Insurance companies and the growth of corporate loans' securitization

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Abstract

Insurance companies have almost nonupled their investments in collateralized loan obligations (CLOs) in the post-crisis period, reaching total holdings of $125B in 2019. The growth in CLOs' investments has far outpaced that of loans and corporate bonds, and was characterized by a strong preference for mezzanine tranches rated investment grade over triple-A rated tranches. We show that insurance companies' investment preferences reflect a search for yield behavior. Conditional on capital charges, insurance companies invest more heavily in bonds and CLO tranches with higher yields. However, insurance companies prefer CLO tranches because they carry higher yields relative to bonds with the same rating. Further, these preferences increased following the 2010 capital regulatory reform, resulting in insurance companies holding more than 40% of mezzanine tranches outstanding in 2019. Finally, we document that insurance companies' demand for risky tranches played a critical role in the rise of corporate loan securitization over the last decade, and contributed positively for the returns of investors of CLOs' equity holders.

1 Introduction

U.S. CLO issuance increased by a factor of thirteen in the post crisis-decade, with the volume of outstanding CLOs more than doubling and reaching almost $647B by 2019 (Figure 1-2).[1] This growth has caught the attention of researchers who have investigated its impact on the cost and risk of corporate loans, the amplification of credit cycles, and the stability of the financial system.[2] However, to date little attention has been devoted to the drivers of that phenomenon. That is the subject of this paper. We are particularly interested in understanding the role that insurance companies have played in the growth of corporate loans' securitization and identify the key factors behind that role.

We begin by analysing the investment behavior of insurance companies in CLOs, corporate bonds and bank loans. Insurance companies have almost nonupled their CLO holdings in the last decade, reaching $125B in 2019. The growth in CLO investments has far outpaced that of loans and corporate bonds, and was characterized by a preference for mezzanine tranches (Aa, A or Baa rated) over triple-A tranches. Insurers' proclivity towards CLOs vis-à-vis other securities, and towards mezzanine tranches rated investment grade within the CLO asset class, reflect a search for yield behavior.

Similar to Becker and Ivashina (2015), we argue that insurers' incentives to reach for yield stem from the capital adequacy regulation's coarse treatment of risk. However, in contrast to Becker and Ivashina (2015), we show those incentives also arise from the regulation's similar treatment of corporate bonds and CLO tranches and are more prevalent in CLO investments. Specifically, capital requirements for asset risk associated with fixed income investments are defined for six macro buckets of securities' credit

[1] Figures estimated on data from Moody's Analytics Structured Finance Portal. Similar figures are reported for the time period 2003-2018 by (NAIC, 2018b) and SFIMA at `https://www.sifma.org/resources/research/us-fixed-income-securities-statistics/`. Our figures underestimate the 2019 values because our data ends in November 2019.

[2] Researchers have investigated the impact of corporate loan securitization on the risk and cost of bank loans (Wang and Xia, 2010; Shivdasani and Wang, 2011; Benmelech et al., 2012; Nadauld and Weisbach, 2012; Bord and Santos, 2015); amplification of credit cycles (Ivashina and Scharfstein, 2010), and and the risk to financial stability (IMF, 2020; BoE, 2019; FSB, 2019; Ivashina and Vallée, 2020; SEC, 2020).

quality named "NAIC designations" (NAIC, 2018a, 2020). Insurers assign a NAIC designation (and the associated risk-based capital charge) to each investment according to a mapping from credit ratings. For example, a security rated triple-A, Aa or A falls into the NAIC 1 designation (i.e., the NAIC bucket corresponding to the highest credit quality), whereas a security rated Baa is designated as NAIC 2. While the NAIC 1 category is mapped to three notches of credit rating (Aaa, Aa and A), all the other NAIC buckets are associated only to one rating class. This implies that asset holdings falling into the NAIC 1 designation are characterized by a significantly marked heterogeneity in terms of credit risk, albeit requiring the same amount of regulatory capital. In light of this discontinuous structure of capital requirements for asset risk, we conjecture that, conditional on the NAIC designation bucket, insurance companies invest more heavily in assets (bonds and CLO tranches) with higher yields.

Perhaps more importantly, in contrast to bank capital regulation which treats corporate bonds differently from CLO tranches, the capital regulatory framework of insurance companies did not distinguish between these securities (except in certain circumstances described next). Yet, as we document, CLO mezzanine tranches, other than the triple-A tranche, tend to carry higher yields than corporate bonds with the same credit rating. This leads us to conjecture that insurance companies have a preference for CLOs' mezzanine tranches over corporate bonds with the same credit rating. These preferences were enhanced after 2010 when the National Association of Insurance Commissioners (NAIC) enacted a regulatory change of capital requirements for CLO holdings. That change was part of a broader reform initiated in 2009 and focused on mortgage-backed securities (MBS) as well, which aimed at providing capital relief to the insurance sector amid the massive wave of downgrades on asset-backed securities during the financial crisis (Becker et al., 2022; NAIC, 2021). The new capital regime for CLO investments remained effective until 2018 and was eventually repealed in 2019. In essence, the reform allowed insurance companies to report CLO tranches purchased at

discount or highly impaired in a lower NAIC category than that implied by the rating-based mapping. The scope of this rule was broad, as it encompassed both legacy and new investments in CLOs, potentially affecting insurers' investment behavior. We, thus, hypothesize that, conditional on the capital charge, insurance companies' incentives to invest in higher yielding CLO tranches increased after the 2010 regulatory reform.

Insurance companies' preference for CLO mezzanine tranches together with their growing importance in this segment of the CLO market likely played a role in the rise of the CLO issuance we observed in the last decade. This is our last hypothesis. In particular, we investigate whether CLO deals in which insurance companies invest more heavily are characterized by a larger fraction of mezzanine tranches. Mezzanine tranches are critical for CLOs because their junior position allows for the production of triple-A tranches. However, in contrast with the latter which are sought by banks, there is far less demand for mezzanine tranches. This is because bank capital regulation treats triple-A tranches favorably while at the same time taxes heavily banks' investments in all of the other CLO tranches.

We use granular data on insurers' fixed income holdings at the security-company-year level to investigate if insurance companies hold a larger share of securities offering a higher yield within a NAIC designation bucket (once having accounted for asset size, maturity date and insurer's conditions). We restrict our sample to CLO tranches and corporate bonds for which we have information on issuance and outstanding amounts throughout their lifetime. In addition, since the balance of CLOs might vary over time due to refinancing or principal amortization once the reinvestment period has ended, we consider only first-time investments of each insurance company in a given security.

In line with our prediction, we find that insurance companies invest more heavily in securities with higher yields within a NAIC designation bucket. An increase in the yield by one standard deviation implies an increase in the insurer's holding share by 14 basis points, which corresponds to an additional investment of $93 million for the

median security in portfolio. Moreover, insurance companies search for yield primarily within the CLO asset class, which is characterized by a higher dispersion of yields.

We next explore a potential heterogeneity in insurers' investment behavior over time periods and across firm attributes. We document that insurance companies search for yield both in the pre-crisis period, when interest rates were relatively high, and in the post-crisis period, when interest rates were close to the zero lower bound, whereas they did not invest significantly more in higher yielding securities during the financial crisis. Overall, this suggests that insurers' propensity to search for yield is stronger in periods of economic expansion, regardless of the level of interest rates. However, in terms of magnitude, the phenomenon is more pronounced in the post-crisis decade than the pre-crisis period, pointing to a higher risk-taking in an environment of contained interest rates compared to a context of relatively high interest rates. Consistent with our priors, insurers' search for yield within the CLO asset class increased during the years the 2010 regulatory reform was in place.

With regards to firm attributes, we find that, conditional on the capital requirement bucket, low-capital insurers hold higher fractions of high yielding securities, consistent with their higher risk-shifting incentives (Jensen and Meckling, 1976). We also find that insurance companies that stood to benefit from the 2010 reform are more prone to search for yield following the implementation of the new rules. Finally, we show that among property and casualty (P&C) insurers, those highly affected by the devastating natural disasters of 2017 (as captured by the yearly change in net income) are more prone to search for yield vis-à-vis lowly affected companies in that year.

In the second part of our empirical analysis, we document how insurers' search for yield behavior translated into a preference for CLO over corporate bond investments. To this end, we focus the attention on securities rated investment grade which account for most of the assets in portfolio. We first show that, on average, the yield on new investments by insurance companies in CLOs is significantly higher than the yield on new

investments in corporate bonds with the same rating. In addition, the yields differential widens for decreasing levels of credit quality, as captured by the assets' ratings. These patterns map to insurers' investment preferences in a one-to-one fashion. We find that insurance companies purchase a larger portion of CLO tranches compared to corporate bonds with the same rating and this behavior is more pronounced for the lower rating classes. Additionally, we show that insurance companies purchase a larger portion of CLO tranches compared to corporate bonds with the same rating the larger is the ratio of the average yield on insurers' investments in CLOs to the average yield of insurers' investments in corporate bonds for each specific rating-year combination.

We explore how insurers' preference for CLOs over corporate bonds evolved over time. We find that, in the pre-crisis period, when CLOs carried roughly the same or even a lower yield than corporate bonds, insurance companies purchased a lower portion of CLO tranches compared to corporate bonds with the same rating. But when the yields on CLOs became significantly higher than the yields on corporate bonds during the financial crisis and especially in the post-crisis decade, insurance companies changed their investment behavior exhibiting a marked preference for CLOs over corporate bonds with the same rating. As an alternative approach to explore the preference of insurers for CLOs vis-à-vis corporate bonds, we focus the attention on a different metric, namely the amount of insurers' CLO holdings as a percentage of the total new investments in CLOs and corporate bonds. We show that insurance companies allocate a larger share of their portfolio to CLO tranches the larger is the yields differential between CLOs and corporate bonds.

In the final part of our paper, we study the implications of insurance companies' search for yield for the CLO market. We show that, while insurers' market share of corporate bonds decreased somewhat from 2003 to 2019, that of CLOs almost quintupled over the same time period. Importantly, that increase was mostly driven by mezzanine tranches rated investment grade (Aa, A or Baa rated), whose market share increased by

a factor of eight (from 5% in 2009 to 44% in 2019). This phenomenon was particularly pronounced for A rated tranches, with insurance companies holding more than 50% of their outstanding volume at year-end 2019. Our investigation of the role of insurance companies on the design of CLO deals shows that deals in which insurance companies have larger investments do have larger mezzanine tranches rated investment grade.

Beside the waterfall structure of CLO deals, we explore many other dimensions in which insurers' proclivity towards CLO tranches relates to the design of CLO deals. We show that CLO deals with a larger holding share by insurance companies have a larger fraction of debt tranches with a fixed-rate coupon, are more likely to be tailor made repackaged CLO deals, have a short non-call period and are more likely to be refinanced, all features indicating that CLO managers construct CLO deals accounting for insurers' demand of CLO tranches.

We complement our analysis presenting some evidence that speaks to the direction of causation. We show that the positive correlation between the share of a CLO deal held by insurance companies and the size of the mezzanine tranches (rated Aa, A or Baa) relative to the deal, along with all the correlations identified for each of the other metrics, are stronger during the time the 2010 regulatory reform was in place. Additionally, we find that in many instances the aforementioned relationships are more pronounced among CLOs issued during the 2010 reform period and held by insurance companies that stood to benefit from the reform. Overall, this adds support to our thesis that insurance companies' preference for CLOs played a role in the growth of corporate loan secularization over the last decade.

We conclude our empirical investigation showing that CLO deals with larger investments by insurers relative to their size invest in riskier loans, consistent with the fact that they are characterized by a larger share of mezzanine tranches. However, the higher returns generated by such underlying riskier loans are catered only to holders of equity tranches, suggesting that CLO equity holders rather than debt holders have

benefited from insurance companies' strong preference for CLO mezzanine tranches.

Our paper is most closely related to the literature on insurance companies' search for yield by arbitraging regulation, including Becker and Ivashina (2015), Becker et al. (2022) and Liu (2019).[3] Becker and Ivashina (2015) document how capital regulation applied to insurers' bond holdings generates incentives to invest in higher yielding corporate bonds conditional on a NAIC designation bucket. We show that such incentives extend beyond corporate bonds also affecting investments in CLO tranches, as well as the portfolio allocation between these two asset classes. More importantly, we document that insurers' search for yield is more pronounced within the CLO space compared to corporate bonds and that insurers' bias towards higher yielding CLOs has had an impact on the design of CLO deals. Our results unveil an important role played by insurance companies as investors in the CLO market, contributing to the expansion of corporate loan securitization observed in the last decade.

Becker et al. (2022) study the effect of the 2009-2010 regulatory reform of capital requirements for investments in mortgage-backed securities on insurance companies' propensity to purchase and hold these assets. We show that, while the extension of the scope of the reform to CLO holdings reinforced insurers' incentives to search for yield within the CLO asset class, these incentives are at work even prior to the reform and depend crucially on the rating-based framework of capital requirements. In addition, our work takes one step forward exploring how insurers' appetite for CLOs affected the design of corporate loan securitization.

Exploiting a change in state laws that legalized in-state financial reinsurance veichles, Liu (2019) investigates how a decrease in insurers' cost of equity affects their underwriting growth and investment risk. Our work explores, instead, insurers' search for yield incentives conditional on the capital requirement (and, hence, the cost of capital)

[3]Studies looking at banks' risk-taking incentives due to regulatory arbitrage include Kroszner and Strahan (2011); Acharya and Steffen (2015); Karolyi and Taboada (2015); Boyson et al. (2016); Demyanyk and Loutskina (2016); Boyer and Kempf (2020); Buchak et al. (2020).

associated to a given security held in portfolio.

Additionally, our paper is related to the literature on the growth of securitization, in particular corporate loan securitization (Ivashina and Scharfstein, 2010; Wang and Xia, 2010; Shivdasani and Wang, 2011; Benmelech et al., 2012; Nadauld and Weisbach, 2012; Bord and Santos, 2015; Ivashina and Vallée, 2020). Our paper paper expands this literature by studying the role of insurance companies as investors in CLOs.[4] We show that, as of 2019, insurance companies account for about half of the investor base of CLO mezzanine tranches rated investment grade, contributing substantially to the demand of mezzanine tranches which is crucial in the origination process of CLOs as it allows for the creation of the highly sought triple-A tranches.

Lastly, our paper is related to the literature on the search for yield incentives during protracted periods of low interest rates. Most of the studies so far, including Peydro and Maddaloni (2011), Jimenez et al. (2014), Ioannidou et al. (2015), Dell'Ariccia et al. (2017), and Paligorova and Santos (2017) focused on banks. Our paper adds to this literature by uncovering a link between low interest rates and insurance companies' search for yield.

The rest of our paper is organized as follows. Section 2 describes insurance companies' capital regulation. That section also lays out the hypotheses we investigate. Section 3 describes our data sources and characterizes our sample. Section 4 presents the results of our investigation of insurance companies' search for yield in the CLO and corporate bond markets. Section 5 discusses how insurers' search for yield behavior translated into a preference for CLOs over corporate bonds. Section 6 presents evidence from the CLO market from insurance companies' preference for CLOs over corporate bonds. Section 7 concludes the paper.

[4]Foley-Fisher et al. (2020) document the increasing participation of insurance companies as CLO issuers through their affiliated asset managers. Our focus, instead, is on insurance companies' participation in the CLO market as investors.

2 Hypotheses: Insurance Companies' Preferences for CLOs

2.1 Insurance Companies' Investments Over Time

Insurance companies are known for investing heavily in corporate bonds and corporate loans, (Becker and Ivashina, 2015) and (Bord and Santos, 2012), respectively. What is perhaps less understood is their increasing preference for CLOs (NAIC, 2018b), particularly in the post Great Recession era (Figure 3). Between 2009 and 2019, insurance companies' investments in corporate bonds went from \$1,143B to \$1,784B, corresponding to a 56% increase. During that same period of time, their investments in corporate loans went from \$18B to \$42B, a 132% increase. In the case of CLOs, their investments went from \$13B to \$125B, a 863% increase.[5]

The increase in insurance companies' CLO investments is remarkable in many ways. Back in 2009, CLO investments were comparable to their loan investments. Yet, over the decade that followed CLO investments' growth was more than six times larger than loan investments. Further, insurance companies showed a clear preference for the mezzanine tranches (rated Aa, A or Baa) over the safest triple-A rated tranches (Figure 5). In 2011, 56% of insurance companies' CLO investments were in triple-A rated tranches while 40% were in mezzanine tranches.[6] By 2019, the former had declined to 44% while the latter had risen to 52%. For comparison, over the same time period the rating composition of insurance companies' bond investments remained mostly unchanged, with 80% invested in bonds rated single A or Baa (Figure 4).[7]

Insurance companies' increasing preference for mezzanine tranches has potentially relevant implications for the market for CLOs. Insurance companies' market share

[5]Figures are calculated by aggregating the par-value of insurers' investments in bonds, loans and CLOs. For reference, NAIC (2018b) reports that insurance companies' CLO exposure in 2018 was \$122B, which is somewhat higher than our estimate for that year (\$113B), possibly because we only consider CLOs issued in USD.

[6]The sharp drop and rebound in the share of triple-A tranches in 2008-11 reflect rating downgrades during the financial crisis and subsequent upgrades.

[7]Limited availability of information on credit ratings assigned to bank loans prevents us from decomposing the time series of loan investments across rating categories.

of corporate bonds exhibits a slightly downward trend (although with a twist in the immediate post-crisis period) over the course of 2003-2019, moving from 21% in 2003 to 18% in 2019 (Figure 6). This downward trend is common across bonds rated Aa and below, whilst the market share of triple-A bonds remained at around 6% during that period (Figure 7). By contrast, insurers' market share of CLO tranches exhibits a monotonic and large increase throughout the sample period, moving from 4% in 2003 to 19% in 2019. This growth was mostly driven by mezzanine tranches Aa, A or Baa rated, whose aggregate market share went from from 5% in 2009 to 44% in 2019 (Figure 8). As a result, by 2019 insurance companies owned more than 50% of outstanding A-rated tranches (by par value), while their market shares of Aa and Baa tranches reached 42% and 39%, respectively.[8]

An alternative way to ascertain the importance of insurance companies in the CLO market is to look at their investments relative to the size of tranches in CLO deals. In our sample, investment grade rated mezzanine tranches (Aa, A and Baa rated) correspond to 22% of a CLO deal at issuance, whereas triple-A tranches represent on average 62%, with the remaining 16% being junior tranches and the equity tranche. According to our estimates, insurance companies buy more that half of mezzanine tranches. That alone suggests insurance companies play an important role in the CLO market, but their importance goes beyond what these figures suggest. The reason is that there is plenty of demand for Aaa rated tranches, especially from banks due to the favorable treatment in capital regulation. Banks, however, play only a marginal role when it comes to the mezzanine tranches ((DeMarco et al., 2020; IMF, 2020)). But that is precisely where insurance companies have a preference to invest. In other words, insurance companies by owning a large fraction of the risky tranches that are not attractive to banks have

[8]Our estimates represent a lower bound because of the conservative approach we adopted to identify CLO tranches held in insurers' portfolio, as described in section 3. Indeed, our estimate is somewhat below DeMarco et al. (2020) estimate that domestic insurance companies held approximately 60% of Cayman-issued U.S. CLO tranches Aa, A or Baa rated in 2018 using Treasury International Capital (TIC) data. According to Liu and Schmidt-Eisenlohr (2019), Cayman-issued U.S. CLOs represent approximately 74% of total U.S. CLO securities in 2018.

become a critical player in the securitization of corporate loans.

