveraged finance. Banks serve as arrangers in both the syndicated loan market and CLO market. This exposes them to pipeline risk and CLO warehousing risks. In the syndicated loan market, the underlying risks are shared across the syndicate which consists of banks that structure, arrange, and underwrite the deal, as well as non-bank institutional investors, including mutual funds, hedge funds, and insurance companies. Through syndication, banks typically retain pro rata debt on their balance sheet, while selling the institutional term loans to other banks and non-bank financial institutions. Banks may also directly extend credit to risky corporations in the form of term loans and revolving credit facilities, without syndication. Outside of a syndicate, non-bank institutions generally cannot extend revolving credit facilities, but may provide additional funding to risky corporations directly. Future work may examine the financial linkages between banks and non-banks, and study potential mechanisms of amplification.

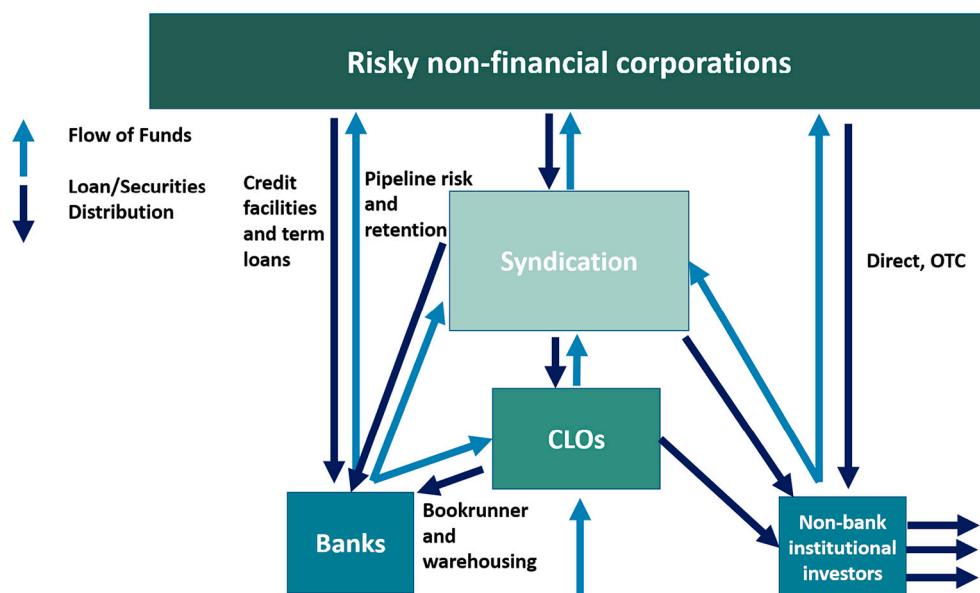


Fig. 16. Financial plumbing of leveraged finance.

Notes: The figure presents the flow of funds and securities/loans in the corporate credit market. The dark blue arrows indicate the distribution of loans and securities, while the light blue arrows indicate the flow of funds. Source: [Financial Stability Board \(2019\)](#).

2. **Increase in Cov-lite Loans:** The incidences of cov-lite loans have increased since the financial crisis of 2008. As bank participation has declined in the leveraged loan market, the incentives to monitor borrowers may have fallen. Non-bank financial institutions may benefit from cov-lite loans, allowing firms to take on more leverage, while “shifting [the] risk to creditors,” primarily banks ([Financial Stability Board \(2019\)](#)). While the risk of breaching a covenant may be lower with cov-lite loans, the loss-given-default may be higher. Coupled with an increase in coordination costs across investors, a greater share of cov-lite loans may weaken creditor protections, eliminate the option of early intervention, and reduce the recovery of defaulted assets, ex-post. It is unclear whether investors are compensated for these risks. Future work may investigate mispricing of cov-lite loans in the leveraged loan and CLO markets. Future work may also estimate the value added of cov-lite loans.
3. **Leverage on Leverage:** As a greater share of M&A and LBO deals adjust EBITDA for synergy addbacks and operational improvements, the adjusted EBITDA figures may be overstated, while the adjusted debt/EBITDA figures may be understated. The adjustments range from 15 to 30% ([Financial Stability Board \(2019\)](#)). This suggests that firms may be more levered than they report. The combination of greater firm leverage and weaker covenants may increase the risks of downgrade and default. Moreover, in addition to borrower leverage, the level of embedded and financial leverage may further amplify shocks. Future work may investigate the relation between intermediary incentives in loan origination, the cyclicity of credit supply, and corporate leverage.
4. **Liquidity and Refinancing Risk:** During adverse economic periods, revolver draw-downs can reduce bank liquidity buffers. Additionally, banks may also have higher pipeline risk during these periods if investor demand dries up and banks are unable to offload their leveraged loan exposures. This can further deplete banks' liquidity. In addition, if CLOs are delinquent on repayment for warehouse facilities, warehousing risk may also materialize as liquidity risk. A loss in bank liquidity may impair banks' ability to extend financing to borrowers and to CLOs, crowding out lending activity. Future work may investigate how liquidity risk arising from leveraged finance may impact refinancing activity.
5. **Greater Concentration:** CLOs hold up to three-quarters of all new institutional loans, implying that they have significant exposure to the same set of borrowers or industries. 90% of CLOs are exposed to the top 50 US borrowers, and 80% are exposed to the top five borrowers ([Financial Stability Board \(2019\)](#)). A spate of serial defaults can be potentially deleterious. Moreover, while CLOs have largely overlapping portfolios, CLO portfolios also overlap with bank and other non-bank portfolios. Hence, contagion may be potentially pervasive across the financial system. The findings of [Kundu \(2021a\)](#) and [Kundu \(2021b\)](#) suggest that default-induced fire sales can exert price pressure across security markets and exacerbate credit crunches. Future work may investigate concentration risk in the CLO market.
6. **Redemption Risk:** Large-scale redemptions and withdrawals of capital across various funds can produce price dislocations and impair market liquidity in the CLO and leveraged loan markets. Future work may estimate the degree of downward pressure on leveraged loan and CLO prices, under different scenarios.
7. **Effects of Regulation:** Regulatory changes have affected the leveraged loan and CLO markets in substantial ways. Future work may analyze the effects of these changes on intermediary incentives, the quality of the underlying assets, and asset prices.

8. Conclusion

Collateralized Loan Obligations (CLOs) are increasingly important providers of credit to risky corporate borrowers. Despite this, there has been little academic research on the CLO market. Understanding how CLOs function is critical for developing deeper insights into how non-bank financial intermediaries operate.

This paper provides a comprehensive overview of the design and structure of the CLO market, describing the general macroeconomic milieu that has facilitated the rapid growth of the market and the mechanics therein. Further, the paper highlights the role of covenants in influencing CLO managerial incentives and trading behavior, and, chronicles recent regulatory changes and developments that have affected the market structure. A survey of the existing literature on CLOs is provided, along with a description of pertinent data sets. Lastly, emerging vulnerabilities and potential areas of future research are discussed.

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