Portfolio Performance Manipulation in Collateralized Loan Obligations*

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ABSTRACT

We examine the discretionary activities that CLO managers engage in to pass monthly overcollateralization (OC) tests. These tests require a CLO's loan portfolio value, scaled by the CLO notes' principal balance, to be above a certain threshold. Using CLOs' granular disclosures, we develop model-free estimates for discretionary loan fair valuation and transaction-based proxies for strategic loan trading. We find a positive association between these discretionary activities and the probability of avoiding an OC test violation. This association varies predictably with junior noteholders' influence and CLO market conditions. Strategic trading—but not discretionary fair valuation—relates to worse future CLO performance.

Keywords: Collateralized loan obligation, CLO, securitization, managerial discretion, loan fair valuation, strategic loan trading.

JEL Classification: M41, G23

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1. Introduction

Over the past 15 years, the massive growth of the U.S. private debt market has been fueled by Collateralized Loan Obligations (CLOs) that facilitate the securitization of corporate loans. CLOs are bankruptcy-remote special-purpose vehicles that purchase tranches of corporate loans and use their payments as collateral to issue new securities. CLOs hold about 70% of high-yield corporate loans outstanding, with the annual issuance of CLO securities exceeding $100 billion (Standard and Poor's, 2015). Despite CLOs' importance in the credit market, there is surprisingly no research on their reporting of performance measures and on how their investment activities affect reporting outcomes.

In this paper, we explore how the managers of CLOs engage in discretionary activities to circumvent reported capital adequacy tests, commonly referred to as overcollateralization tests (OC tests).[1] The OC tests reflect a CLO's solvency by requiring that the ratio of its loan portfolio value to the CLO notes' principal balance exceed a certain threshold. The CLO's portfolio value is measured as the sum of five components: (a) the principal balance of performing loans; (b) the cash generated by loan trading and held by the CLO; (c) the fair value or the recovery value of defaulted loans, whichever is lower; (d) the fair value of excess CCC-rated loans; and (e) the purchase price of deep-discount loans.[2] CLOs issue both junior notes, which are first to be affected by a decrease in the portfolio value, and senior notes, which incur losses only after the junior notes are wiped out. An OC test violation can have severe consequences for both CLO noteholders and

[1] CLO managers are large asset management firms that administer CLO portfolios to mitigate credit risks and increase portfolio returns.

[2] Excess CCC-rated loans are loans that are in excess of the maximum amount of loans rated CCC or below that a CLO is allowed to hold. Deep-discount loans are loans purchased at 80%–85% of par value or below. These definitions are highly standardized and explicitly described in CLO prospectuses. Section 2 discusses in detail CLO reporting and the overcollateralization tests.

managers. For instance, managers' fees decrease significantly, payments to junior noteholders are suspended, or the CLO notes may be downgraded by rating agencies.

A study of CLO managers' discretionary activities offers several empirical advantages. CLOs are required to report monthly loan-level information on their portfolio structure and performance, trading activity, and fair value estimates for defaulted and CCC-rated loans. We can thus observe fair value estimates for the same loan in the same month across different CLOs. Using these granular disclosures, we develop model-free estimates for discretionary loan fair valuation and transaction-based proxies for strategic trading that CLO managers use to meet the OC tests. These estimates allow us to distinguish managerial discretion exercised by either inflating loan fair values or trading strategically. Moreover, since all CLOs are required to meet the same set of tests monthly and thus have common reporting objectives, we can evaluate a CLO manager's pressure to engage in discretionary activities by directly measuring OC test slack relative to other CLOs.

We predict a positive association between CLO managers' choice to inflate loan fair values and to trade strategically and the probability of avoiding an OC test violation, given the significant costs related to missing an OC test. We capture inflation in loan fair values if the CLO reports greater fair values for defaulted or excess CCC-rated loans than the average fair values reported by other CLOs for the same loans in the same month. We focus on two strategic trading activities that can help managers achieve greater portfolio gains and pass an OC test. First, we measure portfolio risk shifting that is reflected in selling loans priced above-par and retaining underperforming loans, for which market price has significantly decreased below par value. Cash gains from selling above-par priced loans improve OC test scores, while retained underperforming loans are still accounted at par in OC test computations. Second, we capture the sale of loans to

affiliated CLOs (i.e., CLOs administered by the same manager) which can allow managers to realize greater cash inflows from trading and thereby increase test scores.

We further expect that the use of the two discretionary activities will vary based on the relative costs and constraints faced by CLOs. First, strategic trading can have an adverse impact on future CLO performance. This impact can be especially significant for junior noteholders, who are the first to suffer from portfolio losses and may thus redeem their notes, forcing the liquidation of the CLO. In contrast, inflating loan fair values likely provides a relatively less costly way of managing portfolio performance to circumvent binding OC tests. We thus predict that the positive association between discretionary loan fair valuation (strategic trading) and the probability of avoiding an OC test violation will be stronger (weaker) when junior noteholders have a greater influence.

Second, we expect that the market conditions under which a CLO operates will affect the use of discretionary activities. Managers of CLOs with weak portfolio performance relative to that of their peers may face more pressure to use discretionary activities that improve reported performance to pass monthly OC tests. We thus expect that the positive association between discretionary activities and the probability of just meeting an OC test will be stronger when CLOs have weak relative portfolio performance. Moreover, when loan market liquidity is high, CLO managers may be able to cash in greater market gains by strategically rebalancing their portfolios. Also, greater loan market liquidity may limit managers' ability to inflate loan fair values, given the greater availability of loan market price benchmarks. These arguments suggest that the positive association between discretionary loan fair valuation (strategic trading) and the probability of avoiding an OC test violation will be weaker (stronger) when loan market liquidity is high.

We test our predictions using a sample of 6,012 CLO-month observations for 415 CLOs over the 2008–2013 period. We obtain data on CLO portfolio holdings, loan trades, and OC test scores

from CLO-i, a new database provided by Creditflux. We also retrieve 3,726 monthly CLO reports from CLO-i and collect the loan fair values used in calculating the OC test scores.

Consistent with our prediction, we document a positive association between a CLO manager's discretionary activities and the probability of just meeting an OC test. In univariate analyses, we show that about 88% of the CLOs that just meet a monthly OC test would have violated it that month if their managers had not inflated the loan fair values and traded strategically. In comparison, the probability of an OC test violation—absent managerial discretion—by CLOs that are performing well ranges from 5% to 26%. These initial findings support our inference that discretionary activities are more important for CLOs that just meet an OC test and have greater pressure to improve reported OC test scores compared to CLOs without such motives.

Our multivariate tests yield similar results. We find that discretionary loan fair valuation, portfolio risk shifting, and loan sales to affiliates are positively related to the probability of just meeting an OC test, controlling for CLO portfolio performance as well as time, CLO manager and trustee fixed effects. Economically, an interquartile increase in discretionary loan fair valuation, portfolio risk shifting, and loan sales to affiliates increases the probability of a CLO just meeting an OC test by about 5.2%, 11.8%, and 5.9%, respectively.

We conduct additional tests that support our arguments on the relation between discretionary activities and the avoidance of OC test violations. First, we show that discretionary loan fair valuation is particularly prominent for non-traded loans, consistent with the fact that fair values are more likely to be subject to managerial manipulation when they cannot be easily verified (Kothari et al., 2010). Second, we find that CLOs with binding OC tests realize greater cash gains from selling loans to an affiliate compared to those without binding tests. Third, we document that increases in discretionary activities over the previous month are positively associated with the

probability of just meeting an OC test score, suggesting that managers are more likely to engage in discretionary activities when an OC test violation is imminent. Relatedly, we show that the managers of CLOs that just meet an OC test are more likely to increase the sales of above-par priced loans and loans to affiliated CLOs just before the reporting date. In sum, these results suggest a robust association between a CLO manager's discretionary activities and the probability of avoiding an OC test violation.

Consistent with our expectations, we find that the relation between discretionary loan fair valuation (strategic trading) and the probability of just meeting an OC test is stronger (weaker) when junior noteholders provide more capital or have the option to redeem their notes, suggesting that CLO managers choose less costly discretionary activities when junior noteholders have greater influence. Moreover, we show that the association between discretionary activities and OC test violation avoidance is stronger for CLOs with weaker portfolio performance relative to that of other CLOs (that is, for CLO managers under greater pressure to meet an OC test). Although we do not find that CLO managers are less likely to inflate loan fair values to pass an OC test when market liquidity is high, we show that under these conditions the relation between portfolio risk shifting (loan sales to affiliates) and the probability of just meeting an OC test becomes stronger (weaker), potentially because an active loan market allows CLO managers to generate greater gains from trading loans. Overall, these findings suggest that managerial discretionary activities vary predictably with their relative costs and constraints as reflected by the CLO's capital structure and market conditions.

Finally, we test whether discretionary activities are related to future CLO portfolio performance. Focusing on the sample of CLOs that just meet an OC test, we find that portfolio risk shifting is associated with lower OC test scores and a higher probability of a CLO note credit

rating downgrade six months ahead. Our results are similar when we also include a control sample of CLOs that just miss an OC test. We show that CLO note prices decrease with strategic trading when OC tests are binding, suggesting that noteholders can unravel managerial discretion to some extent. Moreover, we find that discretionary loan fair valuation does not affect future CLO performance or note prices, consistent with this activity providing a relatively less costly way to meet an OC test.

Our paper adds to the growing literature on agency costs in corporate loan securitizations. Prior research evaluating the presence of these costs—by examining the quality of securitized loans, as measured by their ex-post performance (e.g., loan defaults or rating downgrades)—has provided mixed evidence. Specifically, Shivdasani and Wang (2011) and Benmelech et al. (2012) find that securitized loans are not of worse quality than other institutional loans, while Bord and Santos (2015) and Kara et al. (2015) show that securitized loans exhibit worse long-term performance. We extend this literature by exploring how ongoing monthly reporting objectives can give rise to agency costs in the context of loan securitizations. We show that CLO managers facing monthly reporting pressures associated with OC tests are more likely to overstate loan fair values, trade with affiliated CLOs, and shift their portfolios to low-performing loans by selling high-quality ones. Thus, CLOs' reporting objectives seem instrumental to the quality of loans CLO managers choose to hold or sell, with such strategic choices having adverse consequences for the future CLO portfolio performance.

Our paper is also relevant to accounting studies that investigate financial institutions' use of gains trading and inflated loan fair values to manipulate reported performance. Dechow and Shakespeare (2009) show that banks are more likely to record gains from securitizing and selling loans at quarter-end to beat earnings thresholds, while Dechow et al. (2010) find that bank

managers exercise discretion in fair valuing the retained interest of securitized loans to enhance reported gains from loan trading. In a more recent paper, Hanley et al. (2018) investigate insurance companies' strategic use of fair value estimates for individual securities, documenting that insurers inflate these estimates when capital adequacy is a concern. We offer several new contributions to this literature. First, the granularity of the CLO data allows us to develop transaction-based proxies for gains trading and to document the effect of strategic trading choices on future CLO portfolio performance. Second, we distinguish whether the discretion exercised by CLO managers to meet reporting benchmarks relates to manipulating loan fair value estimates or trading strategically. We are thus able to overcome the data limitations of prior studies in which only one discretion source is observed or these activities cannot be easily disentangled (Barth and Taylor, 2010). We also provide important evidence on the interplay of discretionary activities, given their relative costs and constraints, by documenting that CLO managers' discretion is influenced by junior noteholders and market conditions, two aspects not widely explored by prior research (e.g., Beatty et al., 1995; Beatty and Liao, 2014).[3]

2. CLO structure, performance reporting, and predictions

CLOs are bankruptcy-remote special-purpose vehicles set up and managed by an asset management firm (CLO manager) to facilitate the securitization of corporate loans. The CLO manager engages with a bank (CLO arranger) that provides short-term ("bridge") financing to the CLO and helps structure the loan portfolio. A typical CLO buys tranches of primarily high-yield corporate loans (CLO assets or securitized loans) and uses their payments as collateral to issue

[3] The interplay between the manipulation of accounting estimates and real transactions (i.e., accruals and real activities management) has also been studied in the corporate setting (e.g., Barton, 2001; Cohen et al., 2008; Cohen and Zarowin, 2010; Badertscher, 2011; Zang, 2012).

new securities (CLO notes and equity) that are sold to banks and other institutional investors.[4] The median total principal value of the securities issued by a CLO is about $400 million. Figure 1 presents the CLO issuance process.

The average CLO portfolio consists of 200–250 loan tranches issued by borrowers in 20–25 industries.[5] The average tranche size is $2.5 million, with a portfolio allocation to an individual borrower of only 2%. Given the portfolio's large size and wide diversification, 70%–75% of the CLO notes are classified as senior and receive investment grade ratings (at least two credit rating agencies rate both the loans in the CLO's portfolio and the notes). Junior notes (CLO equity) provide 15%–20% (5%–10%) of a CLO's capital structure. CLO managers actively manage the loan portfolio and can rebalance up to 20% of the loans therein without explaining their investment strategy to CLO noteholders. On average, a CLO trades loans about 15 times per month and the average loan face amount traded is $1.3 million. CLO managers thus have considerable discretion in selecting the portfolio structure after the CLO origination and over its life (10–12 years).[6]

2.1. CLO reporting and the overcollateralization tests

CLOs are required to disclose monthly detailed loan-level information on the portfolio's structure and performance. CLO performance is assessed based on several compliance tests, which are specified in the CLO prospectus and capture the portfolio's characteristics and riskiness. The thresholds of these tests are also stated in the prospectus and typically do not change over the life of the CLO.[7] Among these tests, the overcollateralization tests (OC tests) are considered the most

[4] We focus on "cash flow" CLOs, which make up the vast majority of CLOs issued over the past 15 years. "Market value" CLOs, in which portfolio loans are fair valued, are much less common. Based on Moody's Structured Credit Market report (2016), there were only two market-value CLOs outstanding by the end of 2016.