This raises an important question: why have insurance companies become so attracted to CLOs in general and their mezzanine tranches in particular? Changes in the relative yields likely played a role: In the post-crisis decade, yields on bonds held by insurers declined across all rating categories (Figure 9). In contrast, yields remained flat for CLO tranches rated investment grade and increased for the riskiest tranches (Figure 10). These differences alone, however, do not explain insurance companies' growing preference for CLOs' mezzanine tranches. As we argue next, that preference derives from three features of their capital regulation.

2.2 Insurance Companies' Capital Regulation

The first important feature is the absence of a strictly increasing relationship between capital requirements and asset risk. Capital requirements for fixed income investments, including corporate bonds, loans and CLOs, are calculated as a weighted sum of the book value of these investments, with weights equal to a risk-based capital charge that captures the credit risk of each asset.[9] The risk-based capital charge is defined for six different buckets of assets' credit quality named "NAIC designations" (NAIC, 2018a, 2020). A NAIC 1 designation corresponds to securities with the highest credit quality, whereas a NAIC 6 designation corresponds to securities with the lowest credit quality. Insurance companies assign a NAIC designation to fixed income investments according to a mapping from credit ratings (Table 1). For example, securities rated Aaa, Aa or A receive the NAIC 1 designation and are subject to a (post-tax) risk-based capital charge of 0.3%. This means that for an investment of $100 in a NAIC 1 security, an insurance company must hold $0.3 in equity capital. Lower credit ratings are associated with higher NAIC designations and risk-based capital weights.[10] While the NAIC 1

[9] Appendix A provides a broad overview on insurers' capital regulation.

[10] Post-tax risk-based capital charges for NAIC designations 2 through 6 differ slightly across insurers' lines of business.

designation is mapped to three different credit ratings (Aaa, Aa, A), all of the other NAIC categories are associated to a unique rating. This design, therefore, implies that insurance companies are required to set aside the same amount of regulatory capital for a subset of investments that carry different yields and expose them to different levels of credit risk (those rated Aaa, Aa, A).

A second feature of insurance companies' capital regulation that likely played a role on their preference for CLOs is the equal treatment the regulation gives to debt securities with the same credit rating. Given that CLO tranches, other than those rated triple A, usually carry higher yields than equally rated corporate bonds, this likely played a role in insurance companies' preference for CLOs' mezzanine tranches rated investment grade.

The third and last feature of the capital regulation relevant to understand insurance companies' growing preference for CLOs' mezzanine tranches has to do with the regulatory change implemented after the Great recession. The mapping presented in Table 1 was applied during the time period considered in our study (2003-2019), except for mortgage backed securities (MBS) and CLOS which were subject different standards starting in 2009 and 2010, respectively. In 2009, the NAIC changed the capital requirements for investments in residential MBS to provide some relief to the insurance industry which was negatively affected by the wave of downgrades in MBS during the subprime crisis (Becker et al., 2022; NAIC, 2021). The new regulation was extended to commercial MBS and CLO investments in 2010 (Foley-Fisher et al., 2020), although the calculation of capital requirements for CLOs and MBS under the new regime were substantially different (NAIC, 2017).

The new framework introduced the so-called "modified filing exempt", MFE, method, which allowed insurers to assign CLO tranches purchased at discount or highly impaired a lower NAIC designation than the designation implied by the rating-based sys-

tem of Table 1.[11] This regulatory regime remained in place until the reporting year 2018 (NAIC, 2019b). Starting in 2019, the ratings-based approach of Table 1 was restored.

Insurance companies appear to have exploited the regulatory reform to reduce capital charges associated with their CLO investments. Insurance companies were required to report separately the volume of CLO investments in the NAIC 1 category that would be in a different NAIC designation absent of the MFE approach. As we can see from Figure 12, the percentage of NAIC 1 CLO investments acquired under the MFE approach is indeed different from zero during the time period where the reform was in place (2010-2018) and reaches its peak of 15% in 2015.[12] Therefore, this regulatory change likely played a role on insurance companies' growing preference for CLO tranches rated investment grade.

2.3 Hypotheses

We build on the features of the capital regulation discussed above to specify the three hypotheses which we investigate, starting with insurance companies' preference for higher yielding securities, then going onto their preferences for CLO investments, in particular mezzannine tranches, and culminating with their impact on the CLO market.

The six-bucket designation system used in the insurance companies' capital regulation implies that the relationship between asset risk and cost of capital is a step function and, hence, not strictly increasing. Similar to Becker and Ivashina (2015) conjecture on insurance companies' corporate bond investments, this leads us to the conjecture that insurers have incentives to maximize the return on their investments both in the bond market and the CLO market, i.e., to search for yield.

Hypothesis 1: Insurance companies have an incentive to invest in higher yielding secu-

[11] Appendix B describes in detail the 2010 regulatory reform.

[12] This information appears to be accurate because as we can see from that figure it follows closely the percentage of NAIC 1 CLO holdings that have a rating different from Aaa, Aa or A.

rities (CLO tranches and corporate bonds) within a NAIC designation bucket.

The capital regulatory framework of insurance companies does not distinguish CLO tranches from corporate bonds with the same rating. However, as we document, CLO tranches, other than the triple-A tranche, tend to carry higher yields than corporate bonds with the same credit rating. This gives us our second hypothesis.

Hypothesis 2: Insurance companies have a preference for CLO mezzanine tranches (those rated Aa, A and Baa) over corporate bonds with the same credit rating.

We focus on mezzanine tranches above investment grade because insurance companies usually do not invest in below-grade rated securities (Figure 4 and Figure 5).

The modified regulatory regime applied to CLOs in 2010-2018 altered the monotonic relationship between asset risk and cost of capital implied by the rating-based mapping. This is especially true for the risky tranches that are more likely to be downgraded, bear a loss, or be purchased at discount. Since the regulatory reform applied to both legacy and new investments in CLOs, the reform likely further tilted insurance companies' preferences for CLOs. We capitalize on this reform to consider two variants of our Hypotheses 1 and 2 where we postulate that insurance companies' search for yield and preferences CLO tranches rated investment grade (relative to bonds), respectively, increased after the 2010 regulatory reform.

Our last hypothesis is about the impact of insurance companies in the market for CLOs. Banks, the major investor in the CLO market, have strong disincentives to invest in CLO tranches that are not rated triple-A. Yet, those tranches are critical for the creation of banks' favored triple-A tranches. Given insurance companies' preference for the CLO mezzanine tranches and their growing importance in the CLO market we hypothesize they had an impact on the CLO market.

Hypothesis 3: Insurance companies' impact on CLO market:
3.1: CLO deals in which insurance companies invest more heavily have a larger fraction

of mezzanine tranches (rated investment grade).

3.2: CLO deals in which insurance companies invest more heavily have a preference for riskier corporate loans.

We test these hypotheses in the next three sections.

3 Data Sources and Sample Characterization

3.1 Data Sources

Our main data source is "Schedule D-Part 1" of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC during 2003-2019. That schedule includes information at the security level on virtually all fixed-income holdings of insurance companies as of December 31 of each year. Schedule D reports for each security investment: the par value, book value, purchase cost, nominal interest rate, effective yield, NAIC designation, purchase date, and maturity date.

Given that Schedule D does not identify all types of securities, we rely on a suite of matching exercises and textual analysis to identify the assets we are interested in (CLOs, corporate bonds, and bank loans).[13] We identify CLO holdings via CUSIP matching and fuzzy matching using historical data on CLO tranches from Moody's Analytics Structured Finance Portal. We identify corporate bonds via CUSIP matching using data from Mergent Fixed Income Securities Database (FISD). We also attempted to identify insurance companies' corporate loan investments but opted for not including these in our study.[14] This was because corporate loans often lack a unique identifier across different data sets/providers. Further, we had access to limited information on outstanding volumes and credit ratings of corporate loans.

[13]The only exception are corporate loans for the years of 2018 and 2019 which are reported in two separate subsections named "bank loans issued" and "bank loans acquired".

[14]We used textual analysis, as well as CUSIP matching and fuzzy matching combining data on syndicated loans from DealScan and Loan Syndications and Trading Association (LSTA), loan funds' holdings from Lipper and Morningstar, and loans in the collateral pool of CLO tranches from Moody's Analytics Structured Finance Portal.

We complement our data on insurance companies' asset holdings with data on CLO tranches, corporate bonds, and insurers' financial conditions. We get historical data on the offering amount, outstanding balance, maturity date, and credit ratings disclosed in CLOs Trustee reports from Moody's Analytics Structured Finance Portal. We are able to match this data using cusips for 99.8% of all insurers' holdings identified as CLOs. There are, however, two caveats related to data obtained by Moody's Analytics Structured Finance Portal. First, information on CLO tranches is available up to beginning of November 2019 and, therefore, does not cover the full year of 2019. Second, we have the entire rating history of CLOs only for a subset of tranches that are rated by Moody's (63% of all CLO tranches in our sample). Information on credit ratings is available only at issuance for CLO tranches evaluated by other rating agencies (Standard's & Poors and Fitch). We assume that those tranches do not experience a change in credit rating and we keep the rating assigned at issuance throughout their lifetime.[15] We also get data on the structure of CLO deals from Moody's Analytics Structured Finance Portal which we use in section 6 to investigate the implications of insurance companies' preference for CLO mezzanine tranches

We get data on the offering amount at issuance, outstanding volume and credit ratings of corporate bonds from Mergent Fixed Income Securities Database (FISD) and Moody's. Finally, we obtain information on the balance sheet and income statement of insurance companies from SNL financial.

3.2 Sample Characterization

Our sample comes from the fixed-income holdings of 5,685 life, P&C and health insurance companies between 2003 and 2019. The full portfolio of securities of these companies over that time period contains 16,620,911 observations. Life and P&C insurers each ac-

[15]This is a reasonable assumption because we observe a change in rating bucket (e.g., from Aaa to Aa) only for 16% of tranches rated by Moody's and most of the changes relate to downgrades and subsequent upgrades occurred in 2009 and 2011. This is consistent with Griffin and Nickerson (2021), who documents that credit agency actions on CLO tranches are very limited even during the covid-19 shock.

count for about 45% of these observations, whereas health insurance companies account for the remaining 11% observations. After we restrict to investments in CLOs and corporate bonds, we are left with 6,402,355 observations of which 129,440 are in CLOs and 6,272,915 are in corporate bonds. After we aggregate investments that insurance companies report in the same security in a given year we are left with 6,264,562 observations of which 128,917 are in CLOs and 6,135,645 are in corproate bonds.[16]

In the econometric analysis presented in section 4 and section 5, we restrict our sample to first-time investments of insurers in CLOs and corporate bonds, i.e., for each insurance company-security pair we keep only the observations corresponding to the year in which the original purchase of the asset took place. We do this because insurance companies make most of their investments when securities are first issued. This leaves us with a panel of 1,714,609 observations, with 57,507 pertaining to CLO investments and 1,657,102 pertaining to corporate bonds.

Lastly, the dataset on the structure of CLO deals from Moody's Analytics Structured Finance Portal which we use in section 6 contains information at the time of issuance for 2,211 CLO deals denominated in USD and issued between 2003 and 2019. We complement this data with (annual) information on (i) outstanding balance, (ii) refinancing and (iii) payments to holders of the equity tranche of these CLO deals throughout their lifetime.

4 Insurance Companies' Search for Yield

In this section, we begin by investigating insurance companies' incentives to invest in higher yielding securities (CLO tranches and bonds) within a NAIC designation bucket (Hypothesis 1). Next, we investigate the potential role of low interest rates and the 2010 regulatory reform on insurance companies' search for yield incentives. Following this,

[16]We aggregate these observations at the security-company-year level by summing up the par value, book value and actual cost of the investments, averaging the nominal interest rate, and calculating a size-weighted average of the effective yield with weights equal to the par value of each investment.

we investigate the heterogeneity of these incentives depending on insurance companies' capitalization and their exposure to losses triggered by large natural disasters.

4.1 Insurance Companies' Preference for higher yielding securities

We start our empirical analysis of Hypothesis 1, which states that insurance companies have the incentive to invest in the higher yielding CLO tranches and bonds within a NAIC designation bucket, with a graphical inspection of insurance companies' investment choices.[17] Figure 13 shows the time series of insurers' new CLOs holdings that fall into the highest credit quality designation (NAIC 1) as a percentage of the total volume outstanding of these tranches based on percentiles of the distribution of CLOs yields for each year. Yields represent the effective rate of return on the investment in a given security as reported by the insurance company.

In line with Hypothesis 1, there is a clear preference for the riskiest tranches within NAIC 1 throughout the sample period, with the exception of the financial crisis where all yields are squeezed at their minimum levels. The search for yield behavior of insurance companies in CLOs pertaining to the NAIC 1 bucket is very pronounced both in the pre-crisis period, when interest rates were relatively high, and in the post-crisis period, when short-term interest rates were close to the zero lower bound. In 2003-2006, the market share of CLO tranches with yields above the the 66th percentile is 25 to 40 percentage points higher than that of tranches with yields in the bottom tercile, whilst from 2011 onwards the gap between the extreme buckets ranges from 10 to 35 percentage points. The compression of the three market shares in 2007-2010 is hardly surprising in light of the CLO market freeze observed during the financial crisis (Figure 1). Note that the three market shares experience a drop in 2019, after the regulatory reform of 2010 was repealed.

[17] We restrict our sample to first-time investments of each insurance company in a given security (CLO tranche or corporate bond) because, for example, the share of a CLO tranche that an insurance company owns may vary due to refinancing or changes in the outstanding balance of the CLO (e.g., amortization of principal).

We obtain a very similar picture when we look at tranche ratings rather than yields (Figure 14). In this case, the market share of the two mezzanine tranches in NAIC 1, that is those rated Aa and single A, is consistently above that of triple-A tranches throughout the sample period, except for the financial crisis when the three market shares overlap.

Insurance companies' reach for yield within the NAIC 1 bucket seems to be more prevalent within CLOs than bonds (Figure 15-15). As we noted above, the market share of CLO tranches with yields above the 66th percentile is 10 to 40 percentage points higher than that of tranches with yields in the bottom tercile throughout our sample period. By contrast, the difference in the market share of corporate bonds with yields above the the 66th percentile and yields below the 33th percentile does not exceed 10 percentage points. This was expected given that the yields of CLO tranches are more disperse than the yields of corporate bonds, especially in the NAIC 1 designation bucket, hereby creating better opportunities to search for yield (Figure 17 and Figure 18).[18] Also, insurers appear to be more prone to search for yield in CLOs in periods of economic growth, in line with Becker and Ivashina (2015) finding on the corporate bond market.

We, next, test more formally our Hypothesis 1 by estimating the following baseline econometric model:

$$\begin{aligned}\frac{Holdings_{sct} \times 100}{Outstanding\ amount_{st}} =& \alpha + \beta_1 Yield_{sct} + \beta_2 Time\ to\ maturity_{sct} \\ &+ \beta_3 Outstanding\ amount_{st} + \mu_{d(s),t} \\ &+ \mu_{c,t} + \mu_{a(s)} + \mu_{l(c)} + \varepsilon\end{aligned} \tag{1}$$

where the dependent variable is the amount held by insurance company c in security s with NAIC designation d in year t when the insurer makes its first investment in that

[18] Both the standard deviation of yields and the difference in yields between triple-A and single-A securities is significantly larger for CLO tranches compared to corporate bonds reported in the NAIC 1 designation.

security, $Holdings_{sct}$, as a percentage of the volume outstanding of security s at year-end t, $Outstanding\ amount_{st}$. The key variable of interest is $Yield_{sct}$, the yield of security s reported by company c in year t. We expect the coefficient on this variable, β_1, to be positive, in line with the premise that insurers invest more heavily in securities offering higher yields within a NAIC category.

We attempt to identify that effect controlling for the time to maturity of the security in years, $Time\ to\ maturity_{sct}$, and the volume outstanding of security s at issuance, $Outstanding\ amount_s$, which allow us to disentangle search for yield from time and issue size preferences of insurance companies. Importantly, we include NAIC designation-year fixed effects, $\mu_{d(s),t}$, to investigate reach for yield within each bucket of risk-based capital charges. Finally, we saturate our econometric model with: company-year fixed effects, $\mu_{c,t}$, to control for company-specific time varying and time invariant conditions that may affect its incentives to invest in a given security; type of asset (CLO or corporate bond) fixed effects, $\mu_{a(s)}$, to account for asset-specific characteristics that may affect insurers' preference for a security class; and line of business fixed effects, $\mu_{l(c)}$, to control for differences in the business model and regulation of life, P&C and health insurance companies which may impact their investment choices. Standard errors are clustered at the company level and year level (two-way clustering).[19]

Table 2 reports the results of model 1. The first column reports the estimates of our baseline model. The coefficient on $Yield_{st}$ is positive and highly statistically significant, corroborating the hypothesis that insurance companies invest more in securities with higher yields within a NAIC designation. An increase in the yield by one standard deviation (2.14 percentage points in the subsample where this regression is estimated) implies an increase in the holding share of insurers by 14 basis points, which is somewhat above the median holding share (0.12). The median outstanding volume of CLOs and corporate bonds in portfolio in the subsample where we estimate the model is \$650

[19]We select the proper clustering level following Petersen (2009), Cameron et al. (2011), and Cameron and Miller (2015).

million. Thus, a 14 basis points increase in the holding share of an insurer corresponds to an additional investment of $93 million for the median security in portfolio. Looking at the control variables, we observe a negative and statistically significant coefficient for the outstanding amount, in line with the idea that insurance companies hold a lower fraction of an asset the larger is its size.

In columns 2 and 3 we replace company-year fixed effects with a set of company-specific controls. These include size (natural logarithm of total admitted assets), ROE (net income to total adjusted capital), capital ratio (total adjusted capital to total admitted assets), and either CAL risk-based capital ratio (column 2) or ACL risk-based capital ratio (column 3).[20] While the ACL risk-based capital ratio captures the distance from the minimum capital requirement that insurance companies must comply with to run their business, the CAL risk-based capital ratio captures the distance from the first capital threshold that triggers oversight actions from insurance regulators. We lose 37,462 observations (out of 1,691,393) in columns 2 and 3 due to missing information on financial metrics for some insurers that are covered in the holding data starting in 2019 but are not covered in the SNL Financial's balance sheet and income statements data.[21] For this reason, we use as baseline model the econometric specification including company-year fixed effects rather than firm controls. Irrespective of the risk-based capital ratio used, the yield's coefficient is very close to that of the baseline regression but somewhat larger.

Column 4 extends our baseline specification to include issuer fixed effects to account for insurance companies' preference towards certain issuers. These fixed effects are largely collinear with the security type fixed effects, as no CLO issuer is also a corporate bond issuer and vice versa. Thus, not surprisingly, this regression delivers results which are virtually the same to those of the baseline model.

[20]Similar to Koijen and Yogo (2015), we use total adjusted capital as a measure of insurers' equity.

[21]These companies began to submit their financial filings with life insurers in 2019.

Finally, in column 5 we take a first look at insurers' relative incentives to search for yield across CLOs and corporate bonds within each NAIC bucket. The coefficient of CLO dummy suggests that, ceteris paribus, insurance companies hold a higher share of CLO tranches compared to corporate bonds. More importantly, and in line with the investment patterns depicted in Figures 13 and 15, the search for yield behavior of insurers appears to be relatively more pronounced in the CLO asset class. The positive and statistically significant coefficient of the interaction term between the yield and the CLO dummy indicates that a one standard deviation increase in the yield (2.14 percentage points in the subsample where this regression is estimated) implies an increase in the holding share of CLO tranches in a given NAIC bucket that is 2.38 percentage points higher than that of corporate bonds. This finding, which was expected given the evidence we presented above on the additional dispersion of the yields on CLO tranches (Figures 17 and 18), is in line with our Hypotheses 2 that insurance companies have a preference for CLOs over corporate bonds with the same credit rating. We investigate this hypothesis thoroughly in the next section.

