Mortality and Longevity

Complex Assets in Insurance and Annuity Industries

FEBRUARY | 2026

SOA Research INSTITUTE

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Executive Summary

The investment portfolio of life and annuity insurers has evolved significantly over the past decade with more structured securities and complex structured assets allocated to their portfolios. This trend has been driven by low interest rates in the post-financial-crisis era, which encouraged insurers to search for additional spread beyond what public corporate bonds could offer. More recently, rising interest rates and tighter bank lending standards have further expanded the pipeline of loans flowing into securitized structures.

The purpose of this research is to examine the growing role of complex assets in life and annuity companies' portfolios, with a focus on their structural design, risk-return characteristics, their performance during crisis, and implications for capital and asset liability management. The research is divided into two phases:

Phase I (current report): A literature review of complex asset types, market developments, risk factors, and regulatory considerations.

Phase II (future report): The second phase will build on the findings of this literature review by incorporating perspectives from industry stakeholders through interviews. These interviews will provide insights into strategic decision making around asset allocation, risk management, and governance practices.

The focus of this study is securitized assets. Securitization is the process of pooling individual assets such as loans, leases, or receivables together and converting them into tradable securities that pass through cash flows from the underlying assets to investors. The complex assets in this study include structured securities such as Collateralized Loan Obligations (CLO), Asset-Backed Securities (ABS), Mortgage-Backed Securities (MBS), and related private financing structures. These assets are characterized by multi-tiered cash flow waterfalls, embedded optionality, and structural features that offer higher yields compared to traditional corporate bonds. Collateralized Loan Obligations' (CLO's) floating rate structure helps companies mitigate interest rate risk, particularly in a rising interest rate environment. In addition, these assets also provide diversification benefit and alignment with companies' liability profiles. At the same time, these assets may expose insurers to risks such as limited liquidity in stress markets, valuation uncertainty due to structural complexity, and potential volatility in regulatory capital treatment.

DEFINITIONS

Collateral Loan Obligations (CLO) are securitizations backed primarily by pools of leveraged loans, which are loans extended to companies with high levels of debt relative to equity. Investors receive cash flows from both interest and principal payments on the pool of underlying loans. CLOs issue investors multiple tranches of notes with different risk return profiles. The senior tranches carry the lowest risk and have lowest expected returns, as they have priority in receiving payments. The mezzanine tranches are subordinate to the senior tranches and therefore bear higher credit risk in exchange for higher potential returns. At the lowest priority level of the capital structure, equity tranche is the first to absorb losses if the underlying loans default, but it also has the potential for the highest returns when the loan portfolio performs strongly.

Like CLOs, Asset-Backed Securities (ABS) are typically structured into tranches with different levels of risk and return. Instead of backing with leveraged loans, ABS are generally backed by pools of consumer loans such as auto loans, credit card receivables, or student loans. While ABS are usually issued through public securitization markets, Asset-

Backed Financing (ABF) is a similar financing structure secured by collateral pools but issued through private lending arrangements instead of public securitizations. The underlying collateral in ABF is diverse and less standardized, with consumer (e.g., point-of-sale financing) and commercial loans (such as equipment leases and aviation loans). Compared to ABS, ABF structures have more bespoke terms with lower liquidity and greater flexibility in terms and collateral composition.

Mortgage-Backed Securities (MBS) are a specific type of asset-backed security backed by pools of mortgage loans. Investors in MBS receive cash flows (interest and principal payments) that come from the borrowers in the underlying mortgage pool. MBS can be categorized as residential (RMBS) or commercial (CMBS) and further classified as government-backed (such as those guaranteed by Ginnie Mae, Fannie Mae, or Freddie Mac) or non-agency-backed without government guarantees.

DRIVERS

This report identifies five key drivers behind the shift toward complex securities:

- Yield enhancement: Complex securities can provide higher spreads and excess yields relative to traditional public and corporate bonds.
- Diversification: By pooling a wide range of loans, they offer investors exposure to different sectors and borrowers within a single security.
- Liability-driven investment: Their structure features can better align with insurers' long-dated liabilities.
- Regulatory capital structure: Higher credit ratings assigned to senior tranches may reduce regulatory capital charges compared to holding the underlying loans directly.
- Partnerships with asset managers: Expertise from asset managers allow life and annuity insurers to have greater access to private markets.

RISK CONSIDERATIONS

While complex assets provide various benefits, they also carry potential risks that require careful oversight.

The performance of structured assets is shaped by both structural design and market conditions. Key risks that can affect the cash flow of these complex assets include:

- Credit risk: While defaults can occur, diversification across large pools can help limit investor losses.
- Prepayment risk: Rate movements impact cash flows, mostly in MBS. Falling interest rates accelerate prepayments and expose investors to reinvest in a lower interest rate environment.
- Liquidity risk: Liquidity varies significantly across asset types with Agency MBS being the most liquid and direct lending CLO and ABF being the least liquid. The liquidity deteriorates sharply during economic downturns.
- Economic environment: Employment, consumer confidence, collateral market values, and economic growth all drive repayment capacity across the pool.
- Valuation uncertainty: Limited transparency and infrequent trading for private assets can mask volatility especially during market downturns.
- Underlying collateral reinvestment risk of CLOs: During the reinvestment period of CLOs, CLO managers may face weaker market conditions that can potentially lead to lower spreads or weaker collateral.
- Servicing quality and manager experience: Timely collections, accurate reporting, and efficient resolution of delinquencies or defaults all directly affect the cash flow stability and recovery rates of complex asset structures, making experienced managers and strong servicers vital to avoiding risk concentration and delayed interventions, increased default rates, and severe losses.

CORRELATIONS

Despite the diverse nature of their underlying asset pools, complex assets exhibit correlations among themselves ranging from moderate (during normal markets) to strong (during downturns), and manifest shared sensitivities to credit risk, interest rate volatility, and liquidity. Correlations with traditional asset classes are low to moderate during normal conditions but can spike during periods of stress. Government bonds often show near-zero correlation with complex asset structures.