[5] The CLO-specific statistics in this section are based on the population of CLOs covered by Creditflux CLO-i over the 2008−2013 period.

[6] The average CLO manager manages about 13 CLOs. While there are 108 managers in the CLO market, the largest six manage CLOs with a principal value of roughly $100 billion.

[7] The CLO noteholders' trustee (a large investment bank) is responsible for calculating the monthly compliance test scores as well as preparing and distributing the CLO reports. The CLO manager usually works with the trustee to

important, as they assess the CLO's solvency and capital adequacy.[8] CLOs are required to meet two OC tests every month: the senior and the junior OC test. They are calculated as follows:

$$Senior\ OC = \frac{[Principal\ balance\ of\ performing\ loans + Cash + Recovery\ value\ of\ defaulted\ loans + Fair\ value\ of\ excess\ CCC\ rated\ loans + Purchase\ price\ of\ deep\ discount\ loans]}{Principal\ balance\ of\ senior\ notes}$$

$$Junior\ OC = \frac{[Principal\ balance\ of\ performing\ loans + Cash + Recovery\ value\ of\ defaulted\ loans + Fair\ value\ of\ excess\ CCC\ rated\ loans + Purchase\ price\ of\ deep\ discount\ loans]}{[Principal\ balance\ of\ senior\ notes + Principal\ balance\ of\ junior\ notes]}$$

Principal balance of performing loans is the sum of the principal balance of all performing loans in the portfolio. These loans usually make up most of a CLO's assets (that is, more than 90% of the portfolio loans). *Cash* is cash generated from trading activities and loan payments that is expected to be reinvested in new loans or disbursed to noteholders. *Recovery value of defaulted loans* is the aggregate expected recovery of loans in default. Defaulted loans are those that do not pay principal and/or interest, are D-rated, or their borrowers filed for bankruptcy. The recovery values for these loans are computed as the lower of their fair values or the recovery values provided by credit rating agencies such as Standard and Poor's and Moody's. *Fair value of excess CCC-rated loans* is the aggregate fair value of CCC-rated loans above the maximum CCC-rated loan balance that a CLO is allowed to hold. Defaulted and excess CCC-rated loans account on average for about 3% and 4% of a CLO loan portfolio, respectively. For traded loans, fair values are based on loan market prices retrieved from data providers such as Intex, Loan Pricing Corporation, and Markit. For non-traded loans, CLO managers seek bids from usually three independent broker-dealers to determine the loans' fair values. If such bids cannot be obtained, CLO managers set the

prepare the reports. In addition, the structured finance team of a Big 4 public accounting firm verifies the accuracy of these calculations by checking portfolio loan holdings and the CLO's cash flows.

[8] CLOs must also comply with tests such as the minimum loan portfolio diversification (across industries, borrowers, and geographies), the minimum portfolio credit rating, and the maximum amount of low-rated loans.

loan fair values themselves.[9] *Purchase price of deep-discount loans* is the aggregate purchase price of portfolio loans purchased at 80%–85% of par value or below.[10] *Principal balance of senior (junior) notes* is the total principal balance of senior (junior) notes issued by the CLO. These definitions are standardized across CLOs and explicitly described in CLO prospectuses.

An OC test violation has significant adverse consequences. First, managers cannot use loan principal and interest payments to buy new portfolio loans. Second, CLO junior noteholders cannot receive payments, as cash flows are diverted to senior noteholders, and are thus likely to redeem their notes early. Relatedly, CLO notes may be downgraded by credit rating agencies (Gapstow Capital Partners, 2014). Third, CLO managers cannot receive their performance-linked compensation, which is, on average, about 40 basis points of a CLO portfolio's par value. Given these costs, managers likely try to avoid an OC test violation. Consistent with this idea, CLOs report an OC test violation in only about 12% of their monthly reports (see Figure 2). In addition, reported OC scores are close to the OC test triggers, mainly due to the low junior OC test slack. Indeed, while senior noteholders seem to be well-protected by a high senior OC slack of about 20% above the senior OC test threshold (except during the credit crisis), the reported junior OC slack is narrower, at around 4% above the junior OC test trigger (see Figure 3).

To better understand how CLO managers engage in discretionary activities to manage OC test scores, we provide three examples in which a CLO experiences (a) an improvement in portfolio quality, (b) a deterioration in portfolio quality that leads to a violation of the OC tests, and (c) a deterioration in portfolio quality with the manager using her discretion to avoid a violation. In all three examples, we assume that the CLO buys 100 loans at par (that is, purchase price = 100%),

[9] CLOs do not report the names of the broker-dealers that provide the loan fair values or whether these values were set by the manager.

[10] CLOs usually avoid purchasing deep-discount loans, since they permanently erode OC test scores. Looking at a sample of 80 CLO reports, we find only four which report deep-discount loans.

each with a principal value of $1 million. The CLO issues $68.6 million in senior notes and $19.6 million in junior notes (with $11.8 million being issued as equity). The senior (junior) OC threshold is set at 136% (107%) and the maximum amount of CCC-rated loans the CLO is allowed to hold is $5 million. The CLO's notes and loans are repaid at maturity (10 years).

In the first example, detailed in Appendix A.1, the performance of 10 loans improves significantly, trading at 120% of par. The CLO manager decides to sell them, receiving $12 million. The manager uses $10 million of these proceeds to buy 10 new loans at par and retains the remainder in cash for future investments. In this example, the CLO portfolio value is $102 million—the sum of the loans' principal balance ($100 million) and the cash holdings ($2 million). Thus, the senior OC score is 149% [=102/68.6], and the junior OC score is 116% [=102/(68.6 + 19.6)]; that is, the CLO passes both tests.

In the second example, detailed in Appendix A.2, we assume that the performance of 10 loans improves (trading at 120% of par) but the performance of several other loans deteriorates; namely, (a) 8 loans with $8 million in total principal value go into default, (b) the credit rating of 10 loans is downgraded to CCC, (c) the market price of 10 loans drops to 85% of par but their credit ratings are not downgraded, and (d) the CLO manager does not rebalance the portfolio. We describe in detail how fair values are computed in Sections A.2.a and A.2.b of Appendix A.2. The total value of the defaulted loans is $3 million. The fair value of excess CCC-rated loans is assessed by ranking the market values of all CCC-rated loans and taking the values of the *lowest* priced loans over and above the maximum threshold; that is, $2.05 million. The principal balance of the performing loans is $87 million ($100 million – $8 million in default – $5 million in excess CCC [=$10 million – $5 million maximum CCC-rated loan threshold]), with a total CLO portfolio value of $92.05 million. The senior OC score is 134% [=92.05/68.6] and the junior OC score 104% [=92.05/(68.6

+ 19.6)]; both tests are violated.

In the third example, detailed in Appendix A.3, we make the same performance assumptions as in Appendix A.2 and further assume that the CLO manager (a) inflates the fair values of excess CCC-rated and defaulted loans (for example, by strategically choosing broker-dealers with higher bids or by overstating fair value estimates for loans without bids) and (b) trades strategically by keeping the underperforming loans to avoid realizing losses and by selling the 10 loans that trade at 120% of par to cash in the gains (the manager can also sell loans to other CLOs under her management to get better sale prices and cash in more gains). Therefore, the manager observes that the CLO is going to report OC scores below the thresholds and tries to avoid the test violation. Given these actions, the fair value of excess CCC-rated loans increases to $2.85 million and the recovery value of the defaulted loans to $3.45 million (see Sections A.3.a and A.3.b of Appendix A.3 for more details). The cash inflow from selling the well-performing loans is $12 million and the principal balance of performing loans in the CLO portfolio is $77 million ($100 million – $8 million in default – $5 million in excess CCC – $10 million of loans sold). The CLO portfolio value is $95.30 million, the senior OC score is 139% [=95.30/68.6], and the junior OC score is 108% [=95.30/(68.6 + 19.6)]. Thus, in this scenario, the manager's discretion in valuing and trading loans allows the CLO to just pass both tests.

2.2. Predictions

Given the significant costs of an OC test violation and our discussion above, we predict a positive association between CLO managers' activities to inflate loan fair values and to trade strategically and the probability of just meeting an OC test. Although CLO managers can employ both types of discretionary activities in the presence of binding OC tests, we expect that their use will vary based on the relative costs and constraints that CLOs face. That is, as CLOs encounter

different costs and constraints for the two discretionary activities, their managers' ability to apply them will differ. First, discretionary loan fair valuation can offer managers a relatively low cost way to pass monthly OC tests compared to strategic trading, which alters portfolio's cash flows and composition, potentially reducing future CLO portfolio performance. Such costs can be particularly important for junior noteholders. While senior noteholders' returns are well-protected against portfolio losses, given the cushion the junior notes and the CLO's equity provide, junior noteholders' returns are more likely to be negatively affected by a decrease in portfolio quality. As a result, junior noteholders may redeem their notes, forcing the early liquidation of the CLO. We thus expect that the association between inflated loan fair values (strategic trading) and the probability of avoiding an OC test violation is stronger (weaker) when junior noteholders' influence is greater.

Second, the market conditions under which a CLO operates are likely to influence the use of discretionary activities. Specifically, we expect that managers of CLOs with weak portfolio performance relative to that of their peers are more likely to employ discretionary activities to pass monthly OC tests. When the costs of violating an OC test in a given month are potentially greater, managers are under greater pressure to improve reported performance and more likely to both inflate loan fair values and trade strategically to avoid a further shortfall between their performance and that of their peer CLOs. Moreover, when loan market liquidity is high and trades are not adversely affected by high transaction costs, CLO managers are able to cash in greater market gains by strategically rebalancing their portfolios to meet an OC test. That is, even though strategic trading potentially imposes greater long-term costs on CLOs, managers may consider that monthly cash gains can outweigh potential future costs. At the same time, higher loan market liquidity may limit managers' ability to inflate loan fair values, given the greater availability of loan market price

benchmarks. We thus expect that the positive association between discretionary loan fair valuation (strategic trading) and the probability of avoiding an OC test violation will be weaker (stronger) when loan market liquidity is higher.

3. Sample selection

We obtain loan-level data on CLOs' portfolio structure, performance, and trades from the Creditflux CLO-i database, which retrieves information from CLOs' monthly reports starting from January 2008. The portfolio data includes loan-level information on loan type, maturity, face amount held, Moody's and Standard and Poor's credit ratings, default status and default date, and the borrower's name and industry. The performance data includes the percentage of CCC-rated and defaulted loans and the senior and junior OC test slack and triggers.

Our primary sample covers the loan-level portfolio data of 493 CLOs and 9,045 CLO reports over the 2008–2013 period.[11] We exclude CLOs that do not report defaulted or excess CCC-rated loans (2,591 monthly reports and 59 unique CLOs), as OC scores are not eroded in the absence of such loans and thus the tests are mechanically passed. We also exclude 442 monthly reports of 19 unique CLOs with managers that administer only one CLO, since these CLOs are recently issued and their coverage in CLO-i is limited. This exclusion is also necessary given the measurement of strategic trading based on loan sales to affiliated CLOs (i.e., CLOs administered by the same manager). Our final sample includes 6,012 monthly reports of 415 unique CLOs. We note that our sample includes CLOs that pass and those that violate the OC tests. Since CLO-i does not cover the OC test calculations, we hand-collect data on fair value estimates for the defaulted and excess

[11] The primary sample includes 4,912 unique loan tranches and 1,788,280 observations at the CLO-loan tranche-month level. Because CLO-i does not code unique portfolio loans, we identify them based on the borrower name, Moody's industry classification, country, loan type (e.g., term loan B), and maturity. This identification has been used in prior studies (Benmelech et al., 2012).

CCC-rated loans in 3,726 monthly reports by 145 unique CLOs that Creditflux posts on its website.[12] We summarize the sample selection process in Table 1.

We examine CLOs' trading behavior by obtaining information on which specific loans a CLO trades, trade dates, prices, and face amount traded. There are 248,612 unique trades by 493 CLOs over the 2008–2013 period (all CLOs in our sample are actively managed). Since the loan trade dates and CLO reporting dates differ, we match the loan trade dates to the first CLO reporting month end-date after the loan trade date to estimate a CLO's monthly portfolio rebalancing.

4. Variable definitions

4.1. Proxies for CLO performance

We test whether CLO managers' discretionary activities are related to the probability of avoiding an OC test violation using an indicator variable that equals one if the CLO just meets an OC test and zero otherwise (*OC test violation avoidance*). As discussed in Section 2, the senior OC test slack is, on average, five times greater than that of the junior OC test slack. Thus, defining "just meeting" an OC test using an absolute percentage (e.g., 3% slack) will bias the measure towards the junior OC test (e.g., a 3% senior OC test slack is reported in only 214 CLO reports, while a 3% junior OC test slack is reported in 2,725 reports). To account for these differences, we rank the reported senior and junior OC test slack across all CLOs that passed the tests. We classify a CLO as just meeting an OC test if its senior or junior OC slack are in the bottom quartile of their distribution.[13] In Panel A of Table 2, we report the summary statistics of the variables we use in the empirical analyses. The mean probability of a CLO just meeting an OC test is 28%. There are twice as many CLOs reporting a low OC slack (1,714 CLO reports) as those that just miss an OC

[12] CLO-i does not make available all the CLO reports used to retrieve data, which explains the drop in sample size.
[13] Our results are robust to defining *OC test violation avoidance* as an indicator variable that equals one if a CLO's senior or junior OC slack is positive but below 1% or 3% and zero otherwise (Panel B of Table 9).

threshold (806 CLO reports), consistent with CLOs' avoiding missing OC test thresholds and managers' earnings management behavior (e.g., Burgstahler and Dichev, 1997).