Overall, the results from this part of our analysis confirm Hypothesis 1 that the design of the insurance sector's capital regulation for asset risk with discontinuous buckets of capital charges generates incentives for insurers to search for yield both in the CLO and corporate bond market segments.

4.2 Search for yield over time

We next explore possible differences in insurers' search for yield over time. This is important because our sample period (2003-2019) encompasses a protracted period of low interest rates, which has been linked to increased risk-taking by the banking industry.[22] It also overlaps with the 2010 regulatory reform, which made it easier for insurance companies to search for yield in the CLO market. The results of our investigation on

[22]See, for example, Altunbas et al. (2014), Peydro and Maddaloni (2011), Dell'Ariccia et al. (2017), Jimenez et al. (2014), Ioannidou et al. (2015) and Paligorova and Santos (2019).

the heterogeneity of the effects over time are reported in Table 3.

Column 1 of Table 3 investigates whether insurance companies' incentives to reach for yield changed across different economic and monetary policy regimes: pre-crisis (2003-2006), financial crisis (2007-2008), zero lower bound (ZLB) period (2009-2015) and post-ZLB (2016-2019). The interaction terms between the yield and the time dummies suggests that insurance companies searched for yield both in the pre-crisis period (when interest rates were relatively high) and the post-crisis period (when interest rates were relatively low), but this behavior is stronger (more than triple in magnitude) during the latter time period.

Interestingly, in the post-crisis decade, insurers' incentives to invest in higher yielding securities within a NAIC category is more pronounced in the post-ZLB period, when the policy rate increased, compared to the ZLB-period. This remains true even when we control for the asset class (column 2), but the difference in the interaction coefficients of the ZLB period and the post-ZLB shrinks significantly. Overall, this suggests that the economic cycle affects significantly firms' propensity to search for yield, with insurers investing in higher yield securities within a NAIC bucket in periods of economic growth, irrespective of the levels of interest rates. However, monetary policy seems also to play a role, as this phenomenon is reinforced in an environment of low interest rates. It is worth noting that, while new issuance of CLOs plummeted during the financial crisis (Figure 1) making reaching for yield de facto not viable for CLO investments at that time, new issuance of corporate bonds also dropped but did not freeze (Figure 19). However, given insurance companies' apparent preference for searching for yield within the CLO asset class (column 5 of Table 2), the collapse in new issuance of CLOs in 2008-2010 (as a result of a broader aversion of investors towards asset-backed securities) might be the key driver behind insurers' vanished propensity to invest in higher yield securities during the financial crisis.

Finally, we investigate whether insurers' incentives to reach for yield within the

CLO asset class is stronger during the time period the 2010 regulatory reform was in place (i.e., 2010-2018). To this end we include a triple interaction between the yield, the CLO dummy and a dummy equal to one if the year falls into the 2010-2018 time period and zero otherwise. As we can see from column 3, the coefficient of the triple interaction is large, positive and statistically significant. Thus, consistent with our prediction, following the 2010 regulatory reform which allowed (under certain conditions) insurers to assign CLOs purchased at discount a lower NAIC designation than the designation implied by the rating-based system, insurance companies increased their investments in CLOs relative to bonds within NAIC buckets.

It is worth mentioning that the NAIC enacted a new reform in 2021 which modified the rating-based mapping of Table 1 moving to a more granular set of 20 NAIC designations (rather than 5). Although this may have partially softened the first of the three drivers of insurers' regulatory arbitrage emphasized in section 2, i.e. the coarse definition of risk, the reform maintained the same treatment of different securities such as CLOs and corporate bonds and reduced the risk-based capital charge for the lowest rated securities within a rating notch in the below investment grade space. This means that the channels behind insurance companies' search for yield are still in place. Indeed, NAIC (2021) shows that insurers' investments in CLO tranches increased by 12% in 2021, albeit at a slower pace than the previous two years, and it was characterized by a shift towards mezzanine tranches.

4.3 Heterogeneity across Insurance Companies

Our next tests explore the heterogeneity in insurers' search for yield behavior across firm attributes. We begin by considering insurance companies' capitalization. In the banking literature, well capitalized banks are believed to be less prone to take on risk.[23] Therefore, we expect stronger evidence of search for yield among insurers with a low

[23]Repullo (2000) shows this link in a model where capital is used as a cushion against adverse contingencies, and Jimenez et al. (2014) and Dell'Ariccia et al. (2017) find evidence consistent with this insight.

level of capitalization.[24] Columns 1 through 3 of Table 4 report the results for three different measures of insurance companies' capitalization: capital ratio, CAL RBC ratio, and ACL RBC ratio, respectively. Irrespective of the capitalization metric adopted, we find that insurance companies with a lower capital ratio or closer to the minimum capital requirements are more prone to search for yield.

As we discussed in section 2, the 2010 regulatory reform allowed insurance companies to assign CLO tranches purchased at discount or highly impaired a lower NAIC designation than the one obtained according to the rating mapping of Table 1. Therefore, the reform implied a positive and presumably exogenous shock to the RBC ratio of some insurers, i.e. those that had CLO tranches at the end of 2009 that could be assigned a lower NAIC designation following the reform. We hypothesize that insurance companies positively affected by the new regulatory regime have an incentive to invest in riskier assets following the reform, given the sudden improvement in their RBC ratio.

Model 4 of Table 4 tests that hypothesis in a diff-in-diff setup. The treatment group and the control group are formed by insurance companies that, based on their CLO holdings at year-end 2009, stood to benefit or not from the 2010 reform, respectively. The positive and statistically significant coefficient of the triple interaction confirms that insurers that benefit from the 2010 reform are more prone to search for yield following the implementation of the reform. As for the validity of our diff-in-diff approach, Figure 20 plots the time series of the estimated coefficients of a linear model where we regress the aggregate volume of CLO tranches held by insurance companies at the time of their first investment in the asset as a percentage of the total volume outstanding of these tranches by NAIC designation buckets on year dummies and including NAIC designation fixed-effects for the treated and the control groups. The parallel trend assumption in our econometric exercise is satisfied prior to the reform, whereas after 2010 affected insurers

[24] Of course this builds on the assumption that the banking insight applies to insurance companies. It is also worth noting that, even within the banking industry, there are different views on the impact of capital on banks' risk taking incentives (e.g. Rochet (1992)).

appear to purchase in some degree a higher portion of CLOs.

Our final test on the search for yield heterogeneity across firms focuses on P&C companies, the category of insurers in our sample more exposed to natural disasters. Figure 21 shows the time series of nationwide property damage from federally-designed disasters from 1964 to 2018. During the last two decades, major disasters occurred in 2005, when hurricane Katrina caused large-scale devastation in the Gulf Coast region, and in 2017, which saw a devastating hurricane season with hurricanes Harvey, Irma and Maria and an unprecedented break out of wildfires in Northern California. The aggregate value of nationwide property damage peaked exactly in 2005 and 2017, reaching almost $100B in both years and implying significant insured losses.

We, thus, investigate if P&C insurers that were hard hit by disaster events, as captured by the yearly change in their net income, search for yield more aggressive in 2005 and 2017 relative to less affected companies. The idea is that insurance companies experiencing higher losses may try to boost their net income by investing in securities offering higher returns. To this end, we generate a dummy variable equal to one if the change in net income of a P&C insurer in a given year is below the median (henceforth abridged "below median dummy") and zero otherwise and we interact this variable with the effective yield and a time dummy for 2005 and 2017, respectively. The results of this investigation are reported in column 5 of Table 4.

Indeed, the only two years when poorly performing insurance companies search for yield more actively is in 2005 and 2017, the two years in our sample period with record losses from natural disasters. While the interaction between the yield and the below median dummy is not statistically significant, the triple interactions of the yield, the below median dummy, and the time dummies for 2005 and 2017 are both positive and significant. Since the coefficient of the triple interaction of 2017 is more than twice that of 2005, this suggests the search for yield in response to the increase in insured losses due to catastrophic events was much stronger in 2017 than 2005. We instigated in

columns 6 and 7 whether insurance companies' responses continued after 2005 and 2017 and found no evidence of persistence, suggesting that their additional search for yield was indeed to compensate for the record looses they experienced on those two years.

This finding corroborates our previous results on low-capital, adding support to our evidence that insurance companies exploit the design of] their capital regulation and search for yield through their investments in both corporate bonds and CLO tranches. In the next section, we go a step further and investigate whether regulation tilted insurance companies' preference for searching for yield using CLOs over corporate bonds (Hypothesis 2).

5 Insurance Companies' Preference for CLOs over Bonds

As we discussed in Section 2, insurance companies' capital requirements treat CLO and corporate bond investments alike. However, Figure 11 shows that the average yield on insurers' investments in CLOs is higher than the yield on insurers' investments in corporate bonds for all rating categories, except the triple-A, starting in 2005.[25] In addition, as we noted earlier, insurance companies hold mainly investment grade CLOs and corporate bonds (Figures 4 and 5). This lead us to our Hypothesis 2, that insurance companies have a preference for CLO mezzanine tranches rated Baa and above over corporate bonds with the same credit rating.

We investigate this prediction in this section, starting with a granular comparison of the yields on CLO tranches and corporate bonds. To this end, we estimate the following type of model:

[25]The fact that we compare yields using the effective interest rate reported by insurance companies one CLO and corporate bonds investments acquired at the same point in time, ensures that our comparison is reliable despite the different type of coupon (fixed versus floating) of the two asset classes. Our result is in line with the evidence presented by Cordell et al. (2022), who show that CLO tranches are characterized by higher returns than corporate bonds with the same rating over their lifetime even when accounting for the different duration between the two asset classes.

$$\begin{aligned} Yield_{sct} =& \alpha + \beta_1 dummy\ CLO_s + \beta_2 Time\ to\ maturity_{sct} \\ &+ \beta_3 Outstanding\ amount_{st} + \mu_{r(s),t} + \mu_{c,t} + \mu_{l(c)} + \varepsilon \end{aligned} \tag{2}$$

where $Yield_{sct}$ is the yield of security s with rating r reported by company c at time t and $\mu_{r(s),t}$ stands for rating-year fixed effects. We estimate the model on the subsample of insurers' first time investments in CLO tranches and corporate bonds rated Aaa, Aa, A and Baa. Column 1 of Table 5 reports the estimate of this regression. We find a positive and statistically significant coefficient for the CLO dummy, indicating that, on average, the yield on insurers' new investments in CLOs is 0.7 percentage points higher than the yield on new investments in corporate bonds with the same rating. When we interact the CLO dummy with the rating, we find that the difference in yields between the two asset classes is statistically significant only for securities rated Aa and below. Importantly, this difference increases monotonically from 0.5 percentage points for the Aa rating class to 1.6 percentage points for the Baa rating class.

A natural question is why securities with the same credit rating offer different yields, conditional on their size and time-to-maturity. Cordell et al. (2022) suggest that CLO tranches may have a different risk-profile than corporate bonds due to the embedded prepayment option (which only applies to some corporate bonds), and lower liquidity in bad times. They also suggest that rating inflation could play a role in the difference in yeilds. Nickerson and Griffin (2017) provide evidence of inflated ratings given to CLO tranches reflecting an underestimation of default correlation.

We explore the implications of the difference in yields on insurers' preference for CLOs vis-à-vis corporate bonds. Towards that end, we begin by estimating the following econometric specification:

$$\begin{aligned}\frac{Holdings_{cst} \times 100}{Outstanding\ amount_{st}} =& \alpha + \beta_1 dummy\ CLO_s + \beta_2 Time\ to\ maturity_{st} \\ &+ \beta_3 Outstanding\ amount_{st} + \mu_{r(s),t} \\ &+ \mu_{c,t} + \mu_{l(c)} + \varepsilon\end{aligned} \tag{3}$$

where the dependent variable is the amount held by insurer c in the security s with rating r at time t (when the insurer makes its first investment in the security) as a percentage of the volume outstanding of the security in that year.

Columns 3-4 of Table 5 show the results of this exercise. The large and highly significant coefficient of the CLO dummy in column 3 confirms that insurance companies have a strong preference for CLOs over corporate bonds with the same credit rating. Consistent with the evidence presented in column 2, this preference increases with risk, as the difference in yields between CLOs and corporate bonds widens (column 4).

Next, We relate insurance companies' preference for CLOs over corporate bonds to the difference in yields between the two asset classes more directly. We construct a ratio of the average yield on insurers' investments in CLOs to the average yield of insurers' investments in corporate bonds for each rating-year pair (henceforth abridged "yields ratio"). Then, we extend model 3 by interacting the CLO dummy with the yields ratio to estimate the following type of regression:

$$\begin{aligned}\frac{Holdings_{cst} \times 100}{Outstanding\ amount_{st}} =& \alpha + \beta_1 dummy\ CLO_s + \beta_2 \frac{Yield\ CLOs_{rt}}{Yield\ bonds_{rt}} \\ &+ \beta_3 dummy\ CLO_s \times \frac{Yield\ CLOs_{rt}}{Yield\ bonds_{rt}} \\ &+ \beta_4 Time\ to\ maturity_{st} + \beta_5 Outstanding\ amount_{st} \\ &+ \mu_{r(s)} + \mu_{c,t} + \mu_{l(c)} + \varepsilon\end{aligned} \tag{4}$$

where $\frac{Yield\ CLOs_{rt}}{Yield\ bonds_{rt}}$ is the yields ratio. Column 5 of Table 5 reports the result of this model. The interaction between the yields ratio and the CLO dummy is positive and

statistically significant, indicating that insurance companies purchase a larger portion of CLO tranches compared to corporate bonds the larger is the difference between the yields on CLOs investments and the yields on corporate bonds investments within a given rating class.

5.1 Preference for CLOs over bonds: Cross-section results

Following the approach we adopted in the previous section, we investigate if there is any heterogeneity in the investment behavior of insurance companies in response to the yields differential between CLOs and corporate bonds.

We begin by considering the role of insurer's capitalization. Models 1-3 of Table 6 extend model 5 of Table 5 to include a triple interaction of the CLO dummy with the yields ratio and each of the variables capturing firm capitalization used before (capital ratio, CAL risk-based capital ratio and ACL risk-based capital ratio). While the simple capital ratio does not imply any differential effect, we find that firms closer to the minimum capital requirements are more sensitive to the yields ratio when deciding the extent of their investments in CLO tranches vis-à-vis corporate bonds with the same rating. This result is in line with the idea that higher leverage brings stronger incentives to search for yield.

Next, we explore how the sensitivity of insurers' preference for CLOs over corporate bonds to the yields ratio varies over time. The estimates of columns 4 indicate that there is not a significant difference across the four macroeconomic regimes considered in the previous section (pre-crisis, financial crisis, ZLB and post-ZLB). The positive and statistically significant coefficient of the triple interaction of the CLO dummy with the reform dummy and the yields ratio in model 5 suggests, instead, that insurance companies' response to the yields ratio is more pronounced during the 2010 regulatory reform period. In addition, insurers that stood to benefit from the reform exhibit a stronger preference for CLO tranches vis-à-vis corporate bonds compared to other insurers in the

post-2009 period, albeit being less sensitive to the yields ratio (column 6).

5.2 Insurance sector preference for CLOs: Aggregate results

The analysis presented so far is very micro in nature, because all of the models of Tables 5 and 6 are estimated on a granular dataset at the security-company-year level. In this sense, the study conducted up to this point sheds light on the drivers behind the amount invested by an insurance company in a given security at a certain point in time depending on whether the security is a CLO tranche or a corporate bond. As we documented in Table 5, insurance companies have a preference for CLOs over corporate bonds with the same rating the higher is the yields differential between the two asset classes. A natural question to ask is whether this mechanism implies shifts in the preferences of the insurance sector over time. We investigate this question next. As a first step, we consolidate securities holdings at the insurer-asset class-rating-year level.[26] To that end, we aggregate up the granular data at the security-company-year level so that we can calculate the volume of insurers' first-time investments in CLOs (or corporate bonds) as a percentage of the total volume outstanding of these securities within a given rating category and a specific year.[27] Next, and following our security-level analysis, we estimate the following model at insurance company level:

$$\begin{aligned}\frac{Holdings_{arct} \times 100}{Outstanding\ amount_{art}} =& \alpha + \beta_1 dummy\ CLO_a + \beta_2 Time\ to\ maturity_{arct} \\ &+ \beta_3 Outstanding\ amount_{art} + \boldsymbol{X'_{ct}\beta_4} + \mu_r \\ &+ \mu_c + \mu_{l(c)} + \varepsilon\end{aligned} \tag{5}$$

where the dependent variable is the amount of first-time investments by company c in the asset class a (CLO tranches or corporate bonds) with rating r in year t as a percentage

[26] Using this level of aggregation rather than the security-level is also important to reduce the mechanic impact from the rise in the number of insurance companies investing in CLOs over time.

[27] By construction, this dataset includes observations pertaining to insurers' "zero investments" in a given asset class-rating category. For example, if a company does not hold any CLO tranche rated Baa in a given year, the percentage of Baa-rated CLOs held by that company in that year is reported with a value of zero.

of the total volume outstanding of the asset class with that rating in that year. The key variable of interest is the CLO dummy variable *dummy CLO*$_a$. *Time to maturity*$_{arct}$ is the average time-to-maturity of all new investments by insurer c in the asset class a with rating r in year t, $\boldsymbol{X'_{ct}}$ is a set of firm controls, and $\mu_{r(a)}$ stands for rating fixed effect.

The results of this exercise are reported in Table 7. Column 1 reports the estimates of model 5. As expected, the coefficient of the CLO dummy is positive and statistically significant, confirming that insurance companies acquire a larger fraction of CLOs compared to corporate bonds. In columns 2 and 3 we investigate how insurance companies' relative preference for CLOs evolved over time. In column 2 we test how those preferences varied over the four time periods we considered in the previous section: pre-crisis (2003-2006), financial crisis (2007-2008), zero lower bound (ZLB) period (2009-2015) and post-ZLB (2016-2019). We find that in the pre-crisis period, when the yields ratio was between 0.5 and 1.25 for all investment grade rating classes, insurance companies purchased a lower portion of CLO tranches compared to corporate bonds with the same rating, suggesting a preference for corporate bonds over CLOs. However, their preference flipped starting with the financial crisis when the yields differential between CLOs and corporate bonds widened. In the post-crisis decade, as the yields ratio continued to be at relatively high levels, insurers' preference for CLOs over corporate bonds with the same rating became much more pronounced.

In column 3, we investigate insurance companies' relative investment preferences following the 2010 regulatory reform, which effectively made CLO investments more attractive to them. To that end, we interact the CLO dummy with a dummy identifying the time period in which the 2010 regulatory reform was into effect (2010-2018). We find that insurers' preference for CLOs over corporate bonds is concentrated exactly during the period in which the new regulatory regime was in place.