PERFORMANCE AND TRENDS

Historically, the performance of complex assets during financial crises has varied widely—mainly due to the large variety of underlying collateral types and structures available—and is closely linked to macroeconomic conditions and shifts. For example, certain segments of private-label RMBS experienced severe losses during the Global Financial Crisis (GFC) due to weak underwriting standards, aggressive loan-to-value ratios, and limited structural protections. With the reforms introduced after the GFC, the so-called "RMBS 2.0" structures have performed much more robustly. But CLOs continued to perform relatively well even during COVID. In the wake of recent crises, multiple enhancements have been introduced to some structures to remove weaker features and enhance stronger ones; nevertheless, complex asset structures perform best during periods of stable interest rates, strong growth, and low unemployment.

Emerging market trends and innovations show that as the mix of loans involved in pooled structures shifts, scrutiny and regulatory oversight of packaged loans are increasing, necessitating strong data systems, early scenario modelling, transparent documentation from banks and lenders, and close attention to terms and rules from investors.

LIQUIDITY RISK QUANTIFICATION

Insurers need to carefully manage their liquidity risk to ensure they can meet future liabilities. While agency MBS and other public structured securities are generally liquid, private assets are less liquid. Given that private assets are not publicly traded and with limited trading information, one potential approach to estimate future trading volume for private securities is to build a regression model based on key factors that can predict liquidity such as trading volume, bid-ask spreads, and round-trip costs. Firms can further manage liquidity risk through balance sheet liquidity stress testing via projecting cash flows under extreme scenarios.

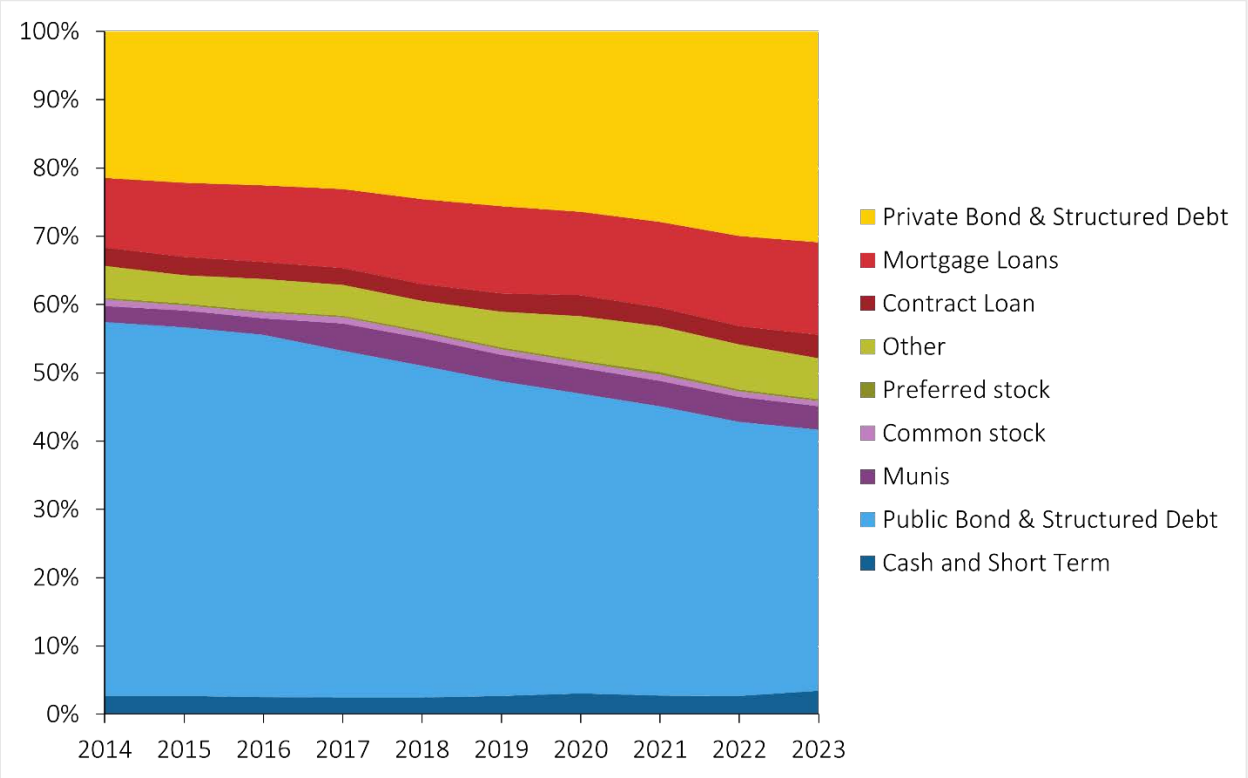
Section 1 Introduction to Complex Assets in Insurance and Annuity Industries

The landscape of investment strategies within life and annuity insurance companies has evolved significantly over the past decade, as complex assets like Collateralized Loan Obligations (CLO), Asset-Backed Securities (ABS), Asset-Backed Finance (ABF), and Mortgage-Backed Securities (MBS) are more widely used in these insurers' portfolios.

According to the National Association of Insurance Commissioners' (NAIC) Year-End 2024 Capital Market report,[1] while insurers' bond allocation declined from 70% in 2010 to 60% at year-end 2024, ABS and other structured securities are the second largest bond type, with strong growth from 12.1% at year-end 2023 to 12.9% at year-end 2024. Agency-backed Residential Mortgage-Backed Securities (RMBS) continued to grow, while exposure to private-label Commercial Mortgage-Backed Securities (CMBS) only declined slightly, likely due to increased caution toward commercial real estate. Another study[2] suggests the top 30 U.S. life insurance companies' asset allocation to Private Bond and Structured Securities increased from 20% to 30% over the past decade.

Figure 1

ASSET HOLDINGS: U.S. LIFE INSURERS



Source: Milliman's All Eyes on Assets in Life Insurance white paper.