We further control for measures of CLO portfolio quality examined by prior studies (e.g., Shivdasani and Wang, 2011; Benmelech et al., 2012; Bord and Santos, 2015) that likely affect the probability of a CLO just meeting an OC test: the percentage of defaulted (*Defaulted loan bucket*) and CCC-rated (*CCC-rated loan bucket*) loans in a CLO portfolio; the average rating of portfolio loans (*Average portfolio rating*), where a loan's rating is defined as a scale variable that takes the value of 1 for AAA (or Aaa), 2 for AA+ (or Aa1), and so forth; the natural logarithm of the senior (*Senior OC*) and junior (*Junior OC*) OC test score in percentage points; and the natural logarithm of the CLO loan portfolio principal balance (*Portfolio size*). Detailed variable definitions are reported in Appendix B. The mean CLO portfolio size is 19.51 or about $360 million. The mean senior OC test score is 4.81 or 129% and the mean junior OC test score is 4.63 or 104%. The mean percentage of defaulted (CCC-rated) CLO loans is 4.05% (7.57%) and the mean loan credit rating in a CLO portfolio is about 15 or B.

In Panel B of Table 2, we report the Spearman correlations among the variables we use in the empirical analyses. The probability of a CLO just meeting an OC test is positively correlated to the percentage of defaulted and CCC-rated loans in a CLO portfolio (3% and 15%, respectively) and to portfolio size (12%) and negatively correlated to the senior and junior OC tests' performance (-53% and -62%, respectively) and to the average portfolio loan rating (-3%).[14]

4.2. Proxies for CLO manager's discretion

We measure discretionary loan fair valuation using the difference between the fair value that a CLO reports for a defaulted or excess CCC-rated loan and the average fair value of this specific

[14] The summary statistics of our variables are economically similar using the sample of 6,012 CLO-month observations (untabulated).

loan reported by other CLOs in the same month, averaged at the CLO-month level (*Discretionary loan fair values*).[15] We use two proxies for strategic trading that allows CLO managers to make greater gains and meet the OC tests. *Portfolio risk shifting* is the ratio of the sum of the number of above-par loans that are sold and underperforming loans that are held by a CLO over a reporting month to the total number of loans in the CLO portfolio. Underperforming loans are those reported in the portfolio at both the beginning and the end of a reporting month, for which market price has deteriorated over the previous six months but are not in the default or the excess CCC-rated bucket.[16] The mean market price of loans classified as underperforming is 88% of par value (untabulated). Our second proxy for strategic trading is the ratio of the number of loans sold to an affiliated CLO (i.e., a CLO administered by the same manager) to the total number of loans sold by the CLO over the reporting month (*Loan sales to affiliates*). To identify loan sales to affiliates, we create a sample of loan transactions between CLOs by merging loan purchases and sales using the borrower's name as well as the loan type, face amount, trade date, and price. About 90% of loan sales to affiliated CLOs are priced equal to or higher than their market price (untabulated).[17]

The mean *Discretionary loan fair values* is low, at 0.25% of par, potentially because large fair value deviations from the reported mean may trigger CLO trustees' attention. On average, CLOs report inflated fair values for about 38% of their defaulted and excess CCC-rated loans, i.e., about 2.7% of their portfolio loans (untabulated). The mean *Portfolio risk shifting* is 4.56% of the CLO portfolio size and the mean *Loan sales to affiliates* is 5.42% of the CLO loan sales. In Panel B of

[15] Our variable compares loan fair values to the average fair values for the same loans reported by other CLOs in the same month, not to the loans' market prices. Since defaulted and CCC-rated loans are not frequently traded, we cannot observe their market prices every month. Our results are robust to different measures for discretionary loan fair valuation (Panel A of Table 9).

[16] If a loan is not traded over this period, we use the average market price of loans issued by the same borrower.

[17] Gaspar et al. (2006) provide evidence of cross-subsidization among mutual funds belonging to the same fund family, implying that these transactions may not take place at market prices. We are able not only to identify loan sales to affiliated CLOs, but also to observe the price of these transactions.

Table 2, we show the probability of a CLO just meeting an OC test to be positively correlated to *Discretionary loan fair values* (33%), *Portfolio risk shifting* (4.21%), and *Loan sales to affiliates* (41%). The correlation of discretionary activity measures is relatively low (less than 13%), suggesting that managers may engage in these activities interchangeably.

5. Research design and empirical results

5.1. Discretionary loan fair values, strategic trading, and OC test violation avoidance

We first test whether the probability of an OC test violation absent managerial discretion differs across CLOs that just meet an OC test and those reporting higher OC scores. To do so, we modify the reported OC test scores by subtracting from their numerator: (a) the *Discretionary loan fair values* multiplied by the defaulted and excess CCC-rated loan principal balance (that is, we reverse the discretionary component of reported fair values), (b) the difference between the sale proceeds and the face value of loans sold above par and the difference between the face value and the average market value of underperforming loans estimated over a 30-day period around the CLO reporting date (that is, we reverse the sales of above-par loans and assume the CLO sells all underperforming loans), and (c) the difference between the price of loans sold to affiliates and the average market price of the same loan estimated over a 30-day period around the sale, multiplied by the face value traded (that is, we reverse the discretionary component of loan sales to affiliates).

We report the results of the univariate tests in Table 3. We show that about 88% of the CLOs that just meet an OC test would have violated it if their managers had not engaged in discretionary loan fair valuation and strategic trading. More specifically, 60% (81% and 49%) of the CLOs that just meet an OC test would have violated it if their managers had not inflated loan fair values (had

not shifted CLO portfolios to riskier loans or traded with affiliates, respectively).[18] These probabilities drop drastically when we focus on CLOs reporting higher OC test performance. For those with a slack ranked in the second and third quartiles of the OC test scores' distribution (the upper quartile), the probability of a violation absent managerial discretion is only 26% (5%). Overall, the results support our inference that discretionary activities are more important for CLOs that just meet an OC test than for those that do not have the same pressures.

We complement the univariate tests with multivariate analyses that examine the relation between the CLO manager's discretionary activities and the probability of just meeting an OC test. We use a probabilistic model where the dependent variable is an indicator variable that equals one if the CLO just meets an OC test and zero otherwise (*OC test violation avoidance*):

$$\begin{aligned}\text{Probability (}\textit{OC test violation avoidance} = 1) = {} & \alpha + \beta_1 \textit{Discretionary loan fair values} \\ & + \beta_2 \textit{Portfolio risk shifting} + \beta_3 \textit{Loan sales to affiliates} \\ & + \beta_4 \textit{Defaulted loan bucket} + \beta_5 \textit{CCC-rated loan bucket} + \beta_6 \textit{Average portfolio rating} + \beta_7 \textit{Senior OC} \\ & + \beta_8 \textit{Junior OC} + \beta_9 \textit{Portfolio size} + \textit{CLO manager FE} \\ & + \textit{CLO trustee FE} + \textit{Month FE}. \end{aligned} \quad \text{(Model 1)}$$

We expect the coefficients on the variables of interest (*Discretionary loan fair values*, *Portfolio risk shifting*, *Loan sales to affiliates*) to be positive. The variables are described in detail in Appendix B. We also include month, CLO manager (73 unique managers) and trustee (12 unique trustees) fixed effects in the analyses to control for differences in CLO performance over time as well as for CLO managers' and trustees' characteristics (e.g., style, skills).[19]

We report the results in Panel A of Table 4. Consistent with our expectations, we find that

[18] We assume that CLOs will sell all underperforming portfolio loans, which significantly explains the high impact of portfolio risk shifting on just meeting an OC test. If we assume that CLOs continue to hold their underperforming loans and only sell those valued above par, the probability of violating an OC test for CLOs that just pass it drops to 54%. In this case, the probability of an OC test violation for CLOs that just pass it is 74%, if managers do not inflate loan fair values and trade strategically (untabulated).

[19] To alleviate potential estimation bias when using a probit model with a large number of fixed effects, we repeat the analyses using an OLS model (e.g., Maddala, 1987; Greene, 2004). The results are unchanged (untabulated).

inflating loan fair value estimates or trading strategically is positively related to a CLO's avoiding a test violation (Column 1). An interquartile increase in *Discretionary loan fair values, Portfolio risk shifting,* and *Loan sales to affiliates* increases the probability of a CLO just meeting an OC test by about 5.2%, 11.8% and 5.9%, respectively, which represent 18.7%, 42.04% and 21.1% of the mean value of the dependent variable.

Our results hold when focusing separately on the senior and junior OC tests (Columns 2 and 3). An interquartile increase in *Discretionary loan fair values* and *Portfolio risk shifting* increases the probability of a CLO avoiding a senior (junior) OC test violation by 1.9% (16.6%) and 8.1% (19.3%), respectively. An interquartile increase in *Loan sales to affiliates* leads to a 15.8% increase in the probability of a CLO avoiding a junior OC test violation; there is no statistically significant relation between trading with affiliated CLOs and just passing the senior OC test. These results suggest that meeting the junior OC test is particularly important for CLO managers, potentially because the senior OC test is, on average, not binding. Also, CLO managers are more incentivized to receive the junior fee (about 40 basis points of a CLO's par value), which is larger than the senior fee (about 17 basis points).

To mitigate concerns that the results are driven by our choices for the control sample of CLOs, we restrict our control group to CLOs that just miss an OC test (Column 4). Similar to *OC test violation avoidance*, we identify CLOs that just miss an OC test by ranking the OC test scores of CLOs that violate an OC test. We classify a CLO as just missing an OC test if its score ranks in the top quartile of this distribution. We note again that twice as many CLOs just pass an OC test as just miss the threshold; that is, out of the sample of monthly reports in which CLOs marginally pass or miss an OC test, 68% just meet the test and 32% just miss it. Our results hold in this specification. We find that an interquartile increase in *Discretionary loan fair values, Portfolio*

risk shifting, and *Loan sales to affiliates* increases the probability of a CLO just meeting an OC test by 11%, 10%, and 6.5%, respectively; however, the results for strategic trading are only significant at the 10% level.

Additional tests support our arguments regarding CLO managers' discretionary activities (Panel B of Table 4). First, regarding discretionary loan fair valuation, we reestimate Model 1 by including *Discretionary loan fair values* separately for traded loans—those that traded at least once over the prior six months—and non-traded loans—those that did not trade over the prior six months. We expect that discretionary fair valuation is more likely for non-traded loans, since CLO managers have greater discretion in estimating these loan fair values by strategically selecting the brokers who provide the loan bids or by determining the values themselves. The remaining controls are the same as those in Model 1. Consistent with our arguments, we find that inflating fair value estimates of non-traded loans is positively related to the probability of a CLO just meeting an OC test. We find no evidence that the discretionary fair valuation of traded loans is associated with binding OC tests, potentially because these values are determined by loan market prices on data platforms and thus are harder to manipulate.[20]

Second, we measure *Discretionary loan sale price to affiliates* using the difference between the price of the loans sold to affiliated CLOs and the average market price for the same loans over the ±30-day period around affiliated trade dates, averaged at the CLO-month level. The discretionary price component is, on average, 1.8% of par (Panel A of Table 2). We test whether the discretionary price component is associated with the probability of avoiding an OC test violation by reestimating

[20] In untabulated tests, we find that our results are similar when looking separately at the discretionary fair value estimates of defaulted and excess CCC-rated loans. Also, since the values of defaulted loans used in the OC score calculations are the lower of the fair values or the recovery values provided by Moody's and Standard and Poor's (see Section 2.2), we further test and find that CLOs that just pass an OC test report defaulted loan fair values greater than their recovery rates.

Model 1 with *Discretionary loan sale price to affiliates* as the main independent variable and including the same control variables. We find that the discretionary sale price to affiliates is positively related to the probability of a CLO just passing an OC test. An interquartile increase in *Discretionary loan sale price to affiliates* increases the probability of a CLO just passing an OC test by about 0.5%.[21]

Third, we examine whether the managers of CLOs that just meet an OC test are more likely to trade strategically just before the CLO reporting day. We expect that such managers exert greater effort to avoid an OC test violation as the reporting date approaches. Since we observe the specific dates of CLOs' loan trades, we calculate the ratio of the sales of above-par priced loans per day of the reporting month to the total monthly above-par priced sales, thus capturing the daily portfolio risk shifting over the reporting cycle. Then, we estimate the daily percentage differences of the above variable to measure changes in CLO managers' efforts. In Figure 4, we report changes in portfolio risk shifting over the 20-day period leading to the reporting date for (a) CLOs that just meet an OC test, (b) CLOs that just miss an OC test, (c) CLOs with OC scores around the median OC score value (ranked in the second and third quartiles of CLOs' monthly OC score distribution), and (d) CLOs with high OC scores (ranked in the upper quartile of CLOs' monthly OC score distribution). We show that while managers overall have similar trading behavior with respect to their above-par priced loan sales over the (-20,-5)-day period prior to the reporting date, the managers of CLOs that just meet an OC test increase their trading activity by about 40% in the five days prior to the reporting date, significantly more than other CLOs do. Moreover, we find that loan sales to affiliates is a more prominent trading activity for CLOs that just meet an OC test than for other CLOs, particularly as the reporting date approaches (see Figure 5).

[21] Our sample size drops, since we do not always observe market prices of these loans around the affiliated trade date.