Up to this point, we have investigated insurers' preference for CLO tranches vis-

à-vis corporate bonds focusing on the amount of new investments in CLOs and corporate bonds by insurance companies in proportion to the total volume outstanding of these two asset classes. An alternative and, perhaps, more intuitive way to explore the preference of insurers for one asset type versus the other would be to look at the the amount of, e.g., CLO holdings as a percentage of the total new investments in CLOs and corporate bonds made by insurance companies. We implement this alternative approach, by estimating the following econometric specification:

$$\begin{aligned}\frac{CLO\ holdings_{rct} \times 100}{Total\ holdings_{rct}} =& \alpha + \beta_1 \frac{Yield\ CLOs_{rt}}{Yield\ Bonds_{rt}} + \beta_2 \frac{CLOs\ Outstanding\ amt_{rt}}{Bonds\ Outstanding\ amt_{rt}} \\ &+ \boldsymbol{X'_{ct}\beta_3} + \mu_r + \mu_c + \mu_{l(c)} + \mu_t + \varepsilon\end{aligned} \tag{6}$$

where the dependent variable is the amount of first-time investments by company c in CLO tranches with rating r in year t as a percentage of the total volume of new investments in CLOs and corporate bonds with that rating in that year. The key variable of interest is the yields ratio, $\frac{Yield\ CLOs_{rt}}{Yield\ bonds_{rt}}$. $\frac{CLOs\ Outstanding\ amt_{rt}}{Bonds\ Outstanding\ amt_{rt}}$ is the ratio of the total outstanding amount of CLO tranches with rating r in year t to the total outstanding amount of corporate bonds with rating r in year t.

Column 4 of Table 7 reports the estimates of this model. The coefficient of the yields ratio is positive and statistically significant, indicating that insurance companies direct a larger portion of their new investments within a given rating class towards CLOs the higher is the yields ratio.[28]

In the following two specifications, we look more closely at the time series of insurance companies' portfolio allocation in CLO tranches and corporate bonds. The

[28] As we mentioned earlier, there has been a shift in the composition of insurance companies investing in CLO tranches after the financial crisis. Presumably, before the crisis, only large and sophisticated insurers invested in CLOs, given the complex nature and opacity of this asset class. As the time went by, a progressively higher fraction of smaller and unsophisticated insurance companies entered the CLO market. A potential concern about the relevance of the observed preference for CLOs over corporate bonds in terms of implications for markets dynamics would be that this phenomenon is mostly driven by the set of new entrants, which may not be influential investors, especially in the CLOs space. To rule out this concern, we re-estimated column 4 on the subsample of insurance companies that invest in CLO tranches both in the time period 2003-2008 and in the post-crisis decade (2009-2019). The coefficient of the yields ratio remained highly significant and, if anything, increases in magnitude. This suggests that the largest and more sophisticated insurers are actually the main drivers of the progressive shift from corporate bonds to CLOs investments observed in the insurance industry.

estimates of column 5 indicate that insurance companies allocated a smaller portion of their portfolio to CLO tranches compared to corporate bonds with the same rating in the first half of the sample up to 2008, pointing to an initial preference for corporate bonds over CLOs. The composition of insurers' portfolio became neutral in 2009-2015, while it was characterized by a marked shift towards CLO tranches in 2016-2019.

If, instead, we split our sample into the time period where the 2010 regulatory reform period was in place (2010-2018) and the remaining of the sample, we do not find a statistically significant difference in the asset allocation of insurers' portfolio between CLOs and corporate bonds (column 6). That is likely because it took some time until insurers' preference for CLOs over corporate bonds tilted significantly their portfolio allocation, as shown in column 5 of Table 7.

In sum, the results we reported in this section provide supporting evidence for Hypothesis 2 that capital regulation similar treatment of corporate bonds and CLO tranches gave insurance companies an incentive to invest in the latter, in particular the CLO mezzanine tranches rated investment grade.

6 Implications of Insurance Companies' Preference for CLOs

In this section we investigate to what extent insurance companies' preference for CLOs has had an effect in the market for corporate loan securitization. Specifically, we investigate to what extent they have affected the capital structure, collateral pool and returns to tranche holders of CLO deals. To this end, we consider a comprehensive sample of 2,211 CLO deals denominated in USD and issued between 2003 and 2019.[29] During our sample period, insurance companies invest in CLO tranches pertaining to 1,875 of these deals.

[29]Our original sample from Moody's Analytics Structured Finance Portal includes 2,238 CLO deals originated in this time period. We exclude 27 multi-currency CLO deals for which we cannot determine the balance in USD of all their tranches.

6.1 Design of CLO Deals

We start by testing Hypothesis 3.1 that CLO deals with a larger holding share by insurance companies are characterized by a larger fraction of mezzanine tranches. Recall that our prior evidence shows insurance companies have a strong preference for mezzanine tranches of CLOs rated investment grade. To investigate this hypothesis, we estimate the following regression on CLO deals at issuance:

$$\frac{Tranche_{rdmt} \times 100}{Issue\ amount_{dmt}} = \alpha + \beta_1 \frac{Insurers\ holdings_{dmt} \times 100}{Issue\ amount_{dmt}} + \mu_{mt} + \varepsilon \tag{7}$$

where the dependent variable is the par value of a tranche/tranches with rating r of CLO deal d issued in year t and managed by manager m, $Tranche_{rdmt}$, as a percentage of the total issue amount of CLO deal d in year t, $Issue\ amount_{dmt}$.[30] Both the numerator and the denominator of the dependent variable are calculated by excluding combo notes pertaining to the same CLO deal, i.e. notes that consist in a repackage of two or more tranches of the CLO deal.[31] $Insurers\ holdings_{dmt}$ is the par value of insurers' aggregate holdings of CLO deal d (including combo notes) in the year of the origination. We saturate the regression including manager-year fixed effects, μ_{mt}, to account for any manager's investment preference and issuance year's macro conditions that may affect the securitization structure of the CLO deal. The coefficient of interest in model 7 is β_1, which captures the correlation between the percentage of a CLO deal represented by tranches with a given rating and the percentage of the deal held by insurance companies. Standard errors are clustered by manager and issuance year (two-way clustering).

Table 8 reports the results of this exercise. We estimate the regression of equation 7, along with two extensions, for the subgroups of Aaa tranches (columns 1-3), mezzanine tranches rated investment grade (columns 4-6), tranches rated below investment grade

[30] For CLO deals whose tranches are originated over a time period spanning two different years, we consider the second year as the issuance year.

[31] Since the underlying of combo notes belonging to a CLO deal consists in two or more tranches from the same deal, we exclude combo notes in the calculations to avoid double counting.

(columns 7-9), and equity tranches (column 10). The first specification suggests that the triple-A share of CLO tranches pertaining to a deal is inversely correlated to the percentage of the deal held by insurance companies. When we move to the subgroup of tranches Aa, A and Baa rated, the coefficient of insurers' holding share flips sign, while remaining statistically significant (column 4). The correlation is, instead, negative for the subset of tranches below investment grade (column 7) and is not significant for equity tranches (column 10). Consistently with our priors, this evidence suggests that CLO deals in which insurance companies invest more heavily are characterized by a larger fraction of mezzanine tranches rated investment grade. A one standard deviation increase in the share of a CLO deal held by insurance companies (14 percentage points in the subsample where this regression is estimated) is associated to an increase in the share of mezzanine tranches rated investment grade (Aa, A or Baa rated) by 5 percentage points.

Another interesting aspect of CLOs' design worth looking at is the composition of the coupon type of CLO tranches. While CLO tranches are typically floating-rate securities, almost 10% of debt tranches in our sample have a fixed-rate coupon. Life insurance companies, which account for 78% of insurers' aggregate holdings of CLOs and corporate bonds in our sample in 2019, typically fund themselves with long-term insurance products. Thus, from an asset-liability management perspective, they have incentives to invest in long-duration assets such as fixed-rate securities to match the duration of their liabilities. This suggests that, ceteris paribus, CLO deals in which insurance companies invest more heavily are characterized by a larger share of fixed-rate tranches. We test this hypothesis by estimating the following slightly modified version of equation 7:

$$\frac{Tranche_{fdmt} \times 100}{Issue\ amount_{dmt}} = \alpha + \beta_1 \frac{Insurers\ holdings_{dmt} \times 100}{Issue\ amount_{dmt}} + \mu_{mt} + \varepsilon \tag{8}$$

where the dependent variable is the par value of a tranche/tranches with a fixed-rate

coupon f of CLO deal d issued in year t and managed by manager m, $Tranche_{fdmt}$, as a percentage of the total issue amount of CLO deal d in year t, $Issue\ amount_{dmt}$.

Models 13-15 of Table 8 report the estimates of equation 8 along with two extensions. The positive and statistically significant coefficient of the CLO deal's holding share by insurance companies confirms our prior.

The positive correlation between insurers' aggregate holdings of a CLO deal and the relative size of (i) mezzanine tranches rated investment grade and (ii) fixed-rate debt tranches cannot be interpreted as causal, though, as it might be confounded by reverse causality. While CLO managers may design the structure of a CLO deal in order to meet insurers' preference for Aa, A or Baa rated mezzanine tranches and fixed-rate tranches, insurance companies may select themselves into CLO deals characterized by a larger fraction of mezzanine tranches and debt tranches with a fixed-rate coupon. We attempt to shed some light on the direction of causation by exploiting the regulatory reform on capital treatment of insurers' investments in CLOs enacted in 2010. Recall that this reform introduced a form a capital relief for certain CLOs purchased at discount or highly impaired and was applied both to existing and new investments. As we documented in the previous section, and consistent with Hypotheses 1 and 2, following the 2010 regulatory reform, insurance companies searched for yield more and increased their investments in CLOs relative to bonds within NAIC buckets. As such, we would expect an increase in the relative size of mezzanine tranches and fixed-rate tranches in CLO deals issued after the implementation of the reform.

To investigate this conjecture, we extend the baseline models including an interaction between insurance companies' holding share of the CLO deal and a dummy equal to one for the time period in which the reform was in place (2010-2018) and zero otherwise (columns 2, 5, 9 and 14). The positive and statistically significant coefficients of the interaction term in columns 5 and 14 suggest that the correlation between insurers' holding share and (i) the percentage of mezzanine tranches rated investment grade and

(ii) the percentage of fixed-rate debt tranches is stronger for as long as the reform was in place.

The previous results point to a possible adjustment in the design of CLOs to meet the increasing demand for mezzanine tranches and fixed-rate debt tranches by insurance companies in the wake of the capital requirements reform. While these results help ease concerns with reverse causality, they are still only suggestive of a causal link between insurance companies' CLO preferences and the design of CLO deals. To further help establish this link, we take a closer look at the insurance companies that stood to benefit from the 2010 regulatory reform. As discussed in section 4, the 2010 reform implied a positive and fairly exogenous shock to the RBC ratio of insurers holding CLO tranches purchased at discount or highly impaired prior to the implementation of the new regulatory regime. We, thus, test if the positive relation between the percentage of the CLO deal held by insurance companies and (i) the portion of mezzanine tranches rated investment grade and (ii) the fraction of debt tranches with a fixed-rate coupon is stronger the higher is the size of the investment in the CLO deal by insurers that benefit from the reform after 2009. To this end, we rely on a diff-in-diff setup with continuous treatment (columns 3, 6, 10 and 15). In line with our hypothesis, the coefficient of the triple interaction is positive and statistically significant for the share of mezzanine tranches rated investment grade (column 6) and the share of fixed-rate debt tranches (column 15), whereas it is negative and statistically significant or not significant for the share of triple-A tranches and tranches below investment grade, respectively.

So far, we documented empirical evidence that is consistent with a causal link between insurance companies' preference for CLOs and the design of CLO deals by focusing on the capital structure of the deals. Table 9 presents the results of three additional exercises where we test this link based on (i) CLO deals backed by CLO tranches from other deals (henceforth abridged "repackaged CLOs"), (ii) the length of the non-call period, and (iii) the refinancing of CLO deals.

Let us start with repackaged CLOs. These CLO deals are associated with a set of combo notes. These notes are produced by repackaging part or all debt and equity tranches of CLOs. In some cases, CLO tranches can be combined with government bonds for principal protection. Combo notes can be structured either based on a CLO or as part of a separate special-purpose vehicle. We refer to repackaged CLO deals as those generated in the latter case. Combo notes are often structured as principal-only securities, meaning that the cash flows from the underlying CLO tranches are used to pay down the principal balance of the combo note. Depending on the composition of the underlying CLO tranches, this feature may allow combo notes to achieve a better rating than some of the individual underlying components (NAIC, 2019a; Morningstar, 2019).[32] Typically, combo notes are structured in bilateral transactions exactly to be tailor made to the investor's specific coupon and rating target (NAIC, 2019a; Morningstar, 2019). The extent to which insurance companies invest in repackaged CLO deals is a signal of whether they lean towards custom-made CLOs. Thus, we estimated the following econometric model:

$$Repackaged\ CLO_{dmt} = \alpha + \beta_1 \frac{Insurers\ holdings_{dmt} \times 100}{Issue\ amount_{dmt}} + \mu_{mt} + \varepsilon \tag{9}$$

where $Repackaged\ CLO_{dmt}$ is a dummy equal to one if CLO deal d issued in year t and managed by manager m is a repackaged deal and zero otherwise.

Column 1 of Table 9 reports the estimates of this model. The positive and statistically significant coefficient of the insurers' holding share in the origination year reveals that insurance companies invest more heavily in repackaged CLO deals, i.e., deals that are most likely designed to meet their desired rating and return. We estimate this regression using a linear model rather than a probit model because we need to include a set of time-varying fixed effects to identify the correlation of interest in a clean way

[32] NAIC (2019a) argues that most rating agencies methodologies identify a loss or a default only when interest payments are not met.

(manager-issuance year fixed effects). Nonlinear models with fixed effects are known to suffer from the so called "incidental parameters problem" (Neyman and Scott, 1948; Lancaster, 2000), which makes the maximum likelihood estimator (MLE) inconsistent. Using a linear model to fit a regression where the outcome variable is binary, on the other hand, exposes to inconsistent estimates. As a robustness check, we re-estimate equation 9 using a probit model (column 2) including manager-issuance year dummies. Note that the sample on which this non-linear model is estimated shrinks compared to that of column 1 due to the fact that many observations of the manager-issuance year dummies which perfectly predict the outcome variable (also known as "perfect separation") need to be dropped to avoid infinitely large maximum likelihood estimates.[33] The probit estimation confirms that insurance companies invest more in repackaged CLO deals.

In columns 3 and 4 we repeat the heterogeneity analysis exploiting the 2010 regulatory reform. We find that insurance companies hold a larger share of repackaged CLO deals during the time period in which the reform was in place and this is especially true the higher is the size of the investment in the repackaged CLO deal made by insurers that stood to benefit from the reform.

Next, we look at the length of the non-call period and the refinancing of CLO deals. The non-call period is defined as the time frame where the CLO managers cannot call or refinance the CLO debt tranches. Typically, the non-call period lasts between two and seven years depending on the reinvestment period (the average length in our sample is four years). At the end of the non-call period, equity holders have the option to refinance the deal. Usually, they do so to take advantage of a reduction in market spreads on CLO debt or to extend the maturity of a CLO, or both. This process can involve either individual tranches or the full set of tranches in the deal (also known as "reset"). In the former case, some of the existing tranches are called and re-issued at

[33]We cluster standard errors only by year, as two-way clustering is not supported by the probit function and software used. This represents, though, a minor limitation, given that we include manager-issuance year fixed effects and the data set is characterized by a much a higher serial correlation than cross correlation of residuals.

current market spreads, whereas the rest of the CLO deal (including the other tranches, the reinvestment period and the maturity date) remains unchanged. In case of a reset, instead, all tranches belonging to the deal are called and re-issued at a lower spread and both the reinvestment period and the maturity date are extended.

Given our evidence on insurance companies' preference for CLO securities vis-à-vis corporate bonds we posit that CLO managers will find it easier to issue deals with a relatively short non-call period and place these with CLOs. We test this hypothesis by estimating the following type of model:

$$\textit{Non-call period}_{dmt} = \alpha + \beta_1 \frac{\textit{Insurers holdings}_{dmt} \times 100}{\textit{Issue amount}_{dmt}} + \mu_{mt} + \varepsilon \tag{10}$$

where $\textit{Non-call period}_{dmt}$ is the length in years of non-call period of CLO deal d issued in year t and managed by manager m. Consistent with our prior, the estimates reported in column 5 of Table 9 indicate that CLO deals characterized by a larger insurers' holding share at origination have a shorter non-call period. This negative correlation emerges during the 2010 regulatory reform period (column 6), but there is not a significant difference in the non-call period across CLO deals in the post-2009 period based on the holding share by insurance companies that had a benefit from the reform (column 7).

Our final test on the design of CLO deals builds on CLOs' refinancing decisions. Refinancing has become a common phenomenon starting in 2015 due to a tightening in CLO spreads (Ellington, 2018). The share of refinanced deals increased from 2% in 2015 to 21% in 2017, but followed a downward path in 2018-2019 (Figure 22).[34] We identify refinanced CLO deals by combining explicit information on refinancing, that is available from 2011 onward, with information on the issuance date and the outstanding balance of CLO debt tranches during the entire life of the deal. A CLO deal is typically refinanced once, but there are cases of deals with multiple refinancing up to a maximum

[34] As mentioned earlier, information on CLOs in 2019 is partial as we have data on issuance only up to November 2019. So, it is possible that we underestimate the share of refinanced deals in 2019.

of 3.

We investigate if insurers' holding share is related to the likelihood that a deal is refinanced or not. Given insurance companies' increased role as investors in the CLO market, we posit that CLO managers will find it easier to refinance CLOs heavily owned by insurance companies. To test this hypothesis, we consider all CLO deals during their lifetime and estimate the following regression:

$$dummy\ Refinancing_{dmt} = \alpha + \beta_1 \frac{Insurers\ holdings_{dmt-1} \times 100}{Outstanding\ volume_{dmt-1}} + \mu_{mt} + \varepsilon \tag{11}$$

where $dummy\ Refinancing_{dmt}$ is a dummy equal to one if CLO deal d managed by manager m is refinanced in year t and zero otherwise. $Insurers\ holdings_{dmt-1}$ is the amount held by insurance companies in deal d in year $t-1$ (hence lagged of one period), and $Outstanding\ volume_{dmt-1}$ is the total volume outstanding of tranches belonging to deal d at year-end $t-1$. Similar to the previous analysis, we include manager-year fixed effects effects, to control for any manager-year specific conditions that may affect the likelihood of a refinancing. Standard errors are clustered by manager and year (two-way clustering).

Column 8 of Table 9 reports the estimates of this regression. Consistent with our prior, the coefficient of insurers' lagged holding share is positive and statistically significant. We, next, re-estimate equation 11 using a probit model (column 9) to account for the binary dependent variable.[35] For ease of interpretation and comparison with the previous specification, we report the marginal effect of insurers' lagged holding share keeping all the other regressors constant at the sample means. As in the linear model, CLO deals with higher insurance companies' investments are more likely to be refinanced.

In the following specification, we extend model 9 to explore a possible heterogeneity in the correlation during the time period in which the regulatory reform of 2010 remained in place. We find that the extent of insurers' holding of a CLO deal is pos-

[35] We lose a significant amount of observations that represent perfect predictors.

itively associated with the likelihood of a refinancing exactly during the time of the reform (2010-2018). We do not find, though, that the positive correlation between refinancing and the size of insurers' investment in the CLO deal is stronger the higher is the holding share by insurance companies that stood to benefit from the 2010 reform (column 11).

The results we reported in the previous section show a very clear preference of insurance companies for CLOs, in particular their mezzanine tranches, over corporate bonds. They also show that these preferences increased following the 2010 reform of the insurance companies' capital standards. In this section we documented a collection of results that altogether suggest a causal impact of insurance companies' preference for CLOs on the origination, design and refinancing of CLO deals. Among others, we presented evidence indicating that insurance investment behavior did impact the relative size of mezzanine tranches in CLO deals. Mezzanine tranches play a critical role in the origination of CLOs not only because they account for about 26% of CLO deals but also because their junior position allows for the creation of the highly sought triple-A tranches. Therefore, insurance companies' growing preference for these tranches, particularly after 2010, together with their dominant role in the market for these tranches (they owned more that 44% of outstanding mezzanine tranches rated investment grade by 2019) likely played a key role in the rise of corporate loan securitization we have observed over the last decade.