Even with a slight decline in the private-label CMBS from 2023 to 2024, life insurance investments in the commercial real estate industry have been growing steadily from 2014 to 2022, with the majority of life insurers' exposure to commercial real estate coming through commercial mortgages. Brown; Life Insurer's Exposure to Commercial Real

[1] "U.S. Insurance Industry's Cash and Invested Assets Rise Over 5% to Close in on $9 Trillion as of Year-End 2024," *NAIC Capital Markets*,https://content.naic.org/sites/default/files/capital-markets-special-reports-asset-mix-ye2024.pdf

[2] "All Eyes on Assets in Life Insurance," *Milliman*,https://www.milliman.com/en/insight/all-eyes-on-assets-in-life-insurance

Estate[3] shows that there has been a steady increase in total assets invested in commercial mortgages in suburban and downtown locations over the past decade. As of the end of 2022, total commercial mortgage exposure in the life insurance industry was approximately $600 billion, which accounted for about 14% of the general account asset allocation. Insurers are also indirectly exposed (to a lesser extent) to commercial real estate through investments in Commercial Mortgage-Backed Securities (CMBS), which totaled around $170 billion in the industry at the end of 2022.

According to the Federal Reserve,[4] private credit including direct lending CLO has grown to nearly $1.7 trillion. Moody's[5] estimates private credit investment, such as ABS with exposure to private corporates, and infrastructure projects is about one-third of U.S. life insurances' asset portfolio. Preqin[6] estimates the private credit AUM will reach $2.8 trillion by year-end 2028.

This literature review brings together insights from previous research on the drivers behind this shift, the structures and risks of these assets, and their performance during crises. It also explores how these investments support both liabilities and surplus, and the implications to risk management and regulatory oversight.

[3] "Life Insurers' Exposure to Commercial Real Estate," *Federal Reserve Bank of Chicago*, August 2024, https://www.chicagofed.org/publications/economic-perspectives/2024/5.
[4] "Private Credit: Characteristics and Risks," *Federal Reserve Board*, February 2024, https://www.federalreserve.gov/econres/notes/feds-notes/private-credit-characteristics-and-risks-20240223.html
[5] "US Life Insurers Head Offshore as Private Credit Upends Industry," *Moody's*, June 2025, https://www.moodys.com/web/en/us/insights/data-stories/private-credit-transforms-life-insurance-industry.html
[6] "Lesson 4.3: Private Debt," *Preqin Academy*, https://www.preqin.com/academy/lesson-4-asset-class-101s/private-debt

Section 2 Drivers of Complex Asset Utilization in Life Insurance and Annuities

The shift to more complex securities is primarily driven by the key drivers below.

2.1 YIELD ENHANCEMENT

Complex securities typically offer higher spreads over public corporate bonds of similar credit quality, and despite the spread tightening of ABS and CLOs recently, they continue to offer opportunities to earn excess yield.

Newly issued AAA CLO tranches were trading at spreads around 145 basis points (bps) as of May 2025,[7] which is well above the spread of comparably rated corporate bonds. Even though the Fed may cut interest rates, the floating rate structure of CLOs offers additional protection in a fluctuating interest rate environment, and investors are taking advantage of higher front-end rates and an inverted treasury curve by investing in floating rate assets.

ABS, meanwhile, are trading around 100 bps higher than corporate bonds with comparable ratings.[8] Esoteric ABS and ABF sectors backed by aircraft leases, solar panels, equipment leases, and other collateral often offer significantly higher yield than public bonds and traditional ABS due to their illiquidity and bespoke structure.

2.2 DIVERSIFICATION

Structured securities offer significantly stronger diversification benefits when compared to corporate bonds, because instead of relying on the performance of a single borrower or loan, these securities pool hundreds or even thousands of loans into one investment. This allows investors to gain exposure to a wide range of borrowers, industries, or regions through a single security. (For example, rather than buying the bond of one airline manufacturer, a buyer can purchase one asset which combines several deals backed by aircraft leases and get broader exposure to the industry and the consumers within it.) And if a few loans in the pool underperform, their losses could often be offset by the rest, which reduces idiosyncratic risk and smooths out returns.

2.3 LIABILITY-DRIVEN INVESTMENT

Life insurance and annuity companies also invest in illiquid assets such as private credit, CLOs, ABS, and other complex structured securities because of their longer duration liabilities. This structural characteristic enables insurers to commit to longer investment horizons. When insurers match long-term liabilities with illiquid assets that generate contractual cash flows, they can hold onto those investments to maturity instead of being forced to sell them during stressed market environments. In this situation, illiquidity is not viewed as a drawback but as a strategic fit to effectively manage assets and liabilities. In practice, many life insurers place predictable cash flows generated from these illiquid complex securities to match with liability cash flows, while riskier residual tranches are typically allocated to surplus portfolio.

2.4 REGULATORY CAPITAL STRUCTURE

Capital requirements have been an additional consideration for insurers increasing their asset allocation to more complex assets such as CLOs over the past decade and a half. Capital charges for assets are primarily determined by credit ratings, with lower-rated assets obtaining a higher capital charge. By investing in structured securities rather than underlying loans/mortgages directly, insurers may be able to lower capital charges, because the tranches of

[7] *U.S. Structured Finance Chart Book: May 2025*, *S&P Global*, https://www.spglobal.com/_assets/documents/ratings/research/101625732.pdf
[8] "Asset-Backed Securities and CLOs Robust Issuance Expected in 2025," *Guggenheim Investments*, https://www.guggenheiminvestments.com/GuggenheimInvestments/media/PDF/1Q25-FISV-ABS-CLOS.pdf

the structured securities they invest in can have a higher credit rating compared with the underlying pool of loans or bonds supporting the structured investment. The higher credit rating in the structured securities is due to credit enhancement, where junior tranches are designed to absorb losses first before losses impact any senior tranches. Therefore, investors of senior tranches have higher credit ratings with greater protection.

Carlino, Foley-Fisher, Heinrich, and Verani (2025)[9] argue that U.S.- and Bermuda-based insurers can significantly reduce their risk-based capital requirements without significantly altering their underlying asset exposure by simply swapping their corporate loan holdings for CLO investments. The cited authors also comment that these lower capital charges can be even more pronounced for lower-rated loans such as middle-market loans, as lower-rated assets have exponentially higher capital charges under the NAIC regulation. As discussed below, required capital charges and levels have recently been revised under the NAIC Principle Based Bond Definition framework effective January 1, 2025, in the U.S. Regulators continue to review appropriate capital charges for these asset classes to confirm that adequate capital is targeted and held.