Finally, we test whether CLOs that significantly increase their discretionary activities are more likely to just meet an OC test. To do so, we reestimate Model 1 using the monthly changes in *Discretionary loan fair values, Portfolio risk shifting,* and *Loan sales to affiliates* as the main independent variables and include the same control variables. CLO-i does not always cover CLO reporting across consecutive months, which leads to a smaller sample in these analyses. In Table 5, we report results that are consistent with our expectations: increases in discretionary activities relative to the prior month are associated with a greater probability of a CLO just passing an OC test. The results are similar overall when we use the senior and junior OC test violation avoidance as our dependent variable (Columns 2 and 3). Restricting our sample to CLOs that just meet or just miss an OC test (Column 4), we find no relation between changes in strategic trading and the probability of avoiding an OC test violation; the coefficient of the changes in discretionary loan fair values is only significant at the 10% level.

Overall, we show that CLO managers trade strategically and inflate loan fair values when OC tests are binding. However, we cannot establish a causal link between discretionary activities and managers trying to avoid an OC test violation because we cannot fully observe their efforts.

5.2. Discretionary activities, CLO junior noteholders, and OC test violation avoidance

We next examine the relative costs and constraints of inflating loan fair values and trading strategically that might affect CLO managers' discretionary choices. Embedded in our predictions are the arguments that managers' discretionary behavior changes with (a) the influence of junior noteholders and (b) CLO market conditions. We expect that the association between inflated loan fair values (strategic trading) and the probability of avoiding an OC test violation is greater (lower) when junior notes constitute a significant part of a CLO's capital structure or when junior noteholders can be more active in redeeming their notes. These noteholders are the first to suffer

from portfolio losses and discretionary loan fair values may offer a less costly way to improve OC test scores compared to strategic trading.

We augment Model 1 with the measures for CLO junior noteholders' influence and their interaction terms with the proxies for managerial discretion:

$$\text{Probability}(\textit{OC test violation avoidance} = 1) = \alpha + \beta_1 \textit{Discretionary loan fair values} + \beta_2 \textit{Portfolio risk shifting} + \beta_3 \textit{Loan sales to affiliates} + \beta_4 \textit{Junior noteholders} (\textit{Call period}) + \beta_5 \textit{Discretionary loan fair values} \times \textit{Junior noteholders} (\textit{Call period}) + \beta_6 \textit{Portfolio risk shifting} \times \textit{Junior noteholders} (\textit{Call period}) + \beta_7 \textit{Loan sales to affiliates} \times \textit{Junior noteholders} (\textit{Call period}) + \textit{Controls} + \textit{CLO manager FE} + \textit{CLO trustee FE} + \textit{Month FE}. \quad \text{(Model 2)}$$

Junior noteholders is an indicator variable equal to one if the ratio of a CLO's current junior note balance to senior note balance ranks in the upper quartile of the distribution of the ratio and zero otherwise. *Call period* is an indicator variable equal to one if a CLO has passed its reinvestment period, after which noteholders can usually withdraw their capital by redeeming the notes, and zero otherwise. The variables of interest are the interaction terms between the proxies for discretionary activities and those that capture junior noteholders' influence. Performance measures, control variables, and model specifications are similar to those in Model 1.

We report the results in Panel A of Table 6. Consistent with our expectations, we find a positive and significant coefficient on *Discretionary loan fair values* × *Junior noteholders* and *Discretionary loan fair values* × *Call period*. Economically, when junior noteholders' influence is proxied by *Junior noteholders* (*Call period*), an interquartile increase in discretionary loan fair valuation further increases the probability of avoiding an OC test violation by 9% (18%). Moreover, we find a negative and significant coefficient on *Portfolio risk shifting* × *Junior noteholders* and *Portfolio risk shifting* × *Call period.* Economically, when junior noteholders'

influence—proxied by *Junior noteholders* (*Call period*)—is strong, an interquartile increase in portfolio risk shifting decreases the probability of avoiding an OC test violation by 5% (6%). In addition, we document a negative and significant coefficient on *Loan sales to affiliates* × *Call period*: when noteholders can withdraw their capital, an interquartile increase in loan sales to affiliates decreases the probability of avoiding an OC test violation by about 3.4%.[22] Overall, these findings suggest that when junior noteholders' influence is stronger, managers shift away from strategic trading and prefer discretionary fair valuation, which is a less costly discretionary activity.

5.3. Discretionary activities, CLO market conditions, and OC test violation avoidance

The market conditions under which a CLO operates likely affect the relation between OC test violation avoidance and the manager's discretionary activities. We expect that when a CLO's portfolio quality is lower than that of its peers, its manager may be under greater pressure to inflate loan fair values and trade strategically to meet an OC test, as credit rating agencies and noteholders compare managers' performance across CLOs. We also expect that when loan market liquidity is high, managers may be able to trade portfolio loans more easily and at a lower cost. This can facilitate larger gains from the sales of well-performing loans that improve OC test scores. At the same time, higher loan market liquidity may restrict CLO managers' ability to inflate loan fair values, given the greater availability of market price benchmarks.

We measure relative portfolio quality by ranking in quartiles the difference between the number of a CLO's defaulted and excess CCC-rated loans and the average number of defaulted and excess CCC-rated loans reported by other CLOs in the same month. *High defaulted/excess CCC-rated loans* is an indicator variable equal to one if the above difference ranks in the upper quartile of the

[22] To interpret the coefficients on the interaction terms, we re-compute the probit models using the inteff command in Stata (Norton et al., 2004). Untabulated results indicate that the coefficients on the interaction terms are statistically significant and maintain their signs. The same applies to all probit models that include an interaction term.

variable distribution and zero otherwise. We measure loan market liquidity by ranking in quartiles the total number of CLOs' loan trades over a reporting month. *High market liquidity* is an indicator variable equal to one if the monthly market liquidity ranks in the upper quartile and zero otherwise. We reestimate Model 2 by substituting *High defaulted/excess CCC-rated loans* and *High market liquidity* for *Junior noteholders*. The variables of interest are the interaction terms between the proxies for discretionary activities and the market condition variables.

We present the results of these tests in Panel B of Table 6. The positive and significant coefficients on the interaction terms in Columns 1 and 2 suggest that when CLOs perform poorly relative to their peers, managers are more likely to exercise discretion and meet an OC test. Economically, an interquartile increase in *Discretionary loan fair values* and *Portfolio risk shifting* when a CLO underperforms its peers further increases the probability of a CLO just meeting an OC test by 9% and 7%, respectively. Moreover, while we find that CLO managers are not less likely to inflate loan fair values when market liquidity is higher (the coefficient on the interaction term *Discretionary loan fair values* × *High market liquidity* is statistically insignificant), the positive and significant coefficient on *Portfolio risk shifting* × *High market liquidity* suggests that CLO managers are more likely to risk shift their portfolios to meet an OC test in months of high market liquidity (Columns 3 and 4). Economically, an interquartile increase in *Portfolio risk shifting* when loan market liquidity is high further increases the probability of a CLO just meeting an OC test by 9%. Relatedly, the negative and significant coefficient (at the 10% level) on *Loan sales to affiliates* × *High market liquidity* is consistent with the fact that in months of strong market liquidity managers do not sell loans to affiliated CLOs to meet an OC test. Overall, these findings further support our inference that the relation between discretionary activities and just meeting an

OC test varies with CLO market conditions.[23, 24]

5.4. Discretionary activities, OC test violation avoidance, and future CLO performance

The cross-sectional analyses above suggest that some discretionary activities (particularly strategic trading) are likely more costly. We next examine whether inflating loan fair values and trading strategically are indeed related to subsequent CLO portfolio performance. We measure future portfolio performance using the natural logarithm of the senior and junior OC scores six months ahead (*Senior* OC_{m+6} and *Junior* OC_{m+6}) and the probability of a note credit rating downgrade over the following six months (*CLO note* $downgrade_{m+6}$).[25] We use an ordinary least squares (OLS) model where the dependent variable is *Senior* OC_{m+6} or *Junior* OC_{m+6} and a probabilistic model where the dependent variable is *CLO note* $downgrade_{m+6}$.

$$\begin{aligned} \textit{CLO performance}_{m+6} = \quad & \alpha + \beta_1 \textit{Discretionary loan fair values}_m + \beta_2 \textit{Portfolio risk shifting}_m \\ & + \beta_3 \textit{Loan sales to affiliates}_m + \textit{Controls}_m + \textit{CLO manager FE} \\ & + \textit{CLO trustee FE} + \textit{Month FE}. \end{aligned} \qquad \text{(Model 3)}$$

The measures for discretionary activities and control variables are similar to those in Model 1. To mitigate the concern that the results are driven by the selection of the control group, we restrict our sample to CLOs that just meet monthly OC tests. Because the CLO-i database does not always cover CLOs' reporting across consecutive months, the sample size in these analyses drops. We report the results in Columns 1–3 of Table 7. In all three specifications, we find that *Portfolio risk*

[23] Although we include trustee fixed effects across our analyses to control for monitoring efforts, the use of managerial discretion is likely affected by trustees' characteristics. In untabulated tests, we find that the association between the probability of just meeting an OC test and discretionary activities is stronger when the CLO's trustee is busy (measured by the number of CLOs the trustee monitors and excluding trustee fixed effects), suggesting that inflating loan fair values and trading strategically is less costly when the CLO trustee is less likely to closely monitor the manager.

[24] In untabulated tests, we find that the association between just meeting an OC test and managerial discretion is greater in the presence of greater performance-linked compensation (i.e., junior fees that a CLO manager gains if both the senior and junior OC tests are met). Moreover, we test whether CLOs delay loan default recognition when OC tests are binding by using the percentage of loans reported as performing which other CLOs report as defaulted in the same month. We find no evidence of such discretionary activity.

[25] Our results are robust when we capture future portfolio performance by measuring senior and junior OC and the probability of a CLO note credit rating downgrade three months ahead (untabulated robustness tests).

shifting is associated with lower future portfolio performance. Economically, an interquartile increase in *Portfolio risk shifting* decreases (increases) future senior and junior OC scores (the probability of a CLO note credit rating downgrade) by about 3% and 0.5% (11%), respectively. We find no evidence that affiliated trading or fair value inflation affect future CLO performance.

We further investigate whether managers' discretionary activities in CLOs that just meet an OC test are associated with worse future performance than in those that just miss a test. We augment Model 3 with *OC test violation avoidance*$_m$ and the interaction terms between *OC test violation avoidance*$_m$ and the measures of managerial discretion. The CLO performance measures, control variables, and model specifications are similar to those in Model 3. We report the results in Columns 4–6 of Table 7. In all three specifications, we find that portfolio risk shifting by CLOs that just meet an OC test is associated with worse future performance relative to the control group of CLOs that just miss an OC test. Economically, relative to CLOs that miss an OC test, an interquartile increase in *Portfolio risk shifting* by CLOs that just meet an OC test further decreases (increases) future senior and junior OC scores (the probability of a CLO note credit rating downgrade) by about 6% and 3% (10%), respectively. Also, relative to CLOs that miss an OC test, an interquartile increase in *Discretionary loan fair values* further decreases the junior OC score by about 0.04%. Overall, our results provide further evidence on the adverse effects of strategic trading and suggest that discretionary loan fair valuation is likely a relatively low cost way to avoid an OC test violation.

5.5. Supplemental analyses

5.5.1. Discretionary activities, OC test violation avoidance, and CLO note prices

Managerial discretion may be unraveled by CLO noteholders who receive granular disclosures about individual portfolio loans and can benchmark managers' activities across CLOs. Such

unravelling is likely to be reflected in lower CLO note prices. In supplemental analyses, we investigate whether CLO noteholders price managerial discretion when trading in the secondary market. We collect a sample of 1,078 unique trades of CLO notes—with complete data on the trade price, size, date, and credit rating—covered by CLO-i (503 CLO-month observations).

In Table 8, we report the results on the relation between discretionary activities to meet an OC test and the pricing of CLO notes.[26] The dependent variable is the natural logarithm of the monthly average CLO note price over the next reporting month (*CLO note price*). Our independent variables of interest are the interaction terms of *OC test violation avoidance* with *Discretionary loan fair values*, *Portfolio risk shifting*, and *Loan sales to affiliates*. We control for the average CLO note rating, the face amount traded, and the control variables included in Model 1. We document that CLO managers' strategic trading choices (primarily portfolio risk shifting) when OC tests are binding are associated with lower CLO note prices (Columns 2 and 3), while discretionary loan fair valuation is not priced (Columns 1 and 3). These findings can potentially be attributed to the different effects of these discretionary activities on CLO performance or to noteholders' inability to unravel discretionary loan fair valuation.

5.5.2. Sensitivity analyses

Finally, we perform several robustness tests to provide additional credibility to our findings. First, we redefine discretionary loan fair valuation using (a) the percentage of defaulted and excess CCC-rated loans for which reported fair values are higher than the fair values that other CLOs report for the same loans in the same month, averaged at the CLO-month level (*Pct. of overvalued loans*); (b) the difference between the fair value of defaulted or excess CCC-rated loans and the median fair value of the same loans reported by other CLOs in the same month, averaged at the

[26] Due to the small sample size for CLO note trades, we cannot follow specifications similar to those in Model 3.

CLO-month level (*Loan fair value – median loan fair value reported by other CLOs*); (c) the mode of the differences between reported loan fair values and the average of the loan fair values reported for the same loans by other CLOs in the same month (*Mode(Discretionary loan fair values)*); and (d) the difference between the fair value of a defaulted or excess CCC-rated loan reported by a CLO and the average market price of below CCC-rated loans traded in the same month, averaged at the CLO-month level (*Loan fair value –average market price of below CCC-rated loans).* The mean *Pct. of overvalued loans* is 0.38 and the mean *Loan fair value – median loan fair value reported by other CLOs* is 0.10. The mean *Mode(Discretionary loan fair values)* is 0.58 and the mean *Loan fair value – average market price of below CCC-rated loans* is -0.51.[27] The correlation between *Discretionary loan fair values* and the proxies above ranges from 20% to 70%, suggesting that all proxies capture the same underlying construct. We reestimate Model 1 using these alternative proxies for discretionary loan fair valuation and report the results in Panel A of Table 9. Consistent with our primary analyses, the coefficients on the discretionary loan fair valuation proxies are positive and significant across all specifications.