6.2 CLOs' collateral pool and returns on tranches

The fact that CLO deals with a larger holding share by insurance companies are characterized by a larger fraction of mezzanine tranches (and a smaller share of triple-A tranches) suggests that CLO managers will find it easier to include riskier loans in the collateral pool of CLOs they place with insurance companies. This forms the conjecture of our Hypothesis 3.2, which we investigate next.

Our starting point to perform this analysis is a granular dataset with information on the collateral pool of CLO deals at the loan investment-CLO deal-issuance year level. As before, we focus on CLO deals denominated in USD and issued between 2003 and 2019. We drop repackaged CLO deals as their collateral is composed by CLO tranches rather than bank loans. We also exclude loan investments reported as credit lines, revolvers and term loans A, as these represent non-typical underlying loans for CLO deals. Given the bullet nature of CLO debt tranches, loans in the underlying portfolio of CLOs tend to be characterized by an amortization schedule that matches that of the CLO tranches.[36] A crucial information contained in our dataset is the interest rate spread, which directly captures the risk premium associated with the loan. We, thus, estimate the following regression:

$$Spread_{ldmt} = \alpha + \beta_1 \frac{Insurers\ holdings_{dmt} \times 100}{Outstanding\ volume_{dmt}} + \mu_{mt} + \varepsilon \tag{12}$$

where $Spread_{ldmt}$ is the spread of loan l in the collateral pool of CLO deal d managed by manager m and at origination in year t. Also in this case, we include CLO manager-issuance year fixed effects and we cluster standard errors by manager and year (two-way clustering). Column 1 of Table 10 reports the estimates of this model.[37] The positive and statistically significant coefficient of the insurance companies' holding share suggests that CLO deals in which insurance companies invest more heavily are backed by riskier loans than other CLO deals. While this regression emphasizes differences the composition of the collateral pool of CLOs, it does not account for the relative size of loans in the portfolio based on their credit quality. So, in the next specification we collapse the data to replace the dependent variable with the weighted average spread of loans in the collateral pool of CLO deals at origination. Weights are given by the size of each loan

[36] In our sample, credit lines, revolvers and term loan A represent only 3% of the cross section of loan investments in the collateral pool of CLO deals at origination.

[37] For the sake of space, we did not report here the results of the heterogeneity analysis performed exploiting the 2010 regulatory reform. The coefficients of the double and triple interactions are in some cases statistically significant and in some cases not significant. These results are available upon request.

investment in the portfolio. The estimates of model 2 show that not only our result is confirmed, but the magnitude is somewhat higher.

The evidence we just unveiled on the pool of collateral triggered by insurance companies' CLO investments poses an interesting question: who benefits from the larger inflows generated by riskier loans in the collateral pool; holders of debt tranches, equity holders, or CLO managers? While we are unable to investigate the effect on CLO managers because we do not have comprehensive data on their compensation arrangements, ascertain the potential effects on debt holders and equity holders. To that end, we start by looking at the interest rate spread set for debt tranches at issuance of the CLO deal using the following econometric model:

$$Weighed\ Average\ Spread_{rdmt} = \alpha + \beta_1 \frac{Insurers\ holdings_{dmt} \times 100}{Issue\ amount_{dmt}} + \mu_{mt} + \varepsilon \qquad (13)$$

where $Weighed\ Average\ Spread_{rdmt}$ is the weighted average spread of debt tranches with rating r of CLO deal d in the year of origination t. The estimates reported in columns 3-5 show that senior tranches and, especially, mezzanine tranches rated investment grade of CLO deals with a larger holding share by insurance companies pay a lower spread. This result is consistent with the idea that CLO managers favor equity holders by offering a lower premium to insurers investing in debt tranches given their strong proclivity towards CLOs. This finding is line with the evidence unveiled by Acharya et al. (2022) in the corporate bond space showing that investors' preference for investment grade securities during the Federal Reserve Quantitative Easing led to a reduction in the cost of funding for risky firms just above the investment grade threshold.

Next, we test if the documented joint evidence of riskier loans and lower spreads paid on debt tranches translates into higher returns to equity holders of CLO deals in which insurance companies invest more heavily. Following Fabozzi et al. (2021) and Cordell et al. (2022), we calculate the internal rate of return of the equity tranche of CLO deals and we estimate the following regression:

$$IRR_{dmt} = \alpha + \beta_1 \frac{Insurers\ holdings_{dmt} \times 100}{Issue\ amount_{dmt}} + \mu_{mt} + \varepsilon \tag{14}$$

where IRR_{dmt} is the internal rate of return of the equity tranche of CLO deal d managed by manager m and originated in year t. We calculate the internal rate of return using the historical record of interest and principal payments to equity holders during the entire life of the CLO deal as reported in the Trustee report. We exclude repackaged CLOs, which typically do not have an equity tranche, and deals for which the equity tranche is not consistently reported over time.[38] More importantly, by construction, we can generate this measure only for CLO deals that have been matured or terminated, meaning that we lose 873 deals originated in the last years of our sample period.

The estimates reported in column 6 of Table 10 indicate that the internal rate of return experienced by holders of equity tranches is higher for CLO deals characterized by larger investments by insurance companies.[39] While the internal rate of return calculated on the stream of cash flows from and to equity holders is the most accurate metric to identify the returns to the equity tranche, we want to consider an alternative measure to capture those returns even for CLO deals that are still alive. To this end we follow Fabozzi et al. (2021) and compute the average of the annualized returns earned by holders of the equity tranche in each pay period until the minimum of the end of the reinvestment phase and the last pay period in 2019. The reason why we consider only the time frame up to the end of the reinvestment period is because it is difficult to distinguish between interest and principal payments in many CLO deals and we want to exclude principal amortization from our calculations.

The estimates reported in column 7 confirm that equity holders of CLO deals

[38]The equity tranche of the underlying CLOs or repackaged CLO deals is usually repacked with debt tranches to generate the combo notes that compose the repackaged deal.

[39]We estimate the model on a sample of 1186 deals. Due to manager-vintage fixed effects, the actual observations drop to 556.

where insurers invest the most earn higher returns. Cordell et al. (2022) show that, unlike CLO debt tranches, equity tranches receive abnormal risk-adjusted returns, suggesting that equity holders earn economic rents at the expense debt holders. They suggest, without supporting evidence, that such rents can be generated either by the demand for credit, i.e., borrowers willing to pay higher spreads, or the demand for CLO tranches, i.e. investors in debt tranches willing to accept lower spreads. The evidence presented in Table 10, combined with the regulatory arbitrage we documented in the previous sections, provide empirical support to the latter interpretation.

In conclusion, CLO deals in which insurance companies invest more tend to own a riskier pool of collateral loans, in line with the evidence that they are characterized by a larger portion of mezzanine tranches. Importantly, the higher returns generated by the underlying riskier loans are captured only by holders of equity tranches. This suggests that riskier corporate borrowers and equity holders in CLO deals have benefited from insurance companies' strong preference for CLO mezzanine tranches induced by their capital regulation design: the former by having better access to bank funding and the latter by enjoying a higher return on their equity investments.

7 Conclusions

Using data on asset holdings of insurance companies over 2003-2019, we document an increasing preference in CLO investments vis-à-vis corporate bond investments. That preference is particularly strong for mezzanine tranches rated investment grade (i.e., Aa, A and Baa rated). We show that this is consistent with a search for yield behavior. Conditional on the asset type and capital charge, insurance companies invest more in securities offering higher yields. That search for yield behavior has led insurance companies to favor CLOs over corporate bonds. Conditional on the credit rating of the security, insurance companies tend to purchase a higher fraction of CLO tranches

compared to corporate bonds the larger is the difference in the yields carried by the two asset classes. Similarly, we find that the share of new securities in portfolio represented by CLO tranches grows for increasing levels of the yields differential.

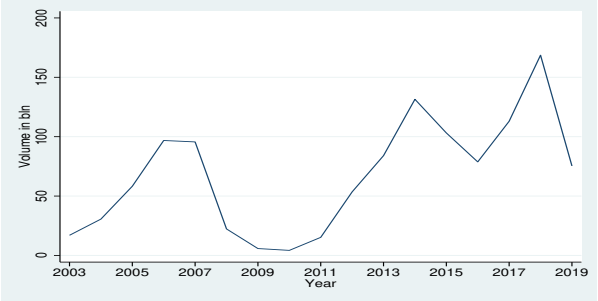
We explore the implications of the observed proclivity of insurance companies towards CLOs for the CLO market. We show that insurance companies have become an important class of investors in CLO securities, representing roughly half of the investor base in CLO mezzanine tranches rated investment grade. The demand for mezzanine tranches is critical for the issuance of CLOs as their junior position allows for the creation of senior tranches rated triple-A highly sought by banks. In addition, we document that insurers' preference for CLO mezzanine tranches had an impact on the design of CLO deals. In particular, we find that CLO deals with higher insurers' investments are characterized by a riskier pool of collateral loans, a larger share of mezzanine tranches rated investment grade, a larger fraction of debt tranches with a fixed-rate coupon, a shorter non-call period, and are more likely to be refinanced during their lifetime. Further, while the debt tranches of those deals carry spreads similar to other deals, we find that equity tranches of deals with large insurers' investments have higher returns. Overall, this suggests that insurance companies have played an important role in the expansion of corporate loans' securitization observed in the last decade. In the process, they likely contributed to an expansion of credit to riskier corporate borrowers and an improvement in the return for investors in the CLO equity tranches.

Our findings provide three interrelated economic insights. First, they confirm that regulation is able to strongly affect firms' incentives to take on risk. While most of the literature has explored this link focusing on banks, our findings show that it is also present among insurance companies and highlight an important implication from the different design of capital regulation applied to banks and insurance companies. Second, our results show that insurance companies have been playing a complementary role to banks in the securitization of corporate loans and, by extension, in the growth

of the shadow banking sector. Third, corporate loans' securitization together with the differences between banks' and insurers' capital regulation has contributed to the transfer a substantial portion of credit risk from the banking sector to the insurance sector.

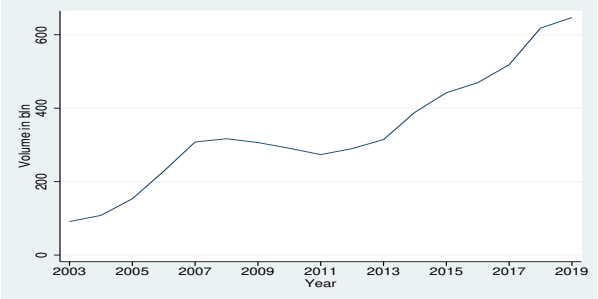
This brings us to some potentially important questions for future research. For example, to what extent the current structure of financial intermediaries broadens the availability of bank credit in particular to riskier borrowers? Similarly, to what extent the current structure is better suited to guarantee funding to corporations over the business cycle than one based on banks alone? Finally, is the allocation of credit risk throughout the financial system promoted by the current structure optimal?

Figure 1: U.S. CLOs New Issuance



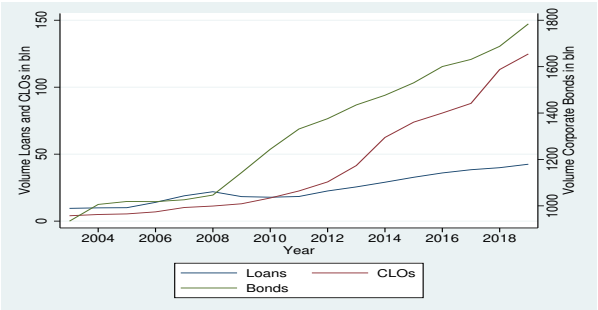
This figure plots the time series of the volume of total new issuance of CLO tranches denominated in USD, excluding refinanced tranches, over the time period 2003-2019 on a yearly basis. The data covers CLOs issuance up to November 8, 2019. Thus, the data point corresponding to 2019 represents the total volume of CLO tranches issued between January 1, 2019, and November 8, 2019. Source: Moody's Analytics Structured Finance Portal.

Figure 2: U.S. CLOs Outstanding



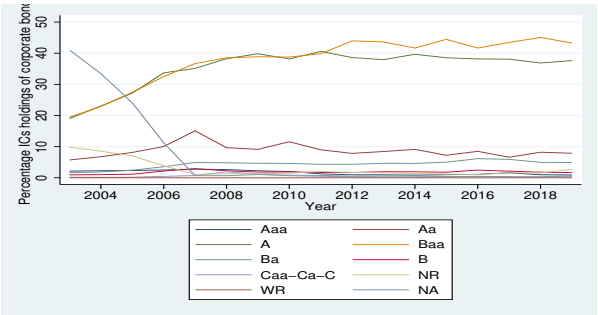
This figure plots the time series of the total outstanding volume of CLO tranches denominated in USD over the time period 2003-2019 on a yearly basis. The data covers CLOs outstanding up to November 8, 2019. Thus, the data point corresponding to 2019 represents the total volume of CLO tranches outstanding between January 1, 2019, and November 8, 2019. Source: Moody's Analytics Structured Finance Portal.

Figure 3: Insurance Companies' Investments Over Time



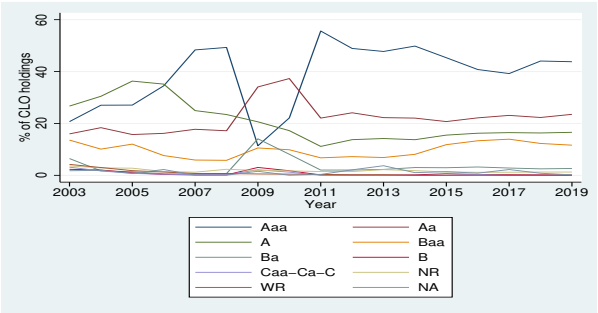
This figure plots the time series of insurance companies' holdings of bonds, corporate loans and CLOs as of December 31 of each year during the time period 2003-2019. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial.

Figure 4: Insurance Companies' Investments in Corporate Bonds Over Time by Rating



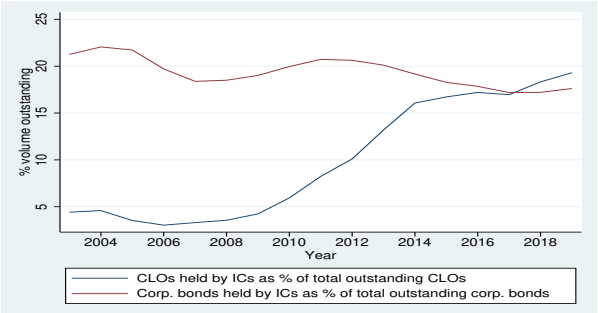
This figure plots the time series of the volume of corporate bond holdings by credit rating as percentage of the total volume of corporate bonds held by insurance companies as of December 31 of each year during the time period 2003-2019. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial. Information on the credit rating of corporate bonds comes from Mergent Fixed Income Securities Database (FISD) and Moody's.

Figure 5: Insurance Companies' Investments in CLOs over Time by Rating



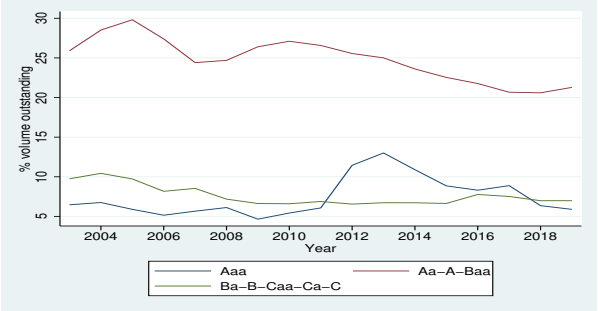
This figure plots the time series of the volume of CLO holdings by credit rating as percentage of the total volume of CLO tranches held by insurance companies as of December 31 of each year during the time period 2003-2019. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial. Information on the credit rating of CLOs comes from Moody's Analytics Structured Finance Portal.

Figure 6: Insurance Companies' Market Shares of CLOs and Corporate Bonds



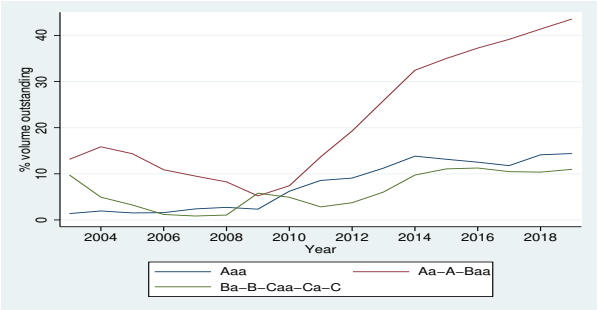
This figure plots the time series of (i) the aggregate volume of CLO holdings of insurance companies as percentage of the total volume outstanding of CLO tranches (blue line) and (ii) the aggregate volume of corporate bond holdings of insurance companies as percentage of the total volume outstanding of corporate bonds (red line) as of December 31 of each year during the time period 2003-2019. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial; Moody's Analytics Structured Finance Portal; Mergent Fixed Income Securities Database (FISD).

Figure 7: Insurance Companies' Market Shares of Corporate Bonds



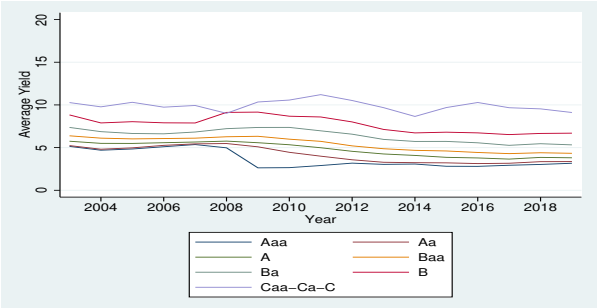
This figure plots the time series of the aggregate volume of corporate bond holdings of insurance companies as percentage of the total volume outstanding of corporate bonds by credit rating as of December 31 of each year during the time period 2003-2019. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial; Mergent Fixed Income Securities Database (FISD); Moody's.

Figure 8: Insurance Companies' Market Shares of CLOs



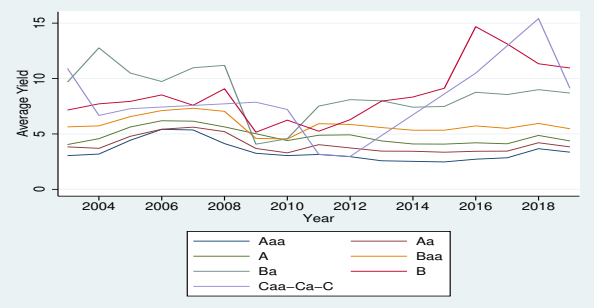
This figure plots the time series of the aggregate volume of CLO holdings of insurance companies as percentage of the total volume outstanding of CLO tranches by credit rating as of December 31 of each year during the time period 2003-2019. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial; Moody's Analytics Structured Finance Portal.