Santo and Fringuelloti (2025)[10] point out another nuance of capital requirements. Before 2017, fixed income securities with very high credit ratings (AAA, AA, and A) were all mapped to the same category with the lowest capital charge. Because of this heterogenous mapping of fixed income securities to a capital category, insurers had more incentive to invest in the highest yielding, lowest rated securities that still fell within the same capital designation. Since then, NAIC C-1 charges have been updated to reflect more granular crediting ratings.

2.5 PARTNERSHIP WITH ASSET MANAGERS

Another driver of the increasing adoption of complex assets in the insurance industry is the growth of private-equity affiliation and ownership in the insurance industry. Over the past decade, many private-equity-backed firms have invested in insurance companies (or reinsured specific blocks) in order to obtain access to a large amount of general account assets under management (AUM). Traditional life insurers are then partnered with or acquired by alternative asset managers to build capital-efficient business models, and asset managers of private equity companies typically invest in riskier, higher-yielding complex assets.

Kirti and Sarin (2024)[11] document that life insurers that were taken over by private equity firms shifted their investments toward private-label Asset-Backed Securities (ABS), and the total annuities direct premiums market share of private capital-backed platforms has more than doubled over the past decade, from 7% in 2015 to 16% in 2024.[12] Carlino and Foley-Fisher (2025)[13] note that increased cooperation between life insurers and their affiliated asset managers has contributed to more complex asset structures with the objective of increasing returns. Life insurers' affiliated asset managers have also become major originators of different types of corporate loans and loan structures, such as Broadly Syndicated Loans (BSL) and middle market CLOs. With interest rates at very low levels throughout much of the 2010s, insurers have leaned toward these complex asset structures to earn higher yields on their portfolios.

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[9] Carlino, Fisher, Heinrich, and Verani. *"Life Insurers' Role in the Intermediation Chain of Public and Private Credit to Risky Firms."* 2025.
[10] Fringuellotti and Santos. *"Insurance Companies and the Growth of Corporate Loans' Securitization."* 2025.
[11] Kirti, Divya, and Natasha Sarin, 2024. "What Private Equity Does Differently: Evidence from Life Insurance." *Review of Financial Studies*, Vol. 37, No. 1, January, pp. 201–230
[12] "Life Insurance: Putting Recent Trends and Developments Into Context," *BMO Commercial Banks Insights*, https://commercial.bmo.com/en/insights/life-insurance-putting-recent-trends-and-developments-into-context/
[13] Carlino, Fisher, Heinrich, and Verani. *"Life Insurers' Role in the Intermediation Chain of Public and Private Credit to Risky Firms."* 2025.

Section 3 Regulatory Update

As insurance companies invest in more complex structures, including repackaging equity-like exposures into debt instruments, this has drawn greater attention from regulators. Both the NAIC in the U.S. and the Bermuda Monetary Authority (BMA) have introduced initiatives to ensure that structured assets are understood and properly evaluated by insures.

3.1 NAIC REGULATORY FRAMEWORK

Effective January 2025, all securities need to be qualified as bonds under the Principal-Based Bond Definition (PBBD) to be reported on Schedule D[14]. This framework emphasizes the substance of an investment's design rather than its legal form. Debt securities that do not meet the definition will instead be reported on Schedule BA and may be subject to higher C-1 capital charges.

NAIC also implemented Actuarial Guideline 53 (AG 53) to improve transparency around the investment spreads insurers use in their reserve calculation. Under AG 53, insurers are required to decompose the overall investment spreads into their underlying risk components, including credit risk, liquidity premium, and other factors that contribute to the spread earned on assets.

With the NAIC recently beginning to revisit the capital treatment of structured securities, it is possible the NAIC will update the capital framework to make it more model-based, as opposed to solely relying on rating agencies. In 2026, the NAIC Valuation of Securities Task Force will require the Securities Valuation Office (SVO) to model CLOs directly and assign NAIC designations. This means CLOs will no longer be broadly exempt from filing with the SVO based on credit rating provider assessments. As a result, investment-grade mezzanine tranches could face higher capital charges when the new regulation takes place, potentially slowing the recent growth in structured asset allocations. Meeting notes from the NAIC's Risk-Based Capital Investment Risk and Evaluation Working Group[15] suggest the final factors may be available for exposure by April 30, 2026.

In parallel, new capital charge proposals would allow the SVO to override the credit ratings if its own risk assessment differs by three or more notches from those assigned by a nationally recognized statistical ratings organization (such as Moody's). This update is particularly targeted toward investments sourced from nontraditional and private markets.

3.2 BMA REGULATORY FRAMEWORK

Similarly, the Bermuda Monetary Authority (BMA) has been strengthening its oversight of structured securities, emphasizing transparency, portfolio-level context, and robust risk management. Insurers are required to submit detailed deal-level data and explain how structured asset investments align with their broader investment strategy and liability profile.

The BMA's assessment focuses on the entire portfolio, rather than structured assets in isolation. There is a particular focus on the quality of underlying collaterals, concentration risk, and potential risk of credit rating downgrades. In addition, the BMA requires insurers to perform stress testing on credit risk and illiquidity premium to evaluate the potential impact on both best estimate liabilities and capital.