Second, to mitigate concerns about the definition of the dependent variable *OC test violation avoidance* using the distribution of the senior and junior OC test slack, we use two additional proxies for CLOs just meeting an OC test score: (a) an indicator variable equal to one if the senior or junior OC slack is positive and below 1% (*OC test slack 1%*) and zero otherwise and (b) an indicator variable equal to one if the senior or junior OC slack is positive and below 3% (*OC test slack 3%*) and zero otherwise. We reestimate Model 1 by using *OC test slack 1%* or *OC test slack*

[27] Defaulted and CCC-rated loans are not frequently traded and thus market prices for a specific loan are not always observable. The ideal variable would compare the fair value of a loan with the quotes of that loan provided by the Loan Pricing Corporation, Intex, or Markit. However, such information is unavailable to us. Thus, we compare the reported fair value of a defaulted or excess CCC-rated loan with the average market price of loans rated CCC or below in the same month. The negative mean value of this variable is driven by the fact that, in some months, we compare the fair value of a defaulted loan to the market price of CCC- or C-rated loans, which is marginally higher.

3% as the dependent variable. We report the results in Panel B of Table 9. While we fail to find that *Loan sales to affiliates* is related to a CLO just meeting the OC tests using *OC test slack 1%* as the dependent variable, the remaining results hold in these specifications, suggesting that the dependent variable definition is unlikely to drive our results.

Last, given that our sample period includes the 2008–2010 credit crisis, we reestimate Model 1 restricting our sample to the credit crisis and the credit expansion years (2011–2013). We report these results in Panel C of Table 9. Our results hold across both sample periods, suggesting that a CLO manager's discretionary activities are not relevant only to the credit crisis.

6. Conclusion

We explore how CLO managers use discretion to avoid violating overcollateralization (OC) tests, which require that the value of a CLO's loan portfolio scaled by the principal balance of its notes be above a certain threshold. We predict and find a positive and significant relation between the probability of just meeting an OC test and CLO managers' discretionary loan fair valuation and strategic trading (which is reflected in selling well-performing loans and retaining underperforming ones or in selling loans to CLOs administered by the same manager). Moreover, we document that the relation between a CLO avoiding an OC test violation and inflating loan fair values (trading strategically) increases (decreases) when junior noteholders' influence is stronger. Looking at CLO market conditions, we show that the relation between managerial discretion and meeting OC tests is amplified when a CLO's relative portfolio performance is weak, i.e., when a CLO manager is under greater pressure to manipulate the OC scores. Also, the relation between the probability of avoiding an OC test violation and shifting the CLO portfolio to riskier assets (trading with CLO affiliates) is stronger (weaker) when loan market liquidity is high, i.e., when CLOs can cash in greater market gains from loan sales. This evidence suggests that CLO managers

use different discretionary activities to meet OC tests and that these activities vary with the CLO's capital structure and market conditions. Lastly, we find that portfolio risk shifting—but not discretionary loan fair valuation—undermines future CLO portfolio performance, which may explain the interplay between discretionary activities documented in the cross-sectional tests.

We acknowledge that, since we do not observe CLO noteholders' realized returns, our findings do not allow us to draw conclusions on the optimality of managers' behavior. Also, CLO managers may engage in other discretionary activities unexplored in this paper and additional factors may affect the interplay between different discretionary activities. We leave it to future research to explore these avenues.

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Appendix A. Example of calculating OC scores under different CLO performance scenarios

This appendix provides an example of how a CLO manager can engage in discretionary activities to manage the OC test scores.

CLO characteristics			
(in $million)			
Principal balance of loans	$100.00		
Principal balance of senior notes	$68.60		
Principal balance of junior notes	$19.60		
Principal balance of the equity tranche	$11.80		
Max. principal balance of CCC-rated loans	$5.00		
CLO note and loan maturity	10 years		
Senior OC trigger	136%		
Junior OC trigger	107%		

A.1.: Positive scenario

CLO portfolio value (in $million)			
Beg. Principal loan balance	$100.00		
Minus: Principal balance of loans sold at 120% of par	$10.00	(cash received = $12.00)	
Plus: Principal balance of loans bought at par	$10.00		
Plus: Cash holdings	$2.00	(= $12.00 –$10.00)	
Total CLO portfolio value	$102.00	(A1)	
Principal balance of senior notes	$68.60	(B)	
Principal balance of junior notes	$19.60	(C)	
Senior OC score	149%	(A1)/(B)	PASSED
Junior OC score	116%	(A1)/[(B) + (C)]	PASSED

A.2.: Negative scenario

CLO portfolio value (in $million)			
Principal balance of performing loans	$87.00		
Plus:			
Value of defaulted loans	$3.00	Section A.2.a	
Value of excess CCC-rated loans	$2.05	Section A.2.b	
Total CLO portfolio value	$92.05	(A2)	
Principal balance of senior notes	$68.60	(B)	
Principal balance of junior notes	$19.60	(C)	
Senior OC score	134%	(A2)/(B)	FAILED
Junior OC score	104%	(A2)/[(B) + (C)]	FAILED

Section A.2.a.: Value of defaulted loans

Defaulted loans	Principal balance (in $m)	Market price (% of par)	Recovery rate by Standard and Poor's	Recovery rate by Moody's	Lower market or recovery	Defaulted loan value (in $m)
1	$1.00	30%	40%	40%	30%	$0.30
2	$1.00	40%	50%	45%	40%	$0.40
3	$1.00	50%	50%	45%	45%	$0.45
4	$1.00	50%	60%	60%	50%	$0.50
5	$1.00	20%	40%	40%	20%	$0.20
6	$1.00	50%	50%	45%	45%	$0.45
7	$1.00	30%	40%	40%	30%	$0.30
8	$1.00	60%	40%	40%	40%	$0.40
Total	$8.00					$3.00

Section A.2.b.: Value of excess CCC-rated loans

CCC-rated loans	Principal balance (in $m)	Market price (% of par)	Excess CCC-rated	Principal balance of excess CCC-rated loans (in $m)	Market value of excess CCC-rated loans (in $m)
1	$1.00	30%	YES	$1.00	$0.30
2	$1.00	35%	YES	$1.00	$0.35
3	$1.00	40%	YES	$1.00	$0.40
4	$1.00	45%	YES	$1.00	$0.45
5	$1.00	55%	YES	$1.00	$0.55
6	$1.00	59%	NO		
7	$1.00	70%	NO		
8	$1.00	70%	NO		
9	$1.00	80%	NO		
10	$1.00	80%	NO		
Total	$10.00			$5.00	$2.05

A.3.: Negative scenario with discretionary loan fair values and strategic trading

CLO portfolio value (in $million)			
Principal balance of performing loans	$77.00		
Plus:			
Cash from selling 10 loans at 120% of par	$12.00		
Value of defaulted loans	$3.45	Section A.3.a	
Value of excess CCC-rated loans	$2.85	Section A.3.b	
Total CLO portfolio value	$95.30	(A3)	
Principal balance of senior notes	$68.60	(B)	
Principal balance of junior notes	$19.60	(C)	
Senior OC score	139%	(A3)/(B)	PASSED
Junior OC score	108%	(A3)/[(B) + (C)]	PASSED

Section A.3.a.: Value of defaulted loans

Defaulted loans	Principal balance (in $m)	Market price (% of par)	Recovery rate by Standard and Poor's	Recovery rate by Moody's	Lower market or recovery	Defaulted loan value (in $m)
1	$1.00	40%	40%	40%	40%	$0.40
2	$1.00	50%	50%	45%	45%	$0.45
3	$1.00	50%	50%	45%	45%	$0.45
4	$1.00	50%	60%	60%	50%	$0.50
5	$1.00	40%	40%	40%	40%	$0.40
6	$1.00	50%	50%	45%	45%	$0.45
7	$1.00	40%	40%	40%	40%	$0.40
8	$1.00	60%	40%	40%	40%	$0.40
Total	$8.00					$3.45

Section A.3.b.: Value of excess CCC-rated loans

CCC-rated loans	Principal balance (in $m)	Market price (% of par)	Excess CCC-rated	Principal balance of excess CCC-rated loans(in $m)	Market value of excess CCC-rated loans (in $m)
1	$1.00	50%	YES	$1.00	$0.50
2	$1.00	50%	YES	$1.00	$0.50
3	$1.00	50%	YES	$1.00	$0.60
4	$1.00	60%	YES	$1.00	$0.60
5	$1.00	65%	YES	$1.00	$0.65
6	$1.00	70%	NO		
7	$1.00	70%	NO		
8	$1.00	70%	NO		
9	$1.00	80%	NO		
10	$1.00	80%	NO		
Total	$10.00			$5.00	$2.85

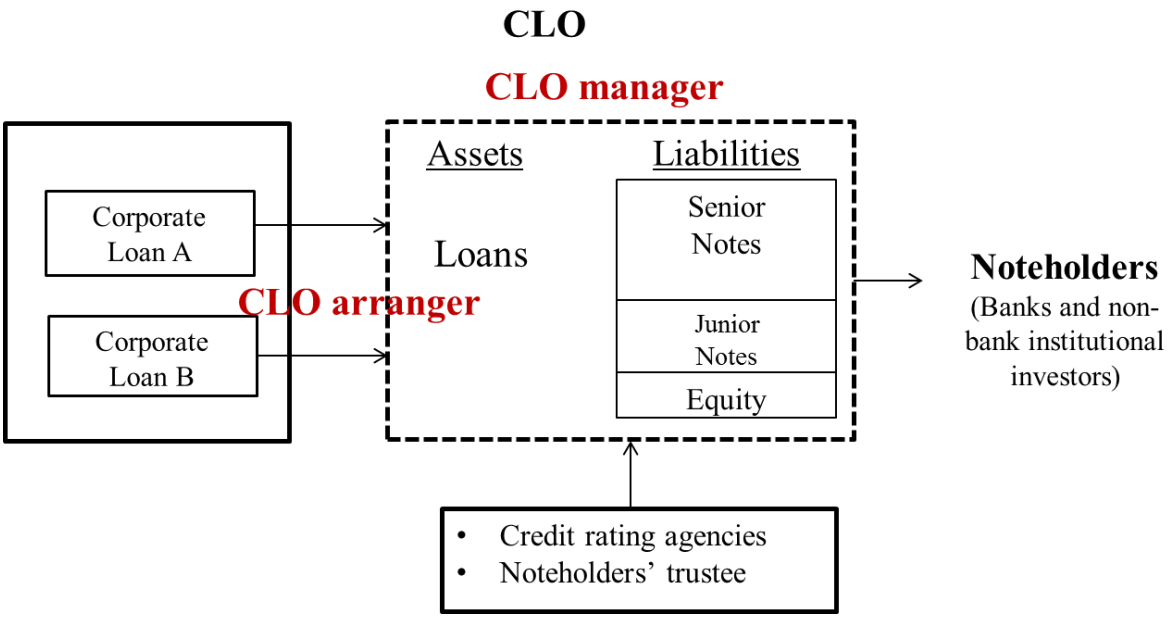
Appendix B. Variable definitions.

This appendix provides definitions for the main variables used in the paper.

Variable	Definitions
CLO performance	
OC test violation avoidance	Binary variable that equals one if a CLO just passes the senior or junior OC test and zero otherwise. We assess that a CLO just passes an OC test if the reported senior (junior) OC test slack ranks in the bottom quartile of the senior (junior) OC test slack distribution across all CLOs that pass the test.
Defaulted loan bucket	The number of defaulted loans scaled by the total number of loans in a CLO portfolio (stated in percentage points).
CCC-rated loan bucket	The number of loans rated CCC or lower scaled by the total number of loans in a CLO portfolio (stated in percentage points).
Average portfolio rating	The average (Standard and Poor's or Moody's) credit rating of the loans in a CLO portfolio. A loan's credit rating is defined as a scale variable that equals 1 for AAA (or Aaa), 2 for AA+ (or Aa1), and so forth. For loans where Moody's and Standard and Poor's ratings differ, we use the most conservative rating.
Senior OC	The natural logarithm of a CLO's senior overcollateralization score in percentage points.
Junior OC	The natural logarithm of a CLO's junior overcollateralization score in percentage points.
Portfolio size	The natural logarithm of a CLO's loan portfolio total principal balance outstanding.
CLO note downgrade	Binary variable that equals one if a CLO note's credit rating is downgraded by at least a notch over the following six months and zero otherwise.
CLO note price	The natural logarithm of the price of traded CLO notes, averaged at the CLO-month level.
CLO discretionary activities	
Discretionary loan fair values	The difference between the fair values of defaulted or excess CCC-rated loans reported by a CLO and the average fair values of the same loans reported by other CLOs in the same month, averaged at the CLO-month level.
Discretionary FV_ traded loans	The difference between the fair values of defaulted or excess CCC-rated traded loans (i.e., traded at least once over the prior six months) and the average fair values of the same loans reported by other CLOs in the same month, averaged at the CLO-month level.
Discretionary FV_ non-traded loans	The difference between the fair values of defaulted or excess CCC-rated non-traded loans (i.e., with no trade over the prior six months) and the average fair values of the same loans reported by other CLOs in the same month, averaged at the CLO-month level.