Figure 9: Yield on Insurance Companies' Investments in Corporate Bonds by Rating



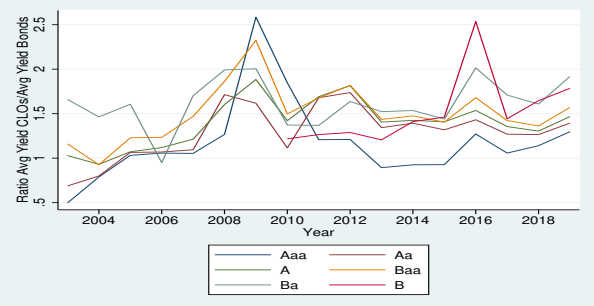
This figure plots the time series of the average yield (in percentage points) of corporate bond holdings reported by insurance companies by credit rating as of December 31 of each year during the time period 2003-2019. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial. Information on the credit rating of corporate bonds comes from Mergent Fixed Income Securities Database (FISD) and Moody's.

Figure 10: Yield on Insurance Companies' Investments in CLOs by Rating



This figure plots the time series of the average yield (in percentage points) of CLO holdings reported by insurance companies by credit rating as of December 31 of each year during the time period 2003-2019. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial. Information on the credit rating of CLOs comes from Moody's Analytics Structured Finance Portal.

Figure 11: Yield on Insurance Companies' Investments in CLOs to Yield of Insurance Companies' Investments in Corporate Bonds by Rating

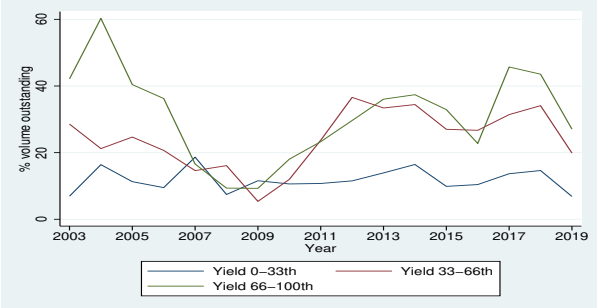


This figure plots the time series of the "yields ratio" of insurers' first-time investments in CLO tranches and corporate bonds, that is the ratio of the average yield of new investments in CLOs to the average yield of new investments in corporate bonds, by credit rating as of December 31 of each year during the time period 2003-2019. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial. Information on the credit rating of corporate bonds comes from Mergent Fixed Income Securities Database (FISD) and Moody's, whereas information on the credit rating of CLOs comes from Moody's Analytics Structured Finance Portal.

Figure 12: Insurance Companies' Share of NAIC 1 Investments Reported According to the MFE Process

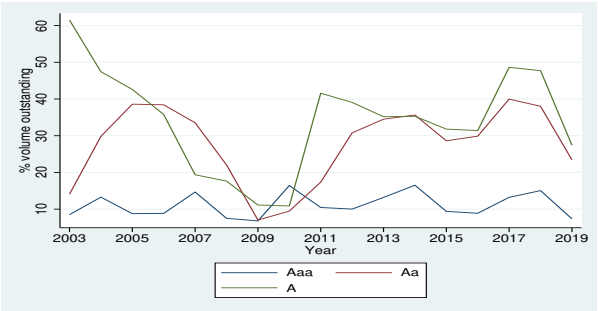
This figure plots the time series of (i) the percentage of CLO holdings in the NAIC 1 designation bucket reported according to the "modified filing exempt" approach, MFE, as identified from the "AM" suffix included in the NAIC designation (blu line), and (ii) the percentage of CLO holdings in the NAIC 1 designation bucket that have a credit rating different from Aaa, Aa or A (red line). Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial. Information on the credit rating of CLOs comes from Moody's Analytics Structured Finance Portal.

Figure 13: Share of CLOs Held by Insurance Companies by Percentiles of the Distribution of Yields



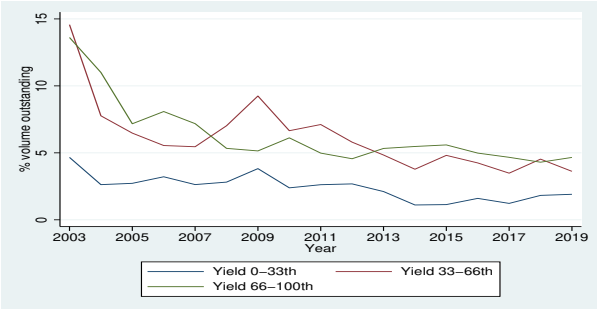
This figure plots the time series of insurers' new CLO holdings in the NAIC 1 designation bucket as percentage of the total volume outstanding of these CLO tranches based on percentiles of the distribution of CLOs yields reported by insurance companies as of December 31 of each year during the time period 2003-2019. New CLO holdings are identified as first-time investments in a given CLO tranche by an insurance company. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial.

Figure 14: Share of CLOs Held by Insurance Companies by Rating



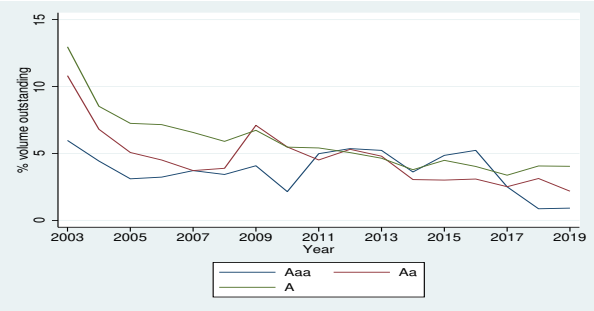
This figure plots the time series of insurers' new CLO holdings in the NAIC 1 designation bucket as percentage of the total volume outstanding of these CLO tranches by credit rating as of December 31 of each year during the time period 2003-2019. New CLO holdings are identified as first-time investments in a given CLO tranche by an insurance company. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial. Information on the credit rating of CLOs comes from Moody's Analytics Structured Finance Portal.

Figure 15: Share of Corporate Bonds Held by Insurance Companies by Percentiles of the Distribution of Yields



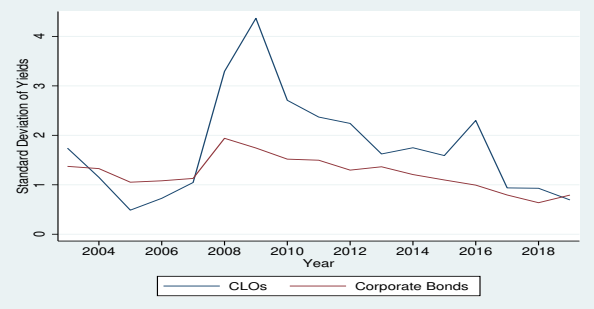
This figure plots the time series of insurers' new corporate bond holdings in the NAIC 1 designation bucket as percentage of the total volume outstanding of these corporate bonds based on percentiles of the distribution of corporate bonds yields reported by insurance companies as of December 31 of each year during the time period 2003-2019. New corporate bond holdings are identified as first-time investments in a given corporate bond by an insurance company. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial.

Figure 16: Share of Corporate Bonds Held by Insurance Companies by Rating



This figure plots the time series of insurers' new corporate bond holdings in the NAIC 1 designation bucket as percentage of the total volume outstanding of these corporate bonds by credit rating as of December 31 of each year during the time period 2003-2019. New corporate bond holdings are identified as first-time investments in a given corporate bond by an insurance company. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial. Information on the credit rating of corporate bonds comes from Mergent Fixed Income Securities Database (FISD) and Moody's.

Figure 17: Standard Deviation of Yields of CLOs and Corporate Bonds in the NAIC 1 Designation

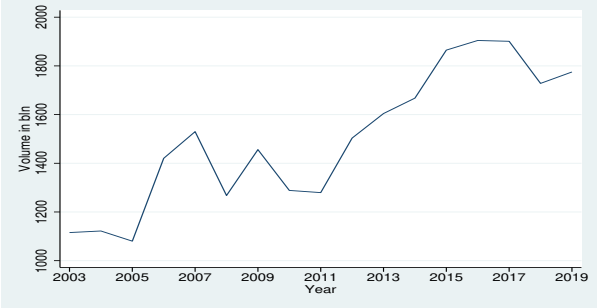


This figure plots the time series of the standard deviation of the yields of insurers' new CLO and corporate bond holdings in the NAIC 1 designation bucket as of December 31 of each year during the time period 2003-2019. New CLO and corporate bond holdings are identified as first-time investments in a given CLO tranche or corporate bond by an insurance company. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial.

Figure 18: Difference in Average Yield of single-A and triple-A Securities

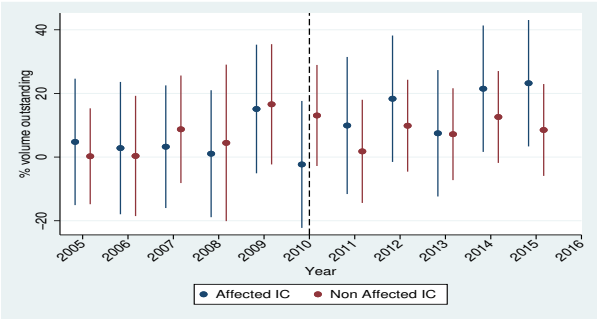
This figure plots the time series of the difference in the average yield (in percentage points) of single-A and triple-A new insurers' holdings of CLO tranches and corporate bonds as of December 31 of each year during the time period 2003-2019. New CLO and corporate bond holdings are identified as first-time investments in a given CLO tranche or corporate bond by an insurance company. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial.

Figure 19: U.S. Corporate Bonds New Issuance



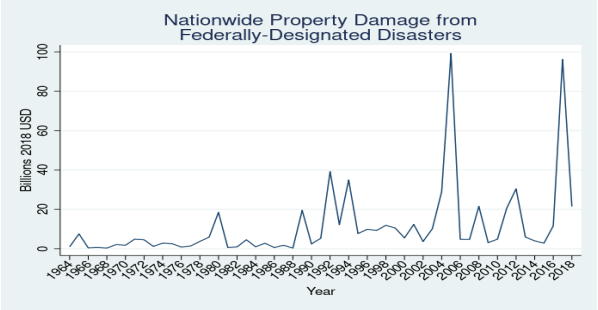
This figure plots the time series of the volume of total new issuance of corporate bonds denominated in USD over the time period 2003-2019 on a yearly basis. Source: Mergent Fixed Income Securities Database (FISD).

Figure 20: Share of CLOs Held by Insurance Companies Affected and Not Affected by the 2010 Regulatory Reform



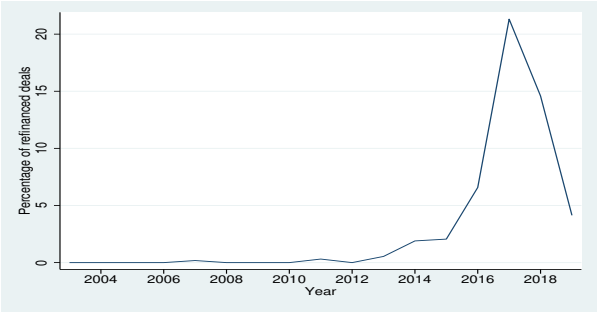
This figure plots the time series of the estimated coefficients, along with their 95% confidence intervals, of a linear model where we regress the aggregate volume of CLO tranches held by insurance companies at the time of their first investment in the asset as a percentage of the total volume outstanding of these tranches by NAIC designation buckets on year dummies and including NAIC designation fixed-effects for (i) insurance companies that benefit (blue line) and (ii) do not benefit (red line) from the 2010 regulatory reform based on their CLO holdings as of December 31, 2009. Source: Schedule D-Part 1 of the annual financial statement filings of life, P&C and health insurance companies submitted to the NAIC and retrieved from SNL Financial; Moody's Analytics Structured Finance Portal.

Figure 21: Weather and Climate Disaster Events



This figure plots the time series of nationwide property damage from federally-designed disasters from 1964 to 2018. Source: Spatial Hazards Events Database for the United States (Sheldus).

Figure 22: Percentage of Refinanced CLOs



This figure plots the time series of the percentage of refinanced CLO deals on a yearly basis over the period 2003-2019. The sample includes CLO deals outstanding during this time window and excluding multi-currency CLO deals. Source: Moody's Analytics Structured Finance Portal.

Table 1: Risk-Based Capital Requirements for Asset Risk

	RBC charge (%)			
NAIC Designation	Life (pre-tax)	Life (post-tax)	P&C and Health	Credit Rating
1	0.40%	0.30%	0.30%	Aaa, Aa, A
2	1.30%	0.96%	1.00%	Baa
3	4.60%	3.39%	2.00%	Ba
4	10.00%	7.38%	4.50%	B
5	23.00%	16.96%	10.00%	Caa
6	30.00%	19.50%	30.00%	Ca, C

This table reports the risk-based capital charges for asset risk applied to fixed income investments of Life, P&C and Health insurance companies. The regulation defines risk-based capital charges associated to fixed income securities held by Life insurers both on a pre-tax and post-tax basis, whereas no tax adjustment is required in the case of P&C and Health insurers. Source: NAIC.

Table 2: Search for yield: Baseline regressions

	(1)	(2)	(3)	(4)	(5)
Dependent variable	Insurance company's holding as percentage of total volume outstanding				
Yield	0.067**	0.069**	0.069**	0.069**	0.003
	(0.02)	(0.03)	(0.03)	(0.03)	(0.01)
dummy CLO					4.680***
					(0.86)
dummy CLO x Yield					1.114***
					(0.22)
Time-to-maturity	-0.003	-0.002	-0.002	-0.000	0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Outstanding Amount	-0.299***	-0.330***	-0.330***	-0.307***	-0.296***
	(0.05)	(0.05)	(0.05)	(0.04)	(0.05)
Size		0.256***	0.256***		
		(0.02)	(0.02)		
ROE		-0.325	-0.325		
		(0.21)	(0.21)		
Capital ratio		0.036	0.036		
		(0.13)	(0.13)		
CAL RBC ratio		0.002***			
		(0.00)			
ACL RBC ratio			0.001***		
			(0.00)		
constant	0.944***	-2.717***	-2.717***	0.906***	0.880***
	(0.10)	(0.32)	(0.32)	(0.09)	(0.05)
NAIC designation x Year FE	Yes	Yes	Yes	Yes	Yes
Security type (CLO or bond) FE	Yes	Yes	Yes	Yes	No
Security issuer FE	No	No	No	Yes	No
Type insurer FE	Yes	Yes	Yes	Yes	Yes
Insurer x Year FE	Yes	No	No	Yes	Yes
Two-way clustering	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year
N	1691393	1653931	1653931	1690436	1691393
R^2	0.292	0.205	0.205	0.422	0.299
$Adj - R^2$	0.274	0.205	0.205	0.404	0.282
F-stat	25.318***	26.425***	26.425***	28.863***	32.32***
Degrees of freedom	(3, 16)	(7, 16)	(7, 16)	(3, 16)	(5, 16)

This table reports panel regression estimates of the linear regression model of equation 1 and its extensions analyzing insurers' search for yield in the CLO and corporate bond asset classes. The models are estimated on a granular dataset at the security-company-year level covering first-time investments by insurance companies in CLO tranches and corporate bonds. The dependent variable is the amount held by an insurance company in a given security and in a certain year (when the insurer makes its first investment in the security) as a percentage of the volume outstanding of the security in that year. As for the independent variables, *Yield* is the yield (i.e., the effective rate or return) of the security reported by the insurer; *dummy CLO* is a dummy variable equal to one if the security is a CLO tranche and zero otherwise; *Time-to-maturity* is the time to maturity of the security in years reported by the insurer; *Outstanding Amount* is the volume outstanding of the security; *Size* is the natural logarithm of total admitted assets of the insurer; *ROE* is the ratio of net income to total adjusted capital of the insurer; *Capital ratio* is the ratio of total adjusted capital to total admitted assets of the insurer; *CAL RBC ratio* is the CAL risk-based capital ratio of the insurer; *ACL RBC ratio* is the ACL risk-based capital ratio of the insurer. For each independent variable the first row reports the coefficient, the second row reports in parenthesis the robust standard error that is corrected for multiclustering at the insurer and year level. Fixed effects are included, "Yes", not included, "No", or subsumed by other fixed effects, "-". ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 3: Search for yield: Heterogeneity over time

Dependent variable	(1)	(2)	(3)
	Insurance company's holding as percentage of total volume outstanding		
Yield			-0.011
			(0.01)
Year=2003-2006 x Yield	0.032*	0.02	
	(0.02)	(0.01)	
Year=2007-2008 x Yield	0.014	-0.001	
	(0.03)	(0.02)	
Year=2009-2015 x Yield	0.115***	0.086**	
	(0.04)	(0.03)	
Year=2016-2019 x Yield	0.363***	0.113***	
	(0.07)	(0.04)	
dummy CLO			6.641**
			(2.59)
dummy CLO x Yield			0.598**
			(0.26)
dummy Reform x Yield			0.024*
			(0.01)
dummy Reform x dummy CLO			-2.567
			(2.58)
dummy Reform x dummy CLO x Yield			0.708**
			(0.33)
Time-to-maturity	-0.011*	-0.004	0.000
	(0.01)	(0.00)	(0.00)
Outstanding Amount	-0.571***	-0.300***	-0.296***
	(0.06)	(0.05)	(0.05)
constant	0.890***	0.942***	0.885***
	(0.09)	(0.07)	(0.05)
NAIC designation x Year FE	Yes	Yes	Yes
Security type (CLO or bond) FE	No	Yes	No
Security issuer FE	No	No	No
Type insurer FE	Yes	Yes	Yes
Insurer x Year FE	Yes	Yes	Yes
Two-way clustering	Insurer, Year	Insurer, Year	Insurer, Year
N	1691393	1691393	1691393
R^2	0.192	0.292	0.300
$Adj - R^2$	0.172	0.274	0.283
F-stat	14.456***	11.556***	25.199***
Degrees of freedom	(6, 16)	(6, 16)	(8, 16)