[14] Statutory Issue Paper No. 169, NAIC
[15] RISK-BASED CAPITAL INVESTMENT RISK AND EVALUATION (E) WORKING GROUP meeting note, 8/27/2025, NAIC

Section 4 Common Structures and Underlying Collateral of Complex Assets

Securitized mortgage loans including residential mortgages and commercial mortgages have been in life insurance companies' balance sheets for a long time. However, over the past decade, life and annuity insurance companies' CLOs and ABS have increased significantly. Over the past 10 years, asset allocation of CMBS and RMBS for the top 30 life insurers in the United States have dropped from 70% to 55%.[16]

4.1 ASSET-BACKED SECURITIES (ABS)

Asset-backed securities are backed by an asset that has a contractual obligation to make payments instead of a company's promise to honor its commitment to pay. Note that ABS generally do not have "hard assets" as the primary collateral; instead, they consist of mortgages and other loans which determine the payments that must be made. There are several different types of ABS including non-mortgage ABS, MBS, and CLOs. Common ABS are secured by consumer loans. However, this asset class is evolving and assets such as equipment leases, aviation/aircraft, renewable energy, and digital assets (to name a few examples) are emerging:[17]

Types of non-mortgage ABS include:[18]

1. Auto Loan and Auto Lease
2. Commercial (agriculture, transportation, construction, equipment, information technology)
3. Unsecured Consumer (student loan, credit card, personal loan, U.S. mobile handset)
4. Non-Traditional (utility-related, corporate, triple net lease, small business loans, aircraft, container/railcar)

Setting up ABS typically requires a Special Purpose Vehicle ("SPV") and a manager is assigned to purchase the pool of assets of a specific type.[19] The ABS SPV has multiple tranches which represent the different levels of risk and return profiles. Note that to appropriately assess the risk of ABS securities typically includes evaluating the borrower's ability to pay their loan/mortgage with prudent assumptions. Additional stress testing would help to capture potential deterioration in credit quality. While ABS securities may be backed by a physical asset, they only serve as a last resort to obtain a means of payment. Essentially, if a borrower is not able to pay their loan, the asset has likely also depreciated in value, which may not be sufficient in terms of cash flows to support the payments to investors.[19] Hence, properly evaluating the borrower's ability to pay will result in a better risk-return assessment.

4.2 COLLATERAL LOAN OBLIGATIONS (CLO)

CLOs are securitizations backed primarily by pools of leveraged loans, which are loans extended to companies with high levels of debt relative to equity. Investors receive cash flows from both interest and principal payments on the pool of underlying loans. While the underlying loans are mostly rated below-investment-grade, they offer higher yields to compensate for that risk. As of August 2022, the B-minus and B-flat leveraged loan borrowers made up about 57% of the loan market.[20]

CLOs transform these riskier underlying loans into securities with credit ratings ranging from AAA down to unrated equity tranches. This transformation occurs through the securitization and credit enhancement process. A CLO

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[16] "All Eyes on Assets in Life Insurance," *Milliman*, https://www.milliman.com/en/insight/all-eyes-on-assets-in-life-insurance
[17] "Emerging Trends in Structured Finance and Asset-Backed Securities," *IQEQ*, https://iqeq.com/expertise/emerging-trends-in-structured-finance-and-asset-backed-securities/
[18] *Global Structured Finance 2024 Outlook, S&P Global*, https://www.spglobal.com/_assets/documents/ratings/research/101591938.pdf
[19] "The ABCs of Asset-Backed Securities (ABS)," *Guggenheim Investments*, https://www.guggenheiminvestments.com/perspectives/portfolio-strategy/asset-backed-securities-abs
[20] Rachelle Kakouris, "Riskiest Segment of Leveraged Loans Now Account for Largest Share of $1.4 Trillion Asset Class," *PitchBook*, https://pitchbook.com/news/articles/riskiest-segment-of-leveraged-loans-now-account-for-largest-share-of-14t-asset-class?utm_source

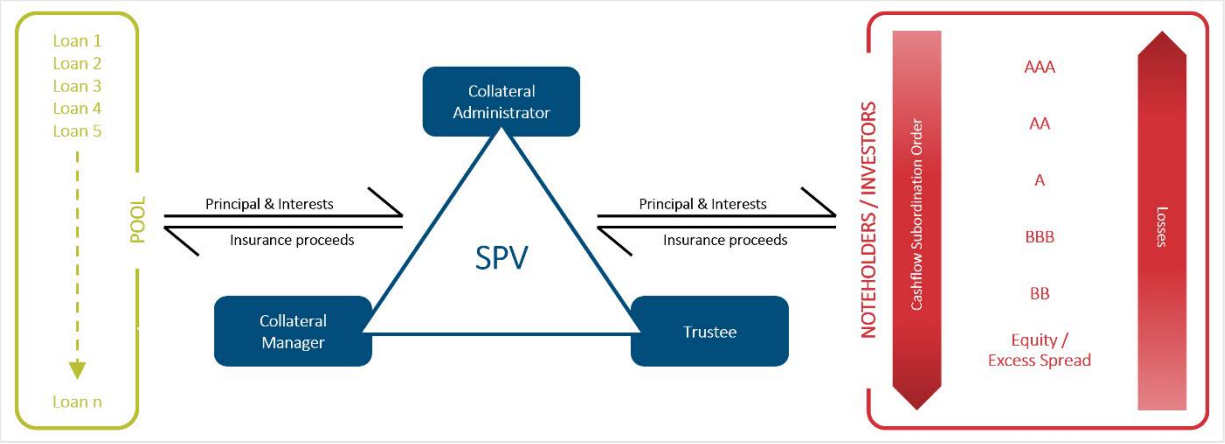
manager establishes a Special Purpose Vehicle (SPV), which acquires the loan pool and issues tranches of notes to investors. The SPV's structure features a cash flow waterfall, where the most senior tranches have first claim on interest and principal payments, while junior tranches absorb losses first. This subordination provides credit protection to the higher-rated tranches. Additional credit enhancements, such as overcollateralization (the aggregate par value of loan pool exceeds the total par value of the issued notes) and interest coverage tests (interest income generated by the underlying loans is sufficient to cover the interest payments due on the issued CLO notes) further support the ability of senior tranches to achieve investment-grade-ratings, even though the underlying collateral is below-investment-grade.

According to the NAIC,[21] insurance companies invest primarily in senior and mezzanine (middle) tranches due to the lower risk they possess, since they have higher seniority and are paid before the residual/equity tranche. Relatively lower amounts of residual/equity tranches are held by insurers due to the higher risk associated with them and the higher capital charges assigned to these tranches.

In terms of the structure, a CLO manager sets up a Special Purpose Vehicle (SPV) which issues notes to the participants (investors). These notes have different risk profiles as they belong to different debt tranches and aim to meet the risk and return needs of the investors (Fig. 3). The notes can be AAA-rated, which is the most senior tranche; this is meant for more risk-adverse investors who are first in line to receive payment at the cost of lower returns. The notes' tranches "waterfall" down to mezzanine and junior tranches, and trickle down to the residual/equity tranche, which is the riskiest as it is the last to receive compensation; however, it also offers the potential for highest returns.