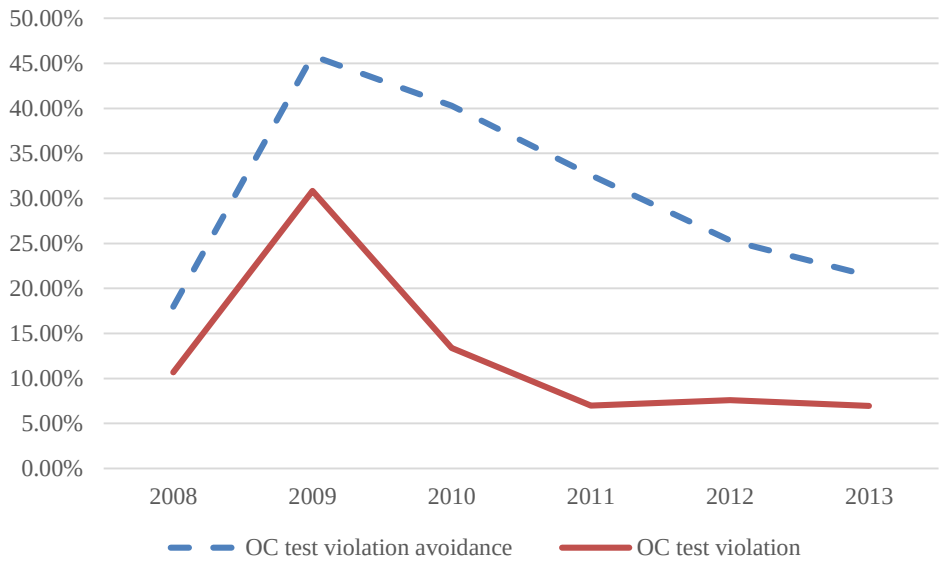
Portfolio risk shifting	The number of loans sold above par value and the number of underperforming loans retained by a CLO, divided by the total number of portfolio loans (stated in percentage points). To identify loans retained by a CLO over a reporting month, we compare the CLO portfolio structure with its structure in the previous month. We define portfolio loans as underperforming if (1) they are not in default or in the excess CCC-rated bucket and (2) they experience negative market returns over the six month period prior to a reporting month. If the loan is not traded, we use the average market returns of all securitized loans issued by the same borrower.
Loan sales to affiliates	The number of loan sales to affiliated CLOs, divided by the total number of monthly loan sales (stated in percentage points). Affiliated CLOs share the same manager.
Discretionary loan sale price to affiliates	The average price of loans sold to affiliated CLOs minus the average market price of these loans over the ±30 day-period around the loan sale date to an affiliated CLO.
CLO characteristics	
Junior noteholders	Binary variable that equals one if the ratio of a CLO's current junior note balance to senior note balance ranks in the upper quartile of the distribution of this ratio and zero otherwise.
Call period	Binary variable that equals one if a CLO has passed its reinvestment period, after which noteholders can withdraw their capital, and zero otherwise.
High defaulted/excess CCC-rated loans	Binary variable that equals one if the difference between the number of defaulted and excess CCC-rated loans reported by a CLO and the average number of defaulted and excess CCC-rated loans reported by other CLOs in the same month ranks in the upper quartile of the distribution of this difference and zero otherwise.
High market liquidity	Binary variable that equals one if the monthly secondary securitized loan market liquidity (estimated as the number of loan sales and purchases that CLOs report in a month) ranks in the upper quartile of its sample distribution and zero otherwise.

Fig. 1. The CLO structure.



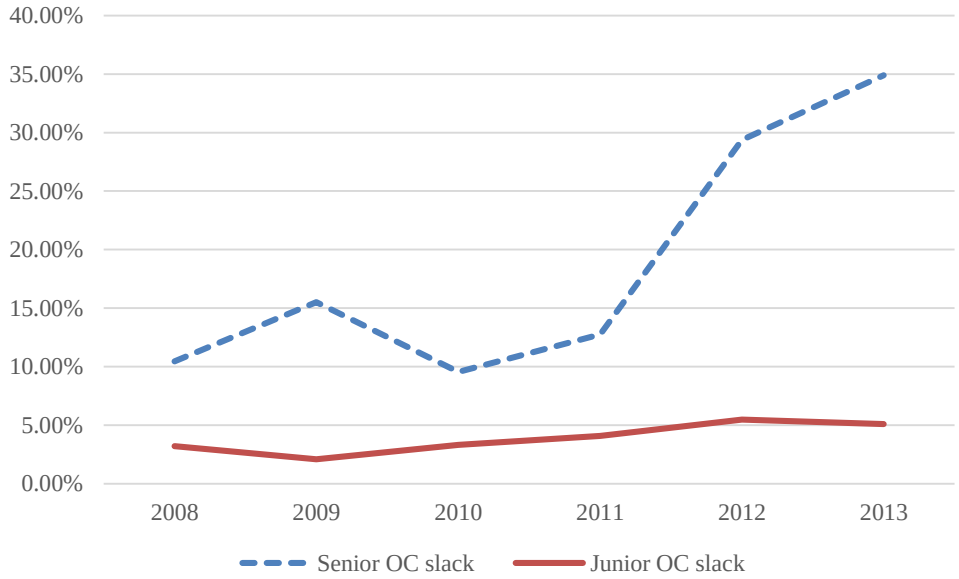
The figure illustrates the key steps in the corporate loan securitization process.

Fig. 2. OC test violations.



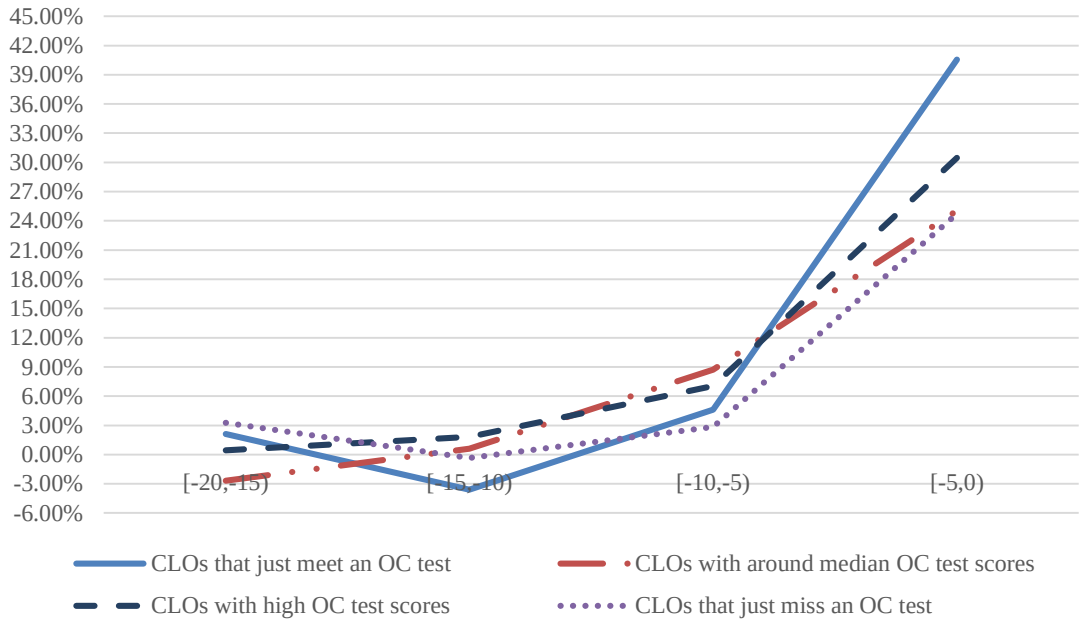
The figure presents the percentage of CLOs that just passed an OC test and thus avoided an OC test violation and the percentage of CLOs that violated an OC test over the 2008-2013 period.

Fig. 3. The slack on OC tests.



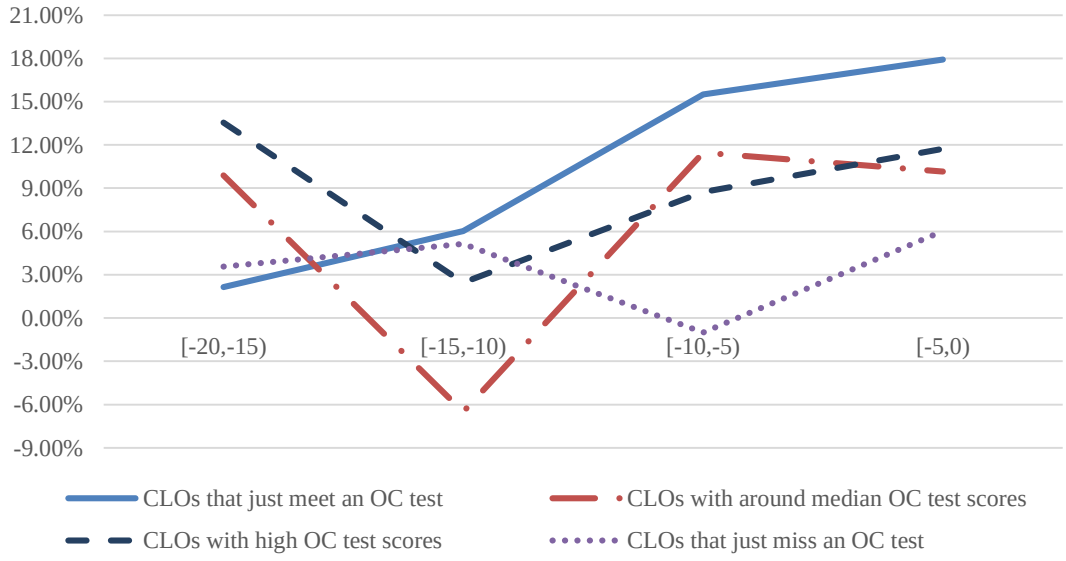
The figure presents the reported senior and junior OC tests' slack (in percentage points) over the 2008-2013 period.

Fig. 4. Intra-month sales of loans that trade above par.



The figure presents intra-month daily percentage changes in above-par loan sales averaged for CLOs that just miss an OC test, CLOs that just meet an OC test, CLOs with around median OC test scores and CLOs with high OC test scores. Day 0 is the day of the monthly CLO report.

Fig. 5. Intra-month loan sales to affiliated CLOs.



The figure presents intra-month daily percentage changes in loan sales to affiliated CLOs for CLOs that just miss an OC test, CLOs that just meet an OC test, CLOs with around median OC test scores and CLOs with high OC test scores. Day 0 is the day of the monthly CLO report.

Table 1
Sample selection.

Panel A: Sample selection		
	Number of CLOs	Number of CLO reports
1. CLO-i population	493	9,045
2. CLOs with defaulted and excess CCC-rated loans	434	6,454
3. CLOs with defaulted and excess CCC-rated loans, with managers that administer at least two CLOs	415	6,012
4. CLOs in (3) with complete data on loan fair values	145	3,726

Panel B: Number of CLO reports by year		
Year	Full sample	CLOs with complete data on loan fair values
2008	157	138
2009	1,307	840
2010	1,471	935
2011	1,170	671
2012	1,148	670
2013	759	472
Total	6,012	3,726

This table presents the sample selection filters (Panel A) and the sample composition over time (Panel B).

Table 2
Descriptive statistics.

Panel A: Summary statistics of the main variables

Variable	Obs.	Mean	S.D.	Q1	Median	Q3
CLO performance						
OC test violation avoidance	6,012	0.28	0.47	0.00	0.00	1.00
Defaulted loan bucket (%)	6,012	4.05	3.76	1.41	2.81	5.34
CCC-rated loan bucket (%)	6,012	7.57	4.31	4.80	6.95	8.40
Average portfolio rating	6,012	15.06	0.66	14.58	14.91	15.41
Senior OC	6,012	4.81	0.33	4.76	4.80	4.90
Junior OC	6,012	4.63	0.09	4.50	4.62	4.71
Portfolio size	6,012	19.51	1.01	18.16	19.81	20.03
CLO note downgrade	6,012	0.17	0.37	0.00	0.00	0.00
CLO note price	503	4.41	0.21	4.32	4.49	4.57
CLO discretionary activities						
Discretionary loan fair values	3,726	0.25	6.08	-1.25	0.25	3.11
Portfolio risk shifting (%)	6,012	4.56	2.62	2.74	4.48	6.01
Loan sales to affiliates (%)	6,012	5.42	8.96	0.00	2.00	6.57
Discretionary FV_traded loans	3,726	0.14	2.99	0.00	0.00	0.00
Discretionary FV_non-traded loans	3,726	0.29	3.07	-2.55	0.37	4.00
Discretionary loan sale price to affiliates	2,253	1.80	1.98	0.10	0.80	1.60
CLO characteristics						
Junior noteholders	6,012	0.23	0.41	0.00	0.00	0.00
Call period	6,012	0.27	0.43	0.00	0.00	1.00
High defaulted/excess CCC-rated loans	6,012	0.25	0.43	0.00	0.00	1.00
High market liquidity	6,012	0.25	0.43	0.00	0.00	1.00

Panel B: Spearman correlations among the proxies for CLO performance and CLO manager's discretionary activities

	Obs.= 3,726	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	*OC test violation avoidance*	1.00											
(2)	*Discretionary loan fair values*	0.33	1.00										
(3)	*Portfolio risk shifting*	0.04	0.04	1.00									
(4)	*Loan sales to affiliates*	0.41	0.09	0.12	1.00								
(5)	*Discretionary FV_traded loans*	0.02	0.43	0.02	0.00	1.00							
(6)	*Discretionary FV_non-traded loans*	0.29	0.55	0.05	0.05	0.09	1.00						
(7)	*Defaulted loan bucket*	0.03	0.04	-0.05	-0.09	0.01	0.05	1.00					
(8)	*CCC-rated loan bucket*	0.15	0.12	-0.07	-0.04	0.05	0.01	0.36	1.00				
(9)	*Average portfolio rating*	-0.03	0.01	-0.02	-0.02	0.04	0.04	0.55	0.52	1.00			
(10)	*Senior OC*	-0.53	-0.19	0.17	-0.25	0.00	0.01	0.03	-0.04	0.11	1.00		
(11)	*Junior OC*	-0.62	-0.23	0.07	-0.21	0.00	-0.01	-0.26	-0.30	-0.16	0.43	1.00	
(12)	*Portfolio size*	0.12	0.12	-0.03	0.05	0.06	0.02	0.24	0.32	0.25	-0.22	-0.15	1.00
(13)	*CLO note downgrade*	0.13	0.04	-0.02	0.01	-0.06	0.00	0.38	0.35	0.29	-0.16	-0.20	0.24

This table presents sample descriptive statistics. Panel A reports the summary statistics of the variables used in the empirical analyses. Panel B reports the Spearman correlations among the measures for CLO performance and discretionary activities. All variables are defined in Appendix B. Continuous variables are winsorized at the 1% and 99% levels.