This table reports panel regression estimates of a series of extensions to the linear regression model of equation 1 analyzing the heterogeneity over time of insurers' search for yield in the CLO and corporate bond asset classes. The models are estimated on a granular dataset at the security-company-year level covering first-time investments by insurance companies in CLO tranches and corporate bonds. The dependent variable is the amount held by an insurance company in a given security and in a certain year (when the insurer makes its first investment in the security) as a percentage of the volume outstanding of the security in that year. As for the independent variables, *Yield* is the yield (i.e., the effect rate or return) of the security reported by the insurer; *dummy CLO* is a dummy variable equal to one if the security is a CLO tranche and zero otherwise; *dummy Reform* is a dummy equal to one if the year falls into the time period 2010-2018, when the 2010 regulatory reform was into effect, and zero otherwise; *Time-to-maturity* is the time to maturity of the security in years reported by the insurer; *Outstanding Amount* is the volume outstanding of the security; *Size* is the natural logarithm of total admitted assets of the insurer; *ROE* is the ratio of net income to total adjusted capital of the insurer; *Capital ratio* is the ratio of total adjusted capital to total admitted assets of the insurer; *CAL RBC ratio* is the CAL risk-based capital ratio of the insurer; *ACL RBC ratio* is the ACL risk-based capital ratio of the insurer. For each independent variable the first row reports the coefficient, the second row reports in parenthesis the robust standard error that is corrected for multiclustering at the insurer and year level. Fixed effects are included, "Yes", not included, "No", or subsumed by other fixed effects, "-". ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 4: Search for yield: Heterogeneity across insurance companies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample		All insurers		Insurers that operate in 2009	P&C insurers	Years 2003-2006 P&C insurers with 2005 Δ*Net Income* below the median	P&C insurers with 2017 Δ*Net Income* below the median
Dependent variable	Insurance company's holding as percentage of total volume outstanding						
Yield (%)	0.127**	0.073**	0.073**	0.037*	0.033**	0.001	0.022
	(0.04)	(0.03)	(0.03)	(0.02)	(0.01)	(0.01)	(0.02)
Capitalization x Yield	-0.173**						
	(0.06)						
CAL RBC ratio x Yield		-0.001**					
		(0.00)					
ACL RBC ratio x Yield			-0.000**				
			(0.00)				
Year>2009 x Yield				0.076*			
				(0.04)			
Benefit Reform				1.284***			
				(0.43)			
Benefit Reform x Yield				-0.121***			
				(0.04)			
Benefit Reform x Year>2009				-1.105*			
				(0.55)			
Benefit Reform x Year>2009 x Yield				0.144*			
				(0.08)			
Year=2005 x Yield					-0.033**	-0.013	
					(0.01)	(0.01)	
Year=2017 x Yield					-0.025*		0.065**
					(0.01)		(0.03)
Year>2005 x Yield						0.004	
						(0.01)	
Year>2017 x Yield							-0.011
							(0.63)
Below Median Change Net Income					0.038		
					(0.04)		
Below Median Change Net Income x Yield					-0.005		
					(0.01)		
Below Median Change Net Income x Year=2005					-0.074		
					(0.08)		
Below Median Change Net Income x Year=2017					-0.367***		
					(0.07)		
Below Median Change Net Income x Year=2005 x Yield					0.035*		
					(0.02)		
Below Median Change Net Income x Year=2017 x Yield					0.101***		
					(0.02)		
Time-to-maturity (years)	-0.002	-0.002	-0.002	-0.003	-0.001	0.000	0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Outstanding Amount ($bln)	-0.330***	-0.330***	-0.330***	-0.349***	-0.213***	-0.479***	-0.224***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.03)	(0.06)	(0.03)
Size	0.257***	0.256***	0.256***	0.245***	0.157***	0.229***	0.168***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
ROE	-0.311	-0.324	-0.324	-0.324	-0.059	0.04	-0.133
	(0.21)	(0.21)	(0.21)	(0.25)	(0.10)	(0.14)	(0.28)
Capitalization	0.757***	0.041	0.041	0.081	0.053	0.188	-0.238
	(0.25)	(0.13)	(0.13)	(0.13)	(0.13)	(0.29)	(0.20)
CAL RBC ratio	0.001**	0.004***			0.000	0.000	0.001
	(0.00)	(0.00)			(0.00)	(0.00)	(0.00)
ACL RBC ratio			0.002***				
			(0.00)				

Continued on next page

Table 4 - continued from previous page

constant	-2.989***	-2.730***	-2.730***	-2.634***	-1.544***	-2.120***	-1.550***
	(0.34)	(0.32)	(0.32)	(0.34)	(0.25)	(0.43)	(0.34)
NAIC designation x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Security type (CLO or bond) FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Security issuer FE	No	No	No	No	No	No	No
Type insurer FE	Yes	Yes	Yes	Yes	No	No	No
Insurer x Year FE	No	No	No	No	No	No	No
Two-way clustering	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year
N	1653931	1653931	1653931	1520349	620644	43891	321247
R^2	0.205	0.205	0.205	0.213	0.130	0.085	0.144
$Adj - R^2$	0.205	0.205	0.205	0.213	0.130	0.084	0.144
F-stat	25.362***	26.342***	26.342***	21.137***	-	-	19.889***
Degrees of freedom	(8, 16)	(8, 16)	(8, 16)	(11, 16)	-	-	(9, 16)

This table reports panel regression estimates of a series of extensions to the linear regression model of equation 1 analyzing the heterogeneity across companies of insurers' search for yield in the CLO and corporate bond asset classes. The models are estimated on a granular dataset at the security-company-year level covering first-time investments by insurance companies in CLO tranches and corporate bonds. Model 4 is estimated on the subsample of insurance companies operating in 2009; model 5 is estimated on the subsample of P&C insurers; model 6 and model 7 are estimated on the subsamples of P&C insurers whose yearly change in net income is below the median in 2005 and 2017, respectively. The dependent variable is the amount held by an insurance company in a given security and in a certain year (when the insurer makes its first investment in the security) as a percentage of the volume outstanding of the security in that year. As for the independent variables, *Yield* is the yield (i.e., the effect rate or return) of the security reported by the insurer; *Benefit Reform* is a dummy variable equal to one if, based on the CLO holdings at 2009 year-end, the insurer benefits from positive shock to its RBC ratio as a result of the 2010 regulatory reform; *Below Median* Δ*Net Income* is a dummy variable equal to one if the change in net income of a P&C insurer is below the median; *Time-to-maturity* is the time to maturity of the security in years reported by the insurer; *Outstanding Amount* is the volume outstanding of the security; *Size* is the natural logarithm of total admitted assets of the insurer; *ROE* is the ratio of net income to total adjusted capital of the insurer; *Capital ratio* is the ratio of total adjusted capital to total admitted assets of the insurer; *CAL RBC ratio* is the CAL risk-based capital ratio of the insurer; *ACL RBC ratio* is the ACL risk-based capital ratio of the insurer. For each independent variable the first row reports the coefficient, the second row reports in parenthesis the robust standard error that is corrected for multiclustering at the insurer and year level. Fixed effects are included, "Yes", not included, "No", or subsumed by other fixed effects, "-". ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 5: Insurance Companies' Preference for CLOs vis-à-vis Corporate Bonds

	(1)	(2)	(3)	(4)	(5)
Sample	Assets with Aaa, Aa, A and Baa rating				
Dependent variable	Yield (%)		Insurance company's new holding as percentage of total volume outstanding		
dummy CLO	0.704***		10.530***		-0.684
	(0.11)		(0.81)		(3.73)
Yield CLO/Yield Bond ratio					0.563
					(0.39)
dummy CLO x Yield CLO/Yield Bond ratio					7.909**
					(2.87)
Capitalization x dummy CLO					
CAL RBC ratio x dummy CLO					
ACL RBC ratio x dummy CLO					
Capitalization x Yield CLO/Yield Bond ratio					
CAL RBC ratio x Yield CLO/Yield Bond ratio					
ACL RBC ratio x Yield CLO/Yield Bond ratio					
Capitalization x dummy CLO x Yield CLO/Yield Bond ratio					
CAL RBC ratio x dummy CLO x Yield CLO/Yield Bond ratio					
ACL RBC ratio x dummy CLO x Yield CLO/Yield Bond ratio					
Rating=Aaa		-0.677***		0.369**	
		(0.21)		(0.13)	
Rating=Aa		-0.214***		0.141**	
		(0.03)		(0.05)	
Rating=Baa		0.532***		-0.132***	
		(0.04)		(0.02)	
Rating=Aaa x dummy CLO		0.238		4.780***	
		(0.27)		(0.66)	
Rating=Aa x dummy CLO		0.473***		10.654***	
		(0.11)		(1.04)	
Rating=A x dummy CLO		0.927***		12.136***	
		(0.11)		(0.96)	
Rating=Baa x dummy CLO		1.556***		12.708***	
		(0.14)		(1.33)	
Time-to-maturity (years)	0.061***	0.062***	-0.001	-0.001	-0.002
	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Outstanding Amount ($bln)	0.071***	0.062***	-0.257***	-0.268***	-0.250***
	(0.01)	(0.01)	(0.05)	(0.04)	(0.04)
constant	3.159***	2.986***	0.847***	0.943***	0.068
	(0.07)	(0.08)	(0.04)	(0.05)	(0.57)
Rating	-	-	-	-	Yes
Rating x Year FE	Yes	No	Yes	No	No
Type insurer FE	Yes	Yes	Yes	Yes	Yes
Insurer x Year FE	Yes	Yes	Yes	Yes	Yes
Two-way clustering	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year
N	1275763	1275763	1276043	1276043	1276043
R^2	0.685	0.682	0.313	0.320	0.310
$Adj - R^2$	0.675	0.672	0.291	0.298	0.288
F-stat	70.687***	38.091***	58.055***	26.209***	31.976***
Degrees of freedom	(3, 16)	(9, 16)	(3, 16)	(9, 16)	(5, 16)

This table reports panel regression estimates of (i) the linear regression model of equation 2 and its extensions (columns 1-2) and (ii) the linear regression model of equation 3 and its extensions (columns 3-5) analyzing insurers' preference for CLOs over corporate bonds. The models are estimated on a granular dataset at the security-company-year level covering first-time investments by insurance companies in CLO tranches and corporate bonds rated Aaa, Aa, A or Baa. The dependent variable of columns 1-2 is the yield (i.e., the effect rate or return) of the security reported by the insurer; the dependent variable of columns 3-5 is the amount held by an insurance company in a given security and in a certain year (when the insurer makes its first investment in the security) as a percentage of the volume outstanding of the security in that year. As for the independent variables, *dummy CLO* is a dummy variable equal to one if the security is a CLO tranche and zero otherwise; *Yield CLO/Yield Bond ratio* is ratio of the average yield on insurers' new investments in CLOs to the average yield of insurers' new investments in corporate bonds for each rating-year pair; *Time-to-maturity* is the time to maturity of the security in years reported by the insurer; *Outstanding Amount* is the volume outstanding of the security. For each independent variable the first row reports the coefficient, the second row reports in parenthesis the robust standard error that is corrected for multiclustering at the insurer and year level. Fixed effects are included,"Yes", not included, "No", or subsumed by other fixed effects, "-". ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 6: Insurance Companies' Preference for CLOs vis-à-vis Corporate Bonds: Sensitivity to the yields ratio across insurance companies and over time

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Assets with Aaa, Aa, A and Baa rating					
Dependent variable	Insurance company's new holding as percentage of total volume outstanding					
dummy CLO	6.584	-1.708	-1.708	11.801	25.621**	33.948***
	(5.11)	(3.81)	(3.81)	(10.08)	(9.26)	(6.88)
Yield CLO/Yield Bond ratio	-0.926*	-0.472	-0.472	0.143	0.356	0.189
	(0.46)	(0.28)	(0.28)	(0.59)	(0.33)	(0.35)
dummy CLO x Yield CLO/Yield Bond ratio	5.27	8.360**	8.360**	12.615	-11.553*	-13.211***
	(3.91)	(2.99)	(2.99)	(10.83)	(5.81)	(3.87)
Capital ratio x dummy CLO	-16.48					
	(10.80)					
CAL RBC ratio x dummy CLO		0.053				
		(0.05)				
ACL RBC ratio x dummy CLO			0.026			
			(0.03)			
Capital ratio x Yield CLO/Yield Bond ratio	1.519**					
	(0.64)					
CAL RBC ratio x Yield CLO/Yield Bond ratio		0.003**				
		(0.00)				
ACL RBC ratio x Yield CLO/Yield Bond ratio			0.002**			
			(0.00)			
Capital ratio x dummy CLO x Yield CLO/Yield Bond ratio	-3.52					
	(8.31)					
CAL RBC ratio x dummy CLO x Yield CLO/Yield Bond ratio		-0.090*				
		(0.05)				
ACL RBC ratio x dummy CLO x Yield CLO/Yield Bond ratio			-0.045*			
			(0.02)			
Year=2007-2008 x dummy CLO				5.340		
				(11.86)		
Year=2009-2015 x dummy CLO				-13.278		
				(10.83)		
Year=2016-2019 x dummy CLO				-21.104*		
				(10.15)		
Year=2007-2008 x Yield CLO/Yield Bond ratio				-0.534		
				(0.57)		
Year=2009-2015 x Yield CLO/Yield Bond ratio				0.562		
				(0.62)		
Year=2016-2019 x Yield CLO/Yield Bond ratio				2.272*		
				(1.10)		
Year=2007-2008 x dummy CLO x Yield CLO/Yield Bond ratio				-14.778		
				(11.82)		
Year=2009-2015 x dummy CLO x Yield CLO/Yield Bond ratio				-3.428		
				(11.42)		
Year=2016-2019 x dummy CLO x Yield CLO/Yield Bond ratio				1.055		
				(10.94)		
dummy Reform x dummy CLO					-33.134***	
					(9.95)	
dummy Reform x Yield CLO/Yield Bond ratio					-0.259	
					(0.58)	
dummy Reform x dummy CLO x Yield CLO/Yield Bond ratio					24.751***	
					(6.41)	
Year>2009 x dummy CLO						-45.897***
						(7.25)
Year>2009 x Yield CLO/Yield Bond ratio						0.325
						(0.44)
Year>2009 x dummy CLO x Yield CLO/Yield Bond ratio						28.647***
						(4.48)
Benefit Reform x dummy CLO						-0.281
						(6.70)
Benefit Reform x Yield CLO/Yield Bond ratio						1.312**
						(0.53)
Benefit Reform x dummy CLO x Yield CLO/Yield Bond ratio						0.918
						(3.19)
Benefit Reform x Year>2009 x dummy CLO						25.195***
						(7.69)

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Table 6 - continued from previous page

Benefit Reform x Year>2009 x Yield CLO/Yield Bond ratio						0.297
						(1.42)
Benefit Reform x Year>2009 x Yield CLO/Yield Bond ratio x dummy CLO						-15.680***
						(4.55)
Time-to-maturity (years)	0.003	-0.003	-0.003	-0.001	-0.002	0.002
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Outstanding Amount ($bln)	-0.325***	-0.308***	-0.308***	-0.267***	-0.255***	-0.281***
	(0.05)	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)
constant	-1.477**	-1.942***	-1.942***	-0.742	0.627	0.040
	(0.59)	(0.40)	(0.40)	(0.56)	(0.66)	(0.55)
Insurer controls	Yes	Yes	Yes	-	-	-
Rating	Yes	Yes	Yes	Yes	Yes	Yes
Rating x Year FE	No	No	No	No	No	No
Type insurer FE	Yes	Yes	Yes	Yes	Yes	Yes
Insurer x Year FE	No	No	No	Yes	Yes	Yes
Two-way clustering	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year
N	1245616	1245616	1245616	1276043	1276043	1156793
R^2	0.249	0.217	0.217	0.322	0.316	0.334
$Adj - R^2$	0.249	0.217	0.217	0.300	0.294	0.313
F-stat	30.208***	27.247***	27.247***	-	24.190***	-
Degrees of freedom	(12, 16)	(12, 16)	(12, 16)	-	(8, 16)	-

This table reports panel regression estimates of extensions of the linear regression model of equation 3 analyzing how the sensitivity of insurers' preference for CLOs over corporate bonds to the yields ratio varies across insurers and over time. The models are estimated on a granular dataset at the security-company-year level covering first-time investments by insurance companies in CLO tranches and corporate bonds rated Aaa, Aa, A or Baa. The dependent variable is the amount held by an insurance company in a given security and in a certain year (when the insurer makes its first investment in the security) as a percentage of the volume outstanding of the security in that year. As for the independent variables, *dummy CLO* is a dummy variable equal to one if the security is a CLO tranche and zero otherwise; *Yield CLO/Yield Bond ratio* is ratio of the average yield on insurers' new investments in CLOs to the average yield of insurers' new investments in corporate bonds for each rating-year pair; *Time-to-maturity* is the time to maturity of the security in years reported by the insurer; *Outstanding Amount* is the volume outstanding of the security; *Capital ratio* is the ratio of total adjusted capital to total admitted assets of the insurer; *CAL RBC ratio* is the CAL risk-based capital ratio of the insurer; *ACL RBC ratio* is the ACL risk-based capital ratio of the insurer. Insurers' controls include *Size*, *ROE*, *Capital ratio*, and *CAL RBC ratio* or *ACL RBC ratio* depending on the specification. For each independent variable the first row reports the coefficient, the second row reports in parenthesis the robust standard error that is corrected for multiclustering at the insurer and year level. Control variables and fixed effects are included,"Yes", not included, "No", or subsumed by other fixed effects, "-". ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 7: Insurance Companies' Preference for CLOs vis-à-vis Corporate Bonds over time

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Holdings with Aaa, Aa, A and Baa rating					
Dependent variable	Insurance company's new holding of asset classes by rating as percentage of total volume outstanding			Insurance company's new holding of CLOs by rating as percentage of total new holdings of CLOs and corporate bonds		
dummy CLO	0.313***		-0.025			
	(0.10)		(0.16)			
Year=2007-2008					-0.746***	
					(0.24)	
Year=2009-2015					0.854	
					(0.53)	
Year=2016-2019					5.953***	
					(1.23)	
Year=2003-2006 x dummy CLO		-0.395***				
		(0.08)				
Year=2007-2008 x dummy CLO		0.094***				
		(0.03)				
Year=2009-2015 x dummy CLO		0.327***				
		(0.10)				
Year=2016-2019 x dummy CLO		0.995***				
		(0.09)				
dummy Reform x dummy CLO			0.581***			
			(0.10)			
Yield CLO/Yield Bond ratio				10.144**		
				(3.78)		
dummy Reform						1.175
						(1.37)
Time-to-maturity (years)	0.107***	0.103***	0.105***			
	(0.01)	(0.01)	(0.01)			
Outstanding Amount ($bln)	0.000***	0.000***	0.000***			
	(0.00)	(0.00)	(0.00)			
Outstanding Amount CLO/ Outstanding Amount Bond ratio				25.572***	24.018***	24.862***
				(4.48)	(3.89)	(4.47)
Size	0.201***	0.199***	0.200***		0.935***	2.676***
	(0.02)	(0.02)	(0.02)		(0.30)	(0.74)
ROE	-0.024	-0.024	-0.024		1.375***	0.832*
	(0.03)	(0.03)	(0.03)		(0.43)	(0.46)
Capital ratio	0.124*	0.124*	0.124*		-1.715	1.673
	(0.06)	(0.06)	(0.06)		(1.15)	(2.14)
CAL RBC ratio	0.001***	0.001***	0.001***		0.013**	0.018***
	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)
constant	-2.621***	-2.600***	-2.611***	-13.366**	-12.139***	-34.186***
	(0.32)	(0.31)	(0.32)	(5.66)	(3.81)	(9.38)

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Table 7 - continued from previous page						
Rating x Year FE	Yes	Yes	Yes	No	No	No
Rating FE	-	-	-	Yes	Yes	Yes
Type insurer FE	Yes	Yes	Yes	Yes	Yes	Yes
Insurer x Year FE	No	No	No	Yes	No	No
Insurer FE	Yes	Yes	Yes	-	Yes	Yes
Two-way clustering	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year	Insurer, Year
N	335276	335276	335276	110660	113610	113610
R^2	0.366	0.375	0.370	0.611	0.373	0.360
$Adj - R^2$	0.358	0.367	0.362	0.416	0.349	0.335
F-stat	90.135***	-	82.059***	18.171***	20.015***	9.970***
Degrees of freedom	(7, 16)	(10, 16)	(8, 16)	(2, 16)	(8, 16)	(6, 16)