It is important to note that the equity or residual tranche is slightly different from the other tranches in a few ways. It does not receive any rating and is treated as the riskiest tranche issued by the SPV. Additionally, the equity tranche does not receive a fixed coupon payment. Since the tranches "waterfall" in terms of payment priority, this tranche receives whatever amount is left after paying the other tranches. In the case of a loss, which is intensified through higher-than-expected defaults, this tranche is the first to take a loss.

Figure 3
COLLATERALIZED LOAN OBLIGATIONS



[21] *Collateralized Loan Obligations (CLOs) Primer, NAIC Capital Markets*, https://content.naic.org/sites/default/files/capital-markets-primer-collateralized-loan-obligations.pdf

CLO life cycle is comprised of four phases (Fig. 4):

1. The warehouse period: During the initial warehouse period, a CLO manager is provided with the financing to purchase Leveraged Loans (LL) to add to his or her portfolio. It is the CLO manager's responsibility to ensure that the loans are diversified and representative of many corporate sectors. As with any asset, diversification helps reduce exposure to company specific risks.

2. The ramp-up period: In the ramp-up period, a CLO manager purchases more assets from the performance of the LL already present in the portfolio or from any remaining capital from the warehouse period. The CLO manager typically carefully monitors the fund.

3. The reinvestment period: During the reinvestment period, which is the longest period, a CLO manager reinvests the cash flows from the loan pool to purchase additional assets and maintain the risk/return profile of the SPV.

4. The amortization period: Lastly, in the amortization period, the cash flows from the portfolio are used to pay any outstanding loans. After senior and mezzanine obligations are met, the remaining cash flows, together with the excess spread generated by the portfolio, are used to compensate the equity tranche investors.

Figure 4
LIFECYCLE OF A CLO

Source: Guggenheim Investments, Wells Fargo.

4.3 MORTGAGE-BACKED SECURITIES (MBS)

MBS are created from individual loans made by multiple banks, the cashflows of which are then pooled together by a special purpose entity (SPE), which then issues debt securities, or tranches, that can be traded in the secondary market. MBS allow investors to hold and trade mortgages. Prior to 1980, U.S. mortgages were held by financial intermediaries; however, the introduction of MBS has enabled others to invest into the Fixed Income market.[22] Similar to CLOs, MBS investors—which tend to be depository institutions, the Federal Reserve, international investors, mutual funds, and money market funds—profit from the interest payments on the pool of underlying mortgages that make up the MBS security.

MBS can be categorized as residential (RMBS) or commercial (CMBS); RMBS are mortgages that are backed by residential real estate, while CMBS are backed by commercial real estate (e.g., offices, warehouses, etc.). Furthermore, RMBS can be categorized into agency and non-agency assets. Agency MBS are government-backed (i.e. Fannie Mae, Freddie Mac, or Ginnie Mae) and provide a credit guarantee, while non-agency MBS are assigned a tranche and are issued by financial institutions.

The structure of MBS can be either pass-throughs or structured into tranches.

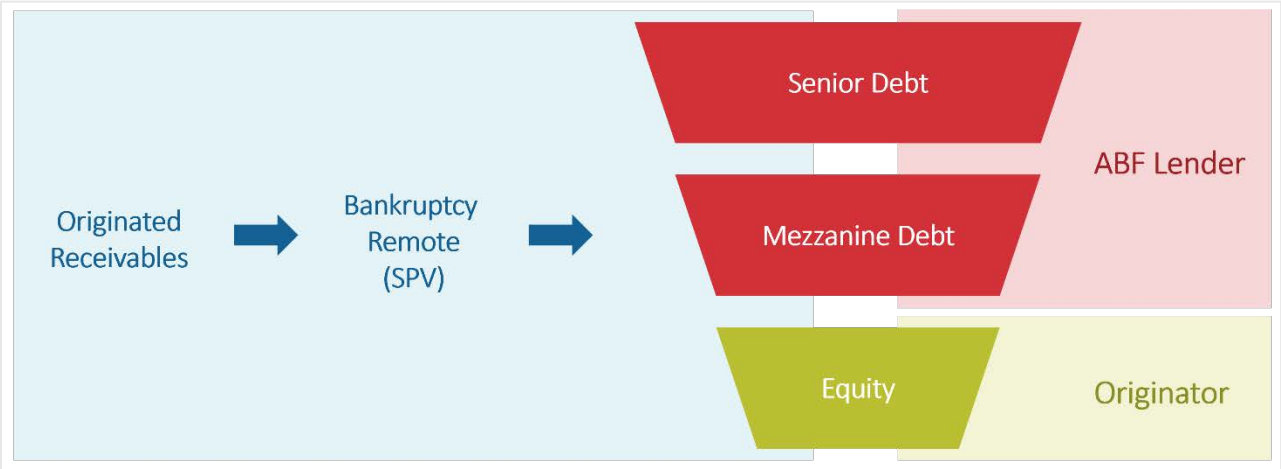
- In a pass-through MBS, the principal and interest payments from borrowers are "passed through" to investors after servicing fees. This structure is relatively straightforward and highly standardized and common among agency MBS.
- In contrast, MBS with tranches, particularly non-agency RMBS and CMBS, involve dividing the pooled cash flows into multiple tranches with varying degrees of credit enhancement and risk. Each tranche receives cash flows according to its seniority in the capital structure. Similar to other tranched structures, each tranche will have a different coupon rate and credit rating, with the higher credit-rated tranches receiving higher subordination from the loan pool. This means that if defaults occur in the underlying collateral pool of mortgages, the more junior tranches with less subordination will suffer losses to their par value prior to more senior tranches. To compensate for taking on higher risk, a more junior tranche will have a higher coupon rate compared with a more senior tranche. Some structures also include interest-only or principal only tranches, which isolate specific components of the mortgage cash flow.