Table 3
Probability of an OC test violation absent managerial discretion.

	Probability of an OC test violation for CLOs that just meet the OC tests, if:	Probability of an OC test violation for CLOs with around median OC test scores, if:	Probability of an OC test violation for CLOs with high OC test scores, if:	Statistical significance in the differences of the mean probabilities:	Statistical significance in the differences of the mean probabilities:
	(1)	(2)	(3)	(1) –(2)	(1) – (3)
CLOs do not inflate fair values and trade strategically	87.563%	26.127%	5.276%	51.059***	85.990***
CLOs do not inflate fair values	60.312%	21.958%	4.563%	20.607***	35.071***
CLOs do not sell above-par loans and do not retain underperforming loans	81.369%	23.233%	4.109%	51.164***	66.111***
CLOs do not trade with affiliates	48.914%	19.741%	1.553%	11.744***	35.097***

This table reports the results of the univariate tests on the probability of a CLO violating an OC test if its manager did not engage in discretionary activities. We assess these probabilities by subtracting from the CLO total portfolio value (i.e., the numerator of the reported senior and junior OC tests) the following components: i) the difference between the reported fair value of defaulted and excess CCC-rated loans and the average fair value reported for the same loans by other CLOs over the same reporting month, multiplied by the principal balance of these loans (i.e., we reverse the discretionary component of reported fair values); ii) the difference between the sale proceeds and the face value of loans sold above par as well as the difference between the face value and the market value of underperforming loans (i.e., we reverse the sales of above-par traded loans and assume that the manager sells off underperforming loans) and iii) the difference between the sale price of a loan to an affiliated CLO and the trade price of the same loan during a [-30, +30] day-period around this sale, multiplied by the loan face value traded (i.e., we reverse the discretionary component of a loan's sale price to affiliated CLOs). Column (1) reports the frequencies of an OC test violation if managers did not engage in discretionary activities for CLOs that just meet an OC test. Column (2) reports the frequencies of an OC test violation if managers did not engage in discretionary activities for CLOs with OC test scores ranked in the second and third quartiles of the distribution of OC performance. Column (3) reports the frequencies of an OC test violation if managers did not engage in discretionary activities for CLOs with OC test scores ranked in the top quartile of the distribution. The last two columns report the t-statistics for the differences in the probability means. Continuous variables are winsorized at the 1% and 99% levels. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 4
Discretionary activities and OC test violation avoidance.

Panel A: Discretionary loan fair values, strategic trading and OC test violation avoidance

	(1)			(2)		
	OC test violation avoidance			*Senior OC test violation avoidance*		
Discretionary loan fair values	0.025***		0.012**	0.007**		0.004**
	(4.922)		(2.618)	(2.299)		(2.580)
Portfolio risk shifting		0.028***	0.036***		0.016***	0.025***
		(5.108)	(3.476)		(6.230)	(4.851)
Loan sales to affiliates		0.007***	0.009***		0.000	-0.005
		(4.402)	(2.947)		(0.107)	(-0.785)
Defaulted loan bucket	-0.024**	-0.004	-0.034***	-0.010	-0.016**	-0.011*
	(-2.134)	(-0.467)	(-2.816)	(-1.035)	(-2.056)	(-1.700)
CCC-rated loan bucket	0.101**	0.088**	0.027	0.165*	0.073	0.028
	(2.430)	(1.985)	(1.239)	(1.875)	(0.160)	(1.493)
Average portfolio rating	-0.119	-0.067	-0.072*	-0.104*	-0.060*	-0.034
	(-1.092)	(-1.556)	(-1.861)	(-1.885)	(-1.793)	(-1.543)
Senior OC	-0.152	-0.153***	-0.227	-0.154**	-0.110***	-0.362***
	(-1.623)	(-5.500)	(-0.902)	(-2.552)	(-9.931)	(-6.398)
Junior OC	-0.073**	0.160	-0.069***	-0.153***	0.158	-0.165***
	(-2.383)	(0.641)	(-3.046)	(-6.734)	(0.790)	(-3.055)
Portfolio size	0.030	-0.005	0.091	-0.081	0.048	-0.095
	(0.243)	(-0.067)	(0.702)	(-0.487)	(0.626)	(-0.763)
Obs.	3,726	6,012	3,726	3,726	6,012	3,726
Pseudo R^2	39.09%	34.82%	41.30%	49.16%	40.16%	52.88%

	(3)			(4)		
	Junior OC test violation avoidance			*OC test violation avoidance* Subsample of CLOs that just pass or just miss an OC test		
Discretionary loan fair values	0.013***		0.038***	0.008**		0.025***
	(3.951)		(4.268)	(2.207)		(5.493)
Portfolio risk shifting		0.033***	0.059**		0.027***	0.030*
		(3.324)	(2.316)		(2.842)	(1.931)
Loan sales to affiliates		0.004***	0.024***		0.005**	0.010*
		(3.046)	(3.561)		(1.969)	(1.765)
Defaulted loan bucket	-0.024**	-0.003	-0.017**	-0.040**	-0.030***	-0.047***
	(-2.600)	(-0.434)	(-2.360)	(-2.635)	(-2.681)	(-3.114)
CCC-rated loan bucket	-0.158	-0.129	-0.021	0.152	-0.104	0.114***
	(-0.703)	(-1.154)	(-0.948)	(0.387)	(-1.340)	(4.218)

Average portfolio rating	0.029	-0.024	0.015	-0.019	0.017	0.027
	(0.712)	(-1.329)	(0.234)	(-0.544)	(0.603)	(0.255)
Senior OC	-0.198	-0.118***	-0.003	0.043*	0.148**	0.144**
	(-1.103)	(-3.756)	(-0.010)	(1.775)	(2.396)	(2.584)
Junior OC	-0.132**	0.148	-0.075***	0.188***	0.171**	0.185***
	(-2.317)	(1.283)	(-2.807)	(2.669)	(2.306)	(7.240)
Portfolio size	-0.122	0.045	0.101	0.128**	0.158***	0.497
	(-1.020)	(1.203)	(0.259)	(2.144)	(2.833)	(0.903)
Obs.	3,726	6,012	3,726	1,469	2,520	1,469
Pseudo R^2	33.71%	17.23%	34.66%	46.06%	43.16%	58.04%

Panel B: Discretionary fair values of traded and non-traded loans, discretionary sale price to affiliates and the probability of avoiding an OC test violation

	(1)		(2)		(3)		(4)	
	OC test violation avoidance		*Senior OC test violation avoidance*		*Junior OC test violation avoidance*		*OC test violation avoidance* Subsample of CLOs that just pass or just miss an OC test	
Discretionary FV_traded loans	0.004		0.001		0.001		-0.001	
	(0.794)		(0.267)		(1.320)		(-0.163)	
Discretionary FV_non-traded loans	0.019***		0.006**		0.011***		0.010**	
	(3.330)		(1.981)		(3.176)		(2.549)	
Discretionary loan sale price to affiliates		0.003***		0.002*		0.020*		0.003***
		(3.238)		(1.911)		(1.855)		(2.711)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	3,726	2,253	3,726	2,253	3,726	2,253	1,469	889
Pseudo R^2	44.15%	27.81%	49.41%	34.80%	36.09%	22.32%	46.27%	48.82%

This table reports the results on the relation between discretionary loan fair values, strategic trading and the probability of a CLO just meeting an OC test. In Panel A, the independent variables of interest are: i) *Discretionary loan fair values*, defined as the difference between the fair value of defaulted or excess CCC-rated loans and the average fair value that other CLOs report for the same loans in the same month, averaged at the CLO-month level; ii) *Portfolio risk shifting*, defined as the percentage of the number of loans sold above their par value and the number of underperforming loans retained by a CLO, divided by the total number of portfolio loans; and iii) *Loan sales to affiliates*, defined as the percentage of the number of loan sales to affiliated CLOs divided by the total number of portfolio loan sales over a reporting month. In

column (1), the dependent variable equals one if a CLO passes its junior or senior OC test and the OC test slack is in the bottom quartile of the OC slack of CLOs that pass the tests, zero otherwise (*OC test violation avoidance*). In column (2) [(3)], the dependent variable equals one if a CLO passes its senior (junior) OC test and the senior (junior) OC test slack is in the bottom quartile of the senior (junior) OC slack of CLOs that pass the test, zero otherwise (*Senior* [*Junior*] *OC test violation avoidance*). In column (4), we restrict our sample to CLOs that just pass an OC test and CLOs that just miss the OC test (i.e., CLOs that violated an OC test and the OC test slack is in the top quartile of the OC slack of CLOs that violate the tests).
Panel B reports results that further corroborate the positive association between CLO managers' discretion in inflating loan fair values, loan sale prices to affiliated CLOs and the probability of just meeting an OC test. We categorize *Discretionary loan fair values* in discretionary fair value estimates related to traded loans, i.e., loans that traded at least once over the previous six months (*Discretionary FV_traded loans*), and non-traded loans, i.e., loans with no trades over this period (*Discretionary FV_non-traded loans*). *Discretionary loan sale price to affiliates* is the average price of portfolio loans sold to affiliated CLOs minus the average market price of these loans over the 30-day period around the loan sale to an affiliated CLO. The dependent variables and control variables (untabulated) are the same as in Panel A. All variables are defined in Appendix B. The values of the continuous variables are winsorized at 1% and 99%. We use a probit model across all columns, marginal effects are reported and z-statistics are in parentheses. Month, manager and trustee fixed effects are included but not tabulated. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. ∗∗∗, ∗∗ and ∗ denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.

Table 5

Changes in discretionary activities and OC test violation avoidance.

	(1)		(2)		(3)		(4)	
	OC test violation avoidance		*Senior OC test violation avoidance*		*Junior OC test violation avoidance*		*OC test violation avoidance* Subsample of CLOs that just pass or just miss an OC test	
d(Discretionary loan fair values)		0.005***		0.002***		0.006***		0.005*
		(3.489)		(3.111)		(3.595)		(1.674)
d(Portfolio risk shifting)	0.002**	0.005	0.001	0.003***	0.006**	0.006**	0.004**	0.007
	(2.303)	(1.627)	(0.701)	(3.050)	(1.972)	(2.459)	(2.374)	(1.290)
d(Loan sales to affiliates)	0.001**	0.002**	0.001*	0.000	0.002***	0.002***	0.002*	0.001
	(2.601)	(2.573)	(1.779)	(0.531)	(3.620)	(2.685)	(1.919)	(0.398)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	4,781	1,856	4,781	1,856	4,781	1,856	2,301	1,212
Pseudo R^2	33.56%	41.72%	39.76%	55.35%	19.97%	34.36%	49.75%	66.34%

This table reports the results on the relation between monthly changes in discretionary loan fair values and strategic trading and the probability of a CLO's just meeting an OC test. *d(Discretionary loan fair values)* is the change in discretionary loan fair valuation compared to the prior month's discretionary loan fair valuation, defined as the difference between the fair value of defaulted or excess CCC-rated loans and the average fair value that other CLOs report for the same loans in the same month, averaged at the CLO-month level. *d(Portfolio risk shifting*) is the change in portfolio risk shifting compared to the prior month's portfolio risk shifting, defined as the percentage of the number of loans sold above their par value and the number of underperforming loans retained by a CLO, divided by the total number of portfolio loans. *d(Loan sales to affiliates*) is the change in affiliated CLO sales compared to the prior month's affiliated CLO sales, defined as the percentage of the number of loan sales to affiliated CLOs divided by the total number of portfolio loan sales over a reporting month. All other variables are defined in Appendix B. Dependent variables and control variables (untabulated) are the same as in Table 4. The values of the continuous variables are winsorized at 1% and 99%. We use a probit model across all columns, marginal effects are reported and z-statistics are in parentheses. Month, manager and trustee fixed effects are included but not tabulated. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. ***, ** and * denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.

Table 6
Discretionary activities, CLO characteristics and OC test violation avoidance.