This table reports panel regression estimates of the linear regression model of equation 5 and its extensions (columns 1-3) and of the linear regression model of equation 6 and its extensions (columns 4-6) analyzing insurers' preference for CLOs over corporate bonds over time. Models 1-3 are estimated on a dataset at the insurer-asset class-rating-year level covering first-time investments by insurance companies in CLO tranches and corporate bonds rated Aaa, Aa, A or Baa. The dependent variable is the amount of first-time investments of an insurance company in one asset class (CLO or corporate bond) with a given rating in a certain year as percentage of the total volume outstanding of the asset class with that rating in that year. Models 4-6 are estimated on a dataset at the insurer-rating-year level covering first-time investments by insurance companies in CLO tranches and corporate bonds rated Aaa, Aa, A or Baa. The dependent variable is the amount of first-time investments of an insurance company in CLO tranches with a given rating in a certain year as percentage of the total volume of new investments in CLOs and corporate bonds with that rating in that year. As for the independent variables, *dummy CLO* is a dummy variable equal to one if the asset class consists in CLO tranches and zero otherwise; *Yield CLO/Yield Bond ratio* is ratio of the average yield on insurers' new investments in CLOs to the average yield of insurers' new investments in corporate bonds for each rating-year pair; *dummy Reform* is a dummy equal to one if the year falls into the time period 2010-2018, when the 2010 regulatory reform was into effect, and zero otherwise; *Time-to-maturity* is the average time-to-maturity of all new investments of the insurer in the asset class for each rating-year pair; *Outstanding Amount* is the total volume outstanding of the asset class for each rating-year pair; *Outstanding CLO/Outstanding Bond ratio* is the ratio of the total outstanding amount of CLO tranches to the total outstanding amount of corporate bonds for each rating-year pair; *Size* is the natural logarithm of total admitted assets of the insurer; *ROE* is the ratio of net income to total adjusted capital of the insurer; *Capital ratio* is the ratio of total adjusted capital to total admitted assets of the insurer; *CAL RBC ratio* is the CAL risk-based capital ratio of the insurer. For each independent variable the first row reports the coefficient, the second row reports in parenthesis the robust standard error that is corrected for multiclustering at the insurer and year level. Fixed effects are included, "Yes", not included, "No", or subsumed by other fixed effects, "-". ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 8: Capital structure of CLO deals

Sample	(1)	(2) Aaa	(3)	(4)	(5) Aa-A-Baa	(6)	(7)	(9) Ba-B-Caa-Ca-C	(10)	(11) NR	(13)	(14) All tranches	(15)
Dependent variable					Tranches as % of CLO							Fixed-rate Tranches as % of CLO	
% of CLO held by ICs	-0.298**	-0.101**	-0.222***	0.355**	0.025	0.289**	-0.029***	-0.006	0.002	-0.025	0.424***	0.178*	-0.036
	(0.12)	(0.04)	(0.05)	(0.17)	(0.03)	(0.11)	(0.01)	(0.01)	(0.04)	(0.05)	(0.11)	(0.09)	(0.05)
dummy Reform x % of CLO held by ICs		-0.218			0.365*			-0.026*				0.273*	
		(0.14)			(0.18)			(0.01)				(0.13)	
Year>2009 x % of CLO held by ICs			0.278***			-0.366**			0.006				0.311**
			(0.06)			(0.13)			(0.04)				(0.11)
% of CLO held by ICs Benefit Reform			0.070			-0.216			0.005				0.254
			(0.16)			(0.14)			(0.05)				(0.16)
% of CLO held by ICs Benefit Reform x % of CLO held by ICs			0.004			-0.001***			0.000				-0.008
			(0.00)			(0.00)			(0.00)				(0.01)
Year>2009 x % of CLO held by ICs Benefit Reform			0.127			0.055			-0.014				-0.651**
			(0.33)			(0.39)			(0.06)				(0.28)
Year>2009 x % of CLO held by ICs Benefit Reform x % of CLO held by ICs			-0.013**			0.011***			-0.001				0.016*
			(0.01)			(0.00)			(0.00)				(0.01)
constant	66.431***	66.315***	62.086***	17.133***	17.326***	22.166***	4.674***	4.660***	4.314***	11.334***	-2.901*	-2.757*	0.226
	(1.79)	(1.64)	(0.89)	(2.44)	(2.22)	(1.34)	(0.14)	(0.13)	(0.08)	(0.67)	(1.61)	(1.50)	(0.97)
Manager x Issuance Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Two-way clustering	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year
One-way clustering													
N	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703	1703
R^2 (Pseudo R^2 for probit)	0.624	0.626	0.684	0.521	0.531	0.628	0.634	0.635	0.647	0.611	0.461	0.465	0.495
$Adj - R^2$	0.436	0.440	0.524	0.282	0.296	0.440	0.452	0.453	0.469	0.418	0.192	0.198	0.240
F-stat	6.005**	6.864***	-	4.572**	2.849*	-	8.870***	5.050**	944.348***	0.302	14.891***	8.666***	8.010***
Degrees of freedom	(1 , 15)	(2 , 15)	-	(1 , 15)	(2 , 15)	-	(1 , 15)	(2 , 15)	(6, 15)	(1 , 15)	(1 , 15)	(2 , 15)	(6, 15)

This table reports regression estimates of the linear regression models of equation 7 and equation 8 and their extensions analyzing the design CLO deals in relation to the share of the CLO deal held by insurance companies. The models are estimated on a dataset at the CLO deal-manager-issuance year level covering information on CLO deals issued over the time period 2003-2019 and whose tranches are denominated in USD. The dependent variable is the percentage of a CLO deal represented by tranches rated (i) triple-A (columns 1-3), (ii) Aa, A and Baa (columns 4-6), (iii) Ba, B, Caa, Ca, C (columns 7-9), or (iv) not rated (column 10) in the year of the issuance. Both the numerator and the denominator of the dependent variable exclude combo notes pertaining to the CLO deal. As for the independent variables, *% CLO held by ICs* is the percentage of the CLO deal held by insurance companies in the year of issuance of the CLO deal (the numerator of this variable includes holdings of combo notes pertaining to the CLO deal whereas the denominator does not); *dummy Reform* is a dummy equal to one if the year falls into the time period 2010-2018, when the 2010 regulatory reform was into effect, and zero otherwise; *% CLO held by ICs Benefit Reform* is the percentage of the CLO deal held by insurance companies that benefit from the 2010 regulatory reform based on their CLO holdings at year-end 2009 in the year of issuance of the CLO deal. For each independent variable the first row reports the coefficient, the second row reports in parenthesis the robust standard error that is corrected for multiclustering at the CLO manager and year level. Fixed effects are included, "Yes", not included, "No", or subsumed by other fixed effects, "-". ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 9: Design and Refinancing of CLO deals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Sample	Issuance of CLO deals							Entire life of CLO deals			
Model	Linear	Probit	Linear	Linear	Linear	Linear	Linear	Linear	Probit	Linear	Linear
Dependent variable	Repackaged CLO			Length Non-call Period				Refinancing			
% of CLO held by ICs	0.005**	0.049***	0.000	-0.000	-0.007**	0.006*	0.017**	0.003*	0.004***	-0.000***	0.000
	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
dummy Reform x % of CLO held by ICs			0.005**			-0.014***				0.004**	
			(0.00)			(0.00)				(0.00)	
Year>2009 x % of CLO held by ICs				-0.000			-0.020**				0.004
				(0.00)			(0.01)				(0.00)
% of CLO held by ICs Benefit Reform				0.000			-0.015				0.000
				(0.00)			(0.03)				(0.00)
% of CLO held by ICs Benefit Reform x % of CLO held by ICs				-0.000			-0.000				-0.000
				(0.00)			(0.00)				(0.00)
Year>2009 x % of CLO held by ICs Benefit Reform				-0.003			0.034				0.001
				(0.00)			(0.03)				(0.00)
Year>2009 x % of CLO held by ICs Benefit Reform x % of CLO held by ICs				0.000***			-0.000				-0.000
				(0.00)			(0.00)				(0.00)
constant	-0.055*	-2.123***	-0.052*	0.011	4.010***	4.003***	3.896***	0.050***	-1.249***	0.051***	0.045**
	(0.03)	(0.42)	(0.03)	(0.01)	(0.05)	(0.04)	(0.04)	(0.01)	(0.14)	(0.01)	(0.02)
Manager x Issuance Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Two-way clustering	Manager, Year		Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year		Manager, Year	Manager, Year
One-way clustering		Year							Year		
N	1703	89	1703	1703	1685	1685	1685	10663	4640	10663	10663
R^2 (Pseudo R^2 for probit)	0.466	0.468	0.480	0.594	0.613	0.614	0.616	0.237	0.147	0.240	0.238
$Adj - R^2$	0.199		0.221	0.389	0.421	0.421	0.422	0.127		0.131	0.128
F-stat	6.130**		3.550*	-	4.827**	6.660***	-	4.508*		23.223***	-
Degrees of freedom	(1 , 15)		(2 , 15)	-	(1 , 15)	(2 , 15)	-	(1, 15)		(2, 15)	-

This table reports panel regression estimates of the regression model of equation 9 and its extensions (columns 1-4), of the regression model of equation 10 and its extension (columns 5-7), and of the regression model of equation 11 and its extensions (columns 8-11) analyzing the design and the likelihood of refinancing of CLO deals in relation to the share of the CLO deal held by insurance companies. Models 1-7 are estimated on a dataset at the CLO deal-manager-issuance year level covering information on CLO deals issued over the time period 2003-2019 and whose tranches are denominated in USD. The dependent variable of models 1-4 is a dummy equal to one if the CLO deal is a repackage of CLO tranches from another/other CLO deal/s; the dependent variable of models 5-7 is the length of the non-call period of the CLO deal. Models 8-11 are estimated on a dataset at the CLO deal-manager-year level covering information on CLO deals outstanding during the time period 2003-2019 whose tranches are denominated in USD. The dependent variable is a dummy equal to one if a CLO deal is refinanced in a given year and zero otherwise. As for the independent variables, *% CLO held by ICs* is the percentage of the CLO deal held by insurance companies in the year of issuance of the CLO deal in models 1-7 and the percentage of the CLO deal held by insurance companies lagged of one year with respect to *Refinancing* in models 8-11 (the numerator of this variable includes holdings of combo notes pertaining to the CLO deal whereas the denominator does not); *dummy Reform* is a dummy equal to one if the year falls into the time period 2010-2018, when the 2010 regulatory reform was into effect, and zero otherwise; *% CLO held by ICs Benefit Reform* is the percentage of the CLO deal held by insurance companies that benefit from the 2010 regulatory reform based on their CLO holdings at year-end 2009 in the year of issuance of the CLO deal in models 1-7 and lagged of one year with respect to *Refinancing* in models 8-11, respectively. Models 1, 3-8, and 10-11 report the estimates of a linear regression. Models 2 and 9 reports the estimates of a probit model. The coefficient of *% CLO held by ICs* in model 9 represents the marginal effect of insurers' lagged holding share keeping all other regressors constant at the sample means. For each independent variable the first row reports the coefficient, the second row reports in parenthesis the standard error. Standard errors of model 1, 3-8, and 10-11 are corrected for multiclustering at the CLO manager and year level. Standard errors of models 2 and 9 are clustered by year. Fixed effects are included, "Yes", not included, "No", or subsumed by other fixed effects, "-". ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 10: Collateral pool, debt tranches and equity tranches of CLO deals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	Collateral pool of CLO deals		Debt tranches of CLO deals			Equity tranche of CLO deals	
Dependent variable	Spread	Weighted Average Spread	Aaa	Aa-A-Baa	Ba-B-Caa-Ca-C	Matured and Terminated CLO deals Internal rate of return	All CLO deals until the reinvestment end date Average annualized rate of return
				Weighted Average Spread			
% of CLO held by ICs	0.003**	0.006**	-0.002*	-0.012**	-0.005	0.177***	0.036*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.02)	(0.02)
constant	3.550***	3.556***	1.144***	2.343***	5.689***	3.038***	18.491***
	(0.02)	(0.04)	(0.01)	(0.06)	(0.08)	(0.16)	(0.25)
Manager x Issuance Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Two-way clustering	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year	Manager, Year
N	321246	1051	1555	1558	1374	556	1447
R^2	0.208	0.874	0.940	0.779	0.728	0.743	0.531
$Adj - R^2$	0.206	0.802	0.910	0.669	0.583	0.592	0.291
F-stat	4.570**	6.152**	4.144*	7.730**	0.775	77.456***	4.007*
Degrees of freedom	(1, 16)	(1, 14)	(1, 14)	(1, 14)	(1, 15)	(1, 11)	(1, 14)

This table reports panel regression estimates of three econometric models analyzing the riskiness of the underlying pool of loans of CLO deals based on equation 12 (models 1-2), the spread of debt tranches of CLO deals based on equation 13 (models 3-5), and the return earned by the equity tranche of CLO deals based on equation 14 (models 6-) in relation to the share of the CLO deal held by insurance companies. Model 1 is estimated on a dataset at the loan investment-CLO deal-manager-issuance year level; models 2-7 are estimated on various datasets at the CLO deal-manager-issuance year level. The datasets cover information on CLO deals issued over the time period 2003-2019 and whose tranches are denominated in USD. The dependent variable of model 1 is the interest rate spread charged on a loan investment belonging to the collateral pool of a CLO deal at the end of the year of origination, excluding credit lines, revolving loans and Term Loan A facilities; the dependent variable of model 2 is the weighted average spread of loan investments in the collateral pool of a CLO deal in the year of issuance, excluding credit lines, revolving loans and Term Loan A facilities; the dependent variable of models 3-5 is the weighted average spread of debt tranches of CLO deals by groups of credit ratings at origination of the deal, excluding combo notes; the dependent variable of model 6 is the internal rate of return earned by the equity tranche of CLO deals matured or terminated during our sample period, excluding CLO deals that represent a repackage of CLO tranches from another/other CLO deal/s; the dependent variable of model 7 is the average of the annualized rate of returns earned by the equity tranche of CLO deals (excluding deals that represent a repackage of CLO tranches from another/other CLO deal/s) in each pay period during the life of the deal until the end of the reinvestment period. As for the independent variables, *% CLO held by ICs* is the percentage of the CLO deal held by insurance companies in the year of issuance of the CLO deal (the numerator of this variable includes holdings of combo notes pertaining to the CLO deal whereas the denominator does not). For each independent variable the first row reports the coefficient, the second row reports in parenthesis the standard error. Standard errors of model 1, 3-8, and 10-11 are corrected for multiclustering at the CLO manager and year level. Standard errors of models 2 and 9 are clustered by year. Fixed effects are included, "Yes", not included, "No", or subsumed by other fixed effects, "-". ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

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Appendices

A Insurance Companies' Capital Regulation

Capital adequacy is the key microprudential tool of solvency regulation for insurance companies. While the U.S. insurance industry is regulated at the state level, regulatory capital requirements are harmonized across states thanks to NAIC's coordination role.[40] All states have adopted the risk-based capital framework designed by the NAIC and first implemented in the early 1990s. Similar to bank capital regulation, that framework defines a minimum amount of capital that insurance companies must maintain in relation to their size and risk profile, and specifies a series of actions that will be implemented against non-compliers. The risk-based capital regime is intended to limit risk-taking of insurers and provide a safety buffer to policyholders and bondholders against insolvency.

The risk-based capital requirement, denoted "authorized control level" (ACL) risk-based capital, is calculated as a function of insurers' exposures to different types of risk. Broadly speaking, the framework classifies risks into three macro categories: asset risk, underwriting risk, and all other business risk. Subcategories of those risks depend on the the specific type of insurer, implying that the capital formula slightly differs across the three main lines of business, i.e. life, P&C, and health. Importantly, the current regulatory framework sets the required capital at the legal entity level (and not at the consolidated level).[41]

The assessment of insurers' solvency conditions is based on the "risk-based capital ratio" — the ratio of "total adjusted capital" (which is essentially the insurer statutory capital and surplus) to the ACL risk-based capital. A capital shortage may trigger four

[40]The NAIC is an organization governed by the chief insurance regulators from the 50 states, the District of Columbia and the five U.S. territories. State regulators coordinate through the NAIC to define common standards, conduct peer review, and oversee the insurance industry.

[41]NAIC created a "Group Capital Calculation Working Group" that is currently developing a capital requirement to be applied at the group level.

levels of regulatory actions, which are progressively more severe for decreasing values of the risk-based capital ratio. For example, if total adjusted capital falls below 200% of the risk-based capital requirement, this indicates the company breached the "company action level" (CAL) and is required to submit a plan to restore its level of capitalization.

Important for us are the capital requirements for asset risk associated to fixed income investments, including corporate bonds, loans and CLOs. These are calculated as a weighted sum of the book value of fixed income investments, with weights equal to a risk-based capital charge that captures the credit risk of each asset. As explained in section 2, the risk-based capital charge is defined for six different buckets of assets' credit quality named "NAIC designations" (NAIC, 2018a, 2020). A NAIC 1 designation corresponds to securities with the highest credit quality, whereas a NAIC 6 designation corresponds to securities with the lowest credit quality. Insurance companies assign a NAIC designation (and the associated risk-based capital charge) to fixed income investments by converting credit ratings according to the mapping presented in Table 1.

With regards to the book value of an asset, it corresponds to "amortized cost" for NAIC 1-5 holdings of life insurers and NAIC 1-2 holdings of P&C and health insurers, unless the asset is impaired. Amortized cost means that the purchase premium or discount is amortized throughout the life of the investment. The book value corresponds, instead, to the lower between the amortized cost and the fair value for NAIC 6 assets of life insurers and NAIC 3-6 of P&C and health insurers. Securities that are not temporarily impaired should be reported at fair value.

B The 2010 Reform of Capital Requirements for CLO Investments

In 2010, the NAIC introduced a new methodology to calculate capital requirements for CLO investments (Foley-Fisher et al., 2020). The new framework allowed insurers to

assign CLO tranches purchased at discount or highly impaired a lower NAIC designation than the designation implied by the rating-based mapping of Table 1. Specifically, insurers could adopt the following multi-step process (named "modified filing exempt", MFE):

1. convert the credit rating of a CLO tranche into a NAIC designation according to the mapping of Table 1. If the conversion results in a NAIC 1 or a NAIC 6 designation, assign this class of risk.

2. It the conversion results in a NAIC 2-5 category, compare the ratio $\textit{book value} \times 100/\textit{par value}$ to the breakpoints of Table A1 to determine the "initial NAIC designation". If this corresponds to NAIC 1-5, assign this class of risk. For example, suppose that the credit rating conversion delivers a NAIC 2. This designation may be replaced with a NAIC 1 if the book value is lower than 97.88% of the investment's par value.

3. If the initial designation obtained in the previous step is NAIC 6, then compare the ratio $\min(\textit{book value}, \textit{fair value}) \times 100/\textit{par value}$ to the pricing matrix of Table A1 and assign the final designation accordingly.

This multi-step process was applied until the reporting year 2018 (NAIC, 2019b). Starting in 2019, the ratings-based approach of Table 1 was restored.

As per statutory guidelines, the NAIC designation of CLOs determined according to points 2 and 3 of the MFE process must be reported with the suffix "AM". While a NAIC designation including this substring does not automatically signal an exception to the baseline rating mapping for the NAIC 2-6 categories, all NAIC 1 designations including the "AM" suffix identify tranches whose credit rating would not translate into a NAIC 1. This means that, for the NAIC 1 category, we are able to exactly identify the volume of CLOs reported based on the 2010 reform.

Table A1: Modified Filing Exempt Approach

	NAIC Designation Breakpoints				
Life	1>2	2>3	3>4	4>5	5>6
NAIC 2	97.88	100.00	104.69	116.23	132.04
NAIC 3	93.49	95.52	100.00	111.02	126.12
NAIC 4	84.22	86.04	90.08	100.00	113.61
NAIC 5	74.13	75.73	79.29	88.02	100.00
P&C and Health	1>2	2>3	3>4	4>5	5>6
NAIC 2	99.14	100.00	101.81	106.20	123.13
NAIC 3	97.28	98.22	100.00	104.31	120.94
NAIC 4	93.36	94.16	95.87	100.00	115.94
NAIC 5	80.52	81.22	82.69	86.25	100.00

This table reports the NAIC designation breakpoints used in the "modified filing exempt", MFE, approach introduced by the 2010 regulatory reform to assign a NAIC designation to CLO tranches rated Baa to Caa. The MFE approach remained into effect from the reporting year 2010 to the reporting year 2018. Source: NAIC.