[22] Andreas Fuster, David Lucca, and James Vickery, *"Mortgage-Backed Securities," Federal Reserve Bank of New York*, https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr1001.pdf

4.4 ASSET-BACKED FINANCING (ABF)

Within the topic of ABS, it would be remiss not to mention Asset-Backed Financing (ABF). ABF (Fig. 5) is similar to ABS in that it is backed by collateral; however, the main difference is that this involves private lending. Due to the liquidity and rating differences of private credit, ABF may offer higher yield opportunities than "normal" ABS assets. ABF is not always a tradeable security like ABS; hence it poses higher liquidity risk. Also, many loans under ABF are made to Below Investment Grade (BIG) companies, which pose a higher level of credit risk.[23]

Figure 5
THE TYPICAL ABF STRUCTURE



4.5 EMERGING STRUCTURES AND TRENDS

RMBS

The market for residential mortgage-backed securities is changing fast. Higher interest rates have reduced the profitability of holding mortgages on bank balance sheets. When rates rise, banks' own funding costs increase, and the spread between what they pay to raid funds and the fixed rates they earn on existing mortgages narrows. Therefore, many are turning back to securitization as a cheaper funding route. At the same time, global rules such as Basel III and the EU and UK securitization laws demand far more detail about every loan that goes into an RMBS deal. Issuers now have to supply complete loan-level data, pass independent data-quality checks, and update investors every quarter. See, for example, Basel Committee on Banking Supervision (BCBS), *"Basel III: Finalising post-crisis reforms,"* Bank for International Settlements, 2017; and European Banking Authority (EBA), *"Guidelines on Loan-Level Information for Securitisations,"* 2018, which set out detailed transparency and reporting requirements for RMBS issuers.

Deal structures have become more flexible but also more tightly controlled. Many new transactions use "master trusts," which let banks add fresh mortgages over time. Those trusts, however, typically must stick to strict limits on loan-to-value ratios, credit scores, arrears, and geographic mix to ensure the pool quality does not drift. Some banks

[23] *Private Credit 101: Understanding Direct Lending and Asset-Based Finance, Capital Group and KKR,* https://www.capitalgroup.com/content/dam/cgc/shared-content/documents/pps-takeaways/Takeaway_Understanding_direct_lending_and_asset_based_finance.pdf?msockid=111480c8124869673e3795a7132968b7

even run a single pool that can back either covered bonds or RMBS, giving them two funding options from the same set of loans.

The mix of loans in RMBS pools is shifting too. More borrowers are choosing interest-only periods or 40-year terms to cope with affordability strains, especially in the UK and Australia. These loan types are often subject to additional credit protections or limits on how many can be securitized, reflecting prevailing supervisory frameworks. Aging populations are driving growth in later-life mortgage products that need special servicing and sometimes insurance against borrower death. In Central and Eastern Europe, deals now lock down foreign-currency risk by converting payments quickly and holding cash in segregated accounts. Green mortgages are also on the rise; pools with a high share of energy-efficient homes can get cheaper funding if they supply reliable energy-performance certificates and climate-risk reports.

For RMBS, managing counterparty risk is another hot topic. Swap contracts now switch automatically to overnight risk-free rates, force the swap bank to post extra collateral if its credit weakens, and can be replaced quickly if the bank is downgraded. Where hedging markets are thin, deals build in higher reserves and excess spread to handle unhedged interest-rate or currency moves. In Australia and Canada, mortgage insurance still plays a key role, but contracts are being rewritten so that any insurer shortfall hits the seller first and not the bondholders.

Ongoing oversight has also become tougher. Issuers are increasingly expected to run both simple trend checks and more detailed roll-rate tests in arrears, updating credit-enhancement numbers when performance deviates from projections**.** And liquidity cushions have grown; most new deals now hold at least three months of senior fees and interest, calculated on stressed rather than headline rates. These requirements are typically aligned with insurer regulatory or rating-agency expectations, which emphasize continuous monitoring of performance and sufficient liquidity to withstand stress scenarios.

The tightening of oversight and complexity of deal structures have important implications for investors. For investors, close attention to swap terms, servicing quality, and replenishment rules is essential, because any weakness can quickly erode protection levels. Overall, today's RMBS landscape rewards clarity, solid risk management, and credible sustainability credentials.

ABS AND RATED NOTE FEEDER

For ABS, there are new collateral types emerging, such as royalties, infrastructure, and renewable energy projects.[24]

Emerging innovations include the use of rated note feeders. Rated note feeders issue rated debt notes to investors, such as insurance companies, allowing them to participate in private credit while benefiting from the favorable regulatory capital treatment.[25] Unlike private bonds, which are directly issued by a single borrower, rated note feeders are structured investments that pool multiple private loans into a fund-like structure, then issue tranched, rated notes backed by those underlying collateral loans. The rating assigned to each tranche reflects its risk profile, providing insurers with clarity on capital charges under regulatory framework. These structures are becoming popular among insurers because they offer diversified and higher yielding assets that meet their regulatory capital requirements. However, it is important to note that rated note feeder structures involve complex legal and operational considerations, and managers typically work closely with a rating agency to underwrite and structure the portfolio appropriately.

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[24] "Rising Annuity Sales Driving Demand for Shorter-Duration Assets," *Insurance Business*, https://www.insurancebusinessmag.com/us/news/life-insurance/rising-annuity-sales-driving-demand-for-shorterduration-assets--alliancebernstein-528544.aspx

[25] *An Introduction to Rated Note Feeders, Seward & Kissel LLP*, https://www.sewkis.com/wp-content/uploads/intro-to-rated-note-feeders.pdf

NET ASSET VALUE (NAV) LOAN

Another emerging trend is increasing investment in NAV structures by life insurance companies. NAV-based facilities are secured by the value of the fund's portfolio investment and by liquidity provided by insurers. NAV financing allows funds to access liquidity based on the value of their portfolio.[26] Additionally, during periods of economic uncertainty and volatility in markets, NAV financing allows funds to return capital to the investors without forcing asset sales. To protect investors as pools shrink, most structures now include triggers that speed up principal payments, require extra cash collateral, or cap how small the borrower count can get.