Panel A: Discretionary activities, CLO junior noteholders and OC test violation avoidance

	OC test violation avoidance			
	(1)	(2)	(3)	(4)
Discretionary loan fair values		0.013***		0.018***
		(4.445)		(6.903)
Portfolio risk shifting	0.023***	0.028***	0.021***	0.026***
	(3.781)	(2.906)	(3.503)	(3.006)
Loan sales to affiliates	0.007***	0.007***	0.011***	0.014***
	(4.220)	(2.813)	(5.328)	(4.278)
Junior noteholders	0.093	-0.187		
	(1.079)	(-1.550)		
Discretionary loan fair values				
× Junior noteholders		0.019**		
		(2.132)		
Portfolio risk shifting				
× Junior noteholders	-0.020**	-0.014*		
	(-2.121)	(-1.854)		
Loan sales to affiliates				
× Junior noteholders	-0.003	0.006		
	(-0.768)	(1.168)		
Call period			-0.142***	-0.133***
			(-2.713)	(-5.221)
Discretionary loan fair values				
× Call period				0.038***
				(4.142)
Portfolio risk shifting				
× Call period			-0.013**	-0.018*
			(-2.580)	(-1.883)
Loan sales to affiliates				
× Call period			-0.005**	-0.008*
			(-1.946)	(-1.809)
Controls	YES	YES	YES	YES
Obs.	6,012	3,726	6,012	3,726
Pseudo R^2	35.23%	42.97%	38.14%	48.22%

Panel B: Discretionary activities, CLO market conditions and OC test violation avoidance

	OC test violation avoidance			
	(1)	(2)	(3)	(4)
Discretionary loan fair values		0.014***		0.016***
		(5.054)		(5.340)
Portfolio risk shifting	0.015**	0.022***	0.013**	0.020**
	(2.458)	(2.679)	(2.279)	(2.395)
Loan sales to affiliates	0.007***	0.009***	0.007***	0.008***
	(4.542)	(3.286)	(4.267)	(3.383)

High defaulted/excess CCC-rated loans	-0.041	-0.120		
	(-0.679)	(-1.294)		
Discretionary loan fair values				
× High defaulted/excess CCC-rated				
loans		0.018**		
		(2.593)		
Portfolio risk shifting				
× High defaulted/excess CCC-rated				
loans	0.023**	0.019*		
	(2.182)	(1.886)		
Loan sales to affiliates				
× High defaulted/excess CCC-rated				
loans	-0.002	-0.004		
	(-0.673)	(-0.894)		
High market liquidity			-0.120***	-0.111
			(-2.781)	(-0.852)
Discretionary loan fair values				
× High market liquidity				0.002
				(0.515)
Portfolio risk shifting				
× High market liquidity			0.027***	0.026***
			(2.902)	(2.731)
Loan sales to affiliates				
× High market liquidity			-0.003	-0.004*
			(-1.510)	(-1.663)
Controls	YES	YES	YES	YES
Obs.	6,012	3,726	6,012	3,726
Pseudo R^2	36.01%	42.86%	35.90%	42.67%

This table reports the results on the role of CLO characteristics in managers' choice of discretionary activities to avoid an OC test violation. Panel A reports the results on the role of CLO junior noteholders in the use of discretionary activities to avoid an OC test violation. *Junior noteholders* is one if the ratio of a CLO's current junior note balance to senior note balance ranks in the upper quartile of the distribution of this ratio, zero otherwise. *Call period* is one if a CLO passed its reinvestment period, after which noteholders can usually withdraw their capital, zero otherwise. Panel B reports the results on the role of CLO market conditions in the use of discretionary activities to just meet an OC test. *High defaulted/excess CCC-rated loans* is one if the difference between the number of defaulted and excess CCC-rated loans reported by a CLO and the average number of defaulted and excess CCC-rated loans reported by other CLOs in the same month ranks in the upper quartile of the distribution, zero otherwise. *High market liquidity* is one if the monthly secondary securitized loan market liquidity (estimated as the number of the loan trades that CLOs report in a month) ranks in the upper quartile of the distribution, zero otherwise. In both panels, the dependent variable equals one if a CLO just passes an OC test, zero otherwise (*OC test violation avoidance*). All variables are defined in Appendix B. Controls (untabulated) include the same variables as in Table 4. The values of the continuous variables are winsorized at 1% and 99%. We use a probit model across all columns, marginal effects are reported and z- statistics are in parentheses. Month, manager and trustee fixed effects are included but not tabulated. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. ∗∗∗, ∗∗ and ∗ denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.

Table 7
Discretionary activities and future CLO portfolio performance.

	Subsample of CLOs that just pass an OC test			Subsample of CLOs that just pass or just miss an OC test		
	(1) *Senior* OC_{m+6}	(2) *Junior* OC_{m+6}	(3) *CLO note* $downgrade_{m+6}$	(4) *Senior* OC_{m+6}	(5) *Junior* OC_{m+6}	(6) *CLO note* $downgrade_{m+6}$
Discretionary loan fair values$_m$	-0.000	-0.000	0.001	-0.000*	-0.006	-0.001
	(-0.827)	(-0.199)	(1.061)	(-1.921)	(-0.405)	(-0.144)
Portfolio risk shifting$_m$	-0.007***	-0.001***	0.025*	-0.009***	-0.001**	0.028**
	(-2.938)	(-2.955)	(1.830)	(-5.500)	(-2.463)	(2.534)
Loan sales to affiliates$_m$	0.000	0.000	0.014	0.000	0.000	0.004
	(0.247)	(0.823)	(0.919)	(0.100)	(1.463)	(1.318)
OC test violation avoidance$_m$				0.008	-0.022	0.227***
				(0.904)	(-1.221)	(2.723)
Discretionary loan fair values$_m$ × *OC test violation avoidance*$_m$				0.001	-0.001*	0.005
				(1.084)	(-1.757)	(0.757)
Portfolio risk shifting$_m$ × *OC test violation avoidance*$_m$				-0.014***	-0.007**	0.023*
				(-2.834)	(-2.506)	(1.706)
Loan sales to affiliates$_m$ × *OC test violation avoidance*$_m$				0.000	-0.000	0.016
				(0.300)	(-0.170)	(1.251)
Defaulted loan bucket$_m$	-0.001	-0.002***	0.004	0.005**	0.000	0.009
	(-0.630)	(-3.522)	(0.297)	(2.593)	(0.011)	(1.321)
CCC-rated loan bucket$_m$	-0.002**	0.001	0.004	0.002**	-0.000	0.006
	(-2.615)	(1.351)	(0.386)	(2.225)	(-0.026)	(1.069)
Average portfolio rating$_m$	0.014*	0.002	0.199***	0.003	0.003	0.012
	(1.839)	(0.838)	(2.714)	(1.548)	(0.549)	(0.712)
Senior OC_m	0.487***	0.105***	-0.690*	0.899***	0.154***	0.008
	(4.563)	(4.083)	(-1.820)	(13.992)	(4.777)	(0.388)
Junior OC_m	-0.053	0.586***	-0.024	0.003*	0.408**	-0.016**
	(-1.502)	(9.519)	(-1.447)	(1.933)	(2.156)	(-1.998)

Portfolio size$_m$	-0.099***	-0.010*	0.023	-0.015	0.024*	-0.094
	(-6.452)	(-1.749)	(0.202)	(-1.267)	(1.742)	(-1.334)
Obs.	647	647	647	1,104	1,104	1,104
(Pseudo) R^2	73.48%	60.06%	52.71%	53.40%	58.41%	61.14%

This table reports the results on the relation between discretionary loan fair valuation, strategic trading and future CLO portfolio performance. In columns (1)-(3), we restrict our sample to CLOs that just meet the senior or junior OC tests. In columns (4)-(6), we restrict our sample to CLOs that just meet or just miss the senior or junior OC tests in the current month and examine their relative future performance. The dependent variable in columns (1) and (4) is the natural logarithm of the CLO senior overcollateralization ratio six months ahead (*Senior OC*$_{m+6}$). The dependent variable in columns (2) and (5) is the natural logarithm of the CLO junior overcollateralization ratio six months ahead (*Junior OC*$_{m+6}$). The dependent variable in columns (3) and (6) is one if a CLO note's credit rating is downgraded over the following six months and zero otherwise (*CLO note downgrade*$_{m+6}$). All variables are defined in Appendix B. The values of the continuous variables are winsorized at 1% and 99%. We use OLS regressions to estimate columns (1), (2), (4) and (5), and coefficients are reported and t-statistics are in parentheses. We use a probit model to estimate columns (3) and (6), and marginal effects are reported and z-statistics are in parentheses. Month, manager and trustee fixed effects are included but not tabulated. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. ∗∗∗, ∗∗ and ∗ denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.

Table 8

Discretionary activities and CLO note prices.

	CLO note price$_{m+1}$		
	(1)	(2)	(3)
Discretionary loan fair values$_m$	0.002		-0.003
	(1.189)		(-1.052)
Portfolio risk shifting$_m$		0.106	0.110
		(0.811)	(0.727)
Loan sales to affiliates$_m$		0.002*	0.000
		(1.735)	(0.023)
OC test violation avoidance$_m$	-0.007	-0.018	0.070
	(-0.093)	(-0.956)	(1.014)
Discretionary loan fair values$_m$			
× *OC test violation avoidance*$_m$	-0.004		-0.004
	(-0.985)		(-0.615)
Portfolio risk shifting$_m$			
× *OC test violation avoidance*$_m$		-0.033*	-0.065**
		(-1.869)	(-2.294)
Loan sales to affiliates$_m$			
× *OC test violation avoidance*$_m$		-0.010*	-0.011
		(-1.664)	(-0.655)
CLO note rating$_m$	-0.003	-0.003**	-0.001
	(-0.611)	(-2.154)	(-0.331)
CLO note amount traded$_m$	0.029	0.011*	0.035**
	(1.082)	(1.895)	(2.122)
Controls$_m$	YES	YES	YES
Obs.	193	503	193
R^2	70.80%	66.92%	78.28%

This table reports the results on the relation between CLO note prices in the secondary market and discretionary activities when OC tests are binding. The dependent variable is the natural logarithm of the average note sale price one month ahead (*CLO note price*). *CLO note amount traded* is the natural logarithm of average note face amount traded. *Note rating* is a scale variable that equals to 1 if the traded note's credit rating is AAA (or Aaa), 2 for AA+ (or Aa1), and so forth, averaged at the CLO-month level. All other variables are defined in Appendix B. Controls include the same variables as in Table 4. The values of the continuous variables are winsorized at 1% and 99%. We use an OLS model across all columns, coefficients are reported, and t-statistics are in parentheses. Month, manager, trustee and note seniority (senior, junior, equity) fixed effects are included but not tabulated. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. ***, ** and * denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.

Table 9
Sensitivity analyses.

Panel A: Redefining discretionary loan fair values

	OC test violation avoidance			
	(1)	(2)	(3)	(4)
Pct. of overvalued loans	0.150**			
	(2.531)			
Loan fair value –median loan fair value reported by other CLOs		0.012**		
		(2.423)		
Mode(Discretionary loan fair values)			0.009**	
			(2.403)	
Loan fair value –average market price of below CCC-rated loans				0.029**
				(2.096)
Portfolio risk shifting	0.024***	0.027***	0.025***	0.032**
	(2.822)	(3.221)	(3.197)	(2.474)
Loan sales to affiliates	0.007**	0.007***	0.007***	0.007*
	(2.547)	(2.895)	(2.958)	(1.942)
Controls	YES	YES	YES	YES
Obs.	3,726	3,726	3,059	1,353
Pseudo R^2	46.45%	44.72%	44.70%	55.25%

Panel B: Redefining OC test violation avoidance

	OC test slack 1%	*OC test slack 3%*
Discretionary loan fair values	0.003***	0.013***
	(2.965)	(4.669)
Portfolio risk shifting	0.006***	0.032***
	(2.752)	(3.287)
Loan sales to affiliates	0.001	0.013***
	(1.204)	(4.026)
Controls	YES	YES
Obs.	3,726	3,726
Pseudo R^2	32.18%	32.44%

Panel C: Discretionary activities and OC test violation avoidance over the credit cycle

	OC test violation avoidance	
	Credit crisis (2008-2010)	Credit expansion (2011-2013)
Discretionary loan fair values	0.014***	0.016***
	(2.829)	(4.669)
Portfolio risk shifting	0.023***	0.012**
	(2.667)	(2.287)

Loan sales to affiliates	0.014***	0.005**
	(3.692)	(2.577)
Controls	YES	YES
Obs.	1,740	1,986
Pseudo R^2	34.42%	48.82%

This table reports the results of the robustness checks. Panel A reports the results on the relation between discretionary loan fair values and the probability of a CLO just meeting an OC test under different definitions of discretionary loan fair valuation. *Pct. of overvalued loans* is the percentage of defaulted and excess CCC-rated loans with reported fair values that are higher than the fair values that other CLOs report for the same loans in the same month, averaged at the CLO-month level. *Loan fair value –median loan fair value reported by other CLOs* is the difference between the fair value of defaulted or excess CCC-rated loans and the median fair values of the same loans reported by other CLOs in the same month, averaged at the CLO-month level. *Mode(Discretionary loan fair values)* is the mode of discretionary loan fair values reported by a CLO. *Loan fair value –average market price of below CCC-rated loans* is the difference between the fair value of a defaulted or excess CCC-rated loan reported by a CLO and the average market price of below CCC-rated loans traded in the same month. Panel B reports the results on the relation between discretionary loan fair values and the probability of a CLO just meeting an OC test when redefining OC test violation avoidance. *OC test slack 1%* is one if the senior or junior OC test slack is greater than zero and lower than 1%, zero otherwise. *OC test slack 3%* is one if the senior or junior OC test slack is greater than zero and lower than 3%, zero otherwise. Panel C reports the results on the relation between discretionary loan fair values, strategic trading and the probability of a CLO just meeting an OC test over the credit crisis (2008-2010) and credit upturn (2011-2013). All other variables are defined in Appendix B. Control variables (untabulated) are the same as in Table 4. The values of the continuous variables are winsorized at 1% and 99%. We use a probit model, marginal effects are reported and z-statistics are in parentheses. Month, manager and trustee fixed effects are included but not tabulated. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. ∗∗∗, ∗∗ and ∗ denote significance at the 1%, 5% and 10% (two-sided) levels, respectively