[26] *Overview of NAV-Based Facilities and Current Market Practices, Institutional Limited Partners Association (ILPA)*, https://ilpa.org/wp-content/uploads/2024/11/Part-I-Nav-Based-Facilities-Guidance.pdf

Section 5 Cash Flow Variability and Factors Influencing Performance

Structured securities can be subject to significant variability in both cash flows and yields due to their complex design and dependence on market rates. Understanding what drivers influence cash flows is essential to accurately forecasting and assessing the risk associated with these assets.

5.1 CREDIT RISK

If the borrowers of the underlying collateral loans of MBS fail to make payments due to negative equity and life events (e.g., unemployment, illness, etc.), they may default on their loans. While agency MBS have guarantees for full and timely payments, leading to prepayment events in the case of default, non-agency MBS investors bear credit losses directly, starting with the most junior securities.

To gauge this risk, insurers can perform scenario analysis to determine how the cash flow projections of their underlying loans and securitized assets change under different economic stresses.

For example, Brown[27] stressed the commercial mortgage holdings of insurance companies by assuming that the average price decline of multifamily, office, and retail properties was 13%, 40%, and 23%, respectively. This analysis concluded that the resulting losses in the commercial properties were on average only about 1% of an insurer's adjusted capital. The main reason for the relatively small losses relative to the size of the commercial mortgage portfolio was the low current Loan-to-Value (LTV) for most of the commercial mortgages in the insurance asset portfolio.

But similar analysis performed on the CMBS properties showed that the risks were much larger, with some insurers experiencing losses that could reach 20% of adjusted capital. This was mainly because the underlying properties in CMBS have much larger exposure to downtown office retail, which was a poorer performing subsector of the overall commercial real estate space. This illustrates how understanding the different geographic and property type exposures in an insurer's commercial real estate investment portfolio is a critical component in understanding the risk of investments.

CLOs are a security that are backed by a pool of debt, and private equity firms often use CLOs to facilitate leveraged buyouts. These CLOs are supported by corporate loans that typically have low credit ratings,[28] and come with a risk that underlying loans can default and lose money for investors.

As shown in Figure 6,[29] it is important to note the rankings of CLOs. AAA-rated CLOs tend to have low volatility with a yield pickup over corporate bonds, while BBB-rated CLOs can yield much higher returns but come with higher volatility and greater possibility of default.

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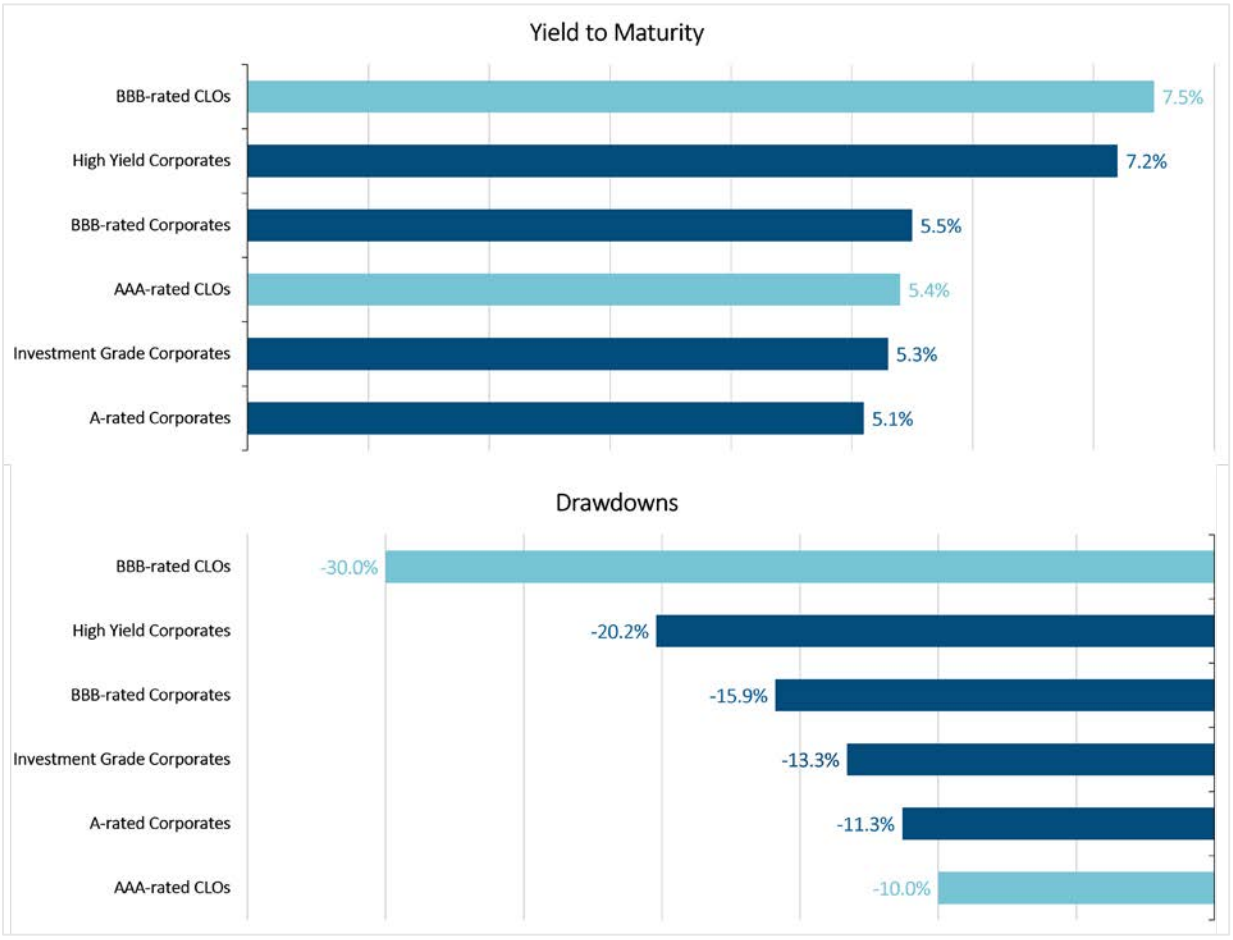
[27] Jordan Brown, *"Life Insurers' Exposure to Commercial Real Estate,"* *Economic Perspectives*, *Federal Reserve Bank of Chicago*, November 2024, https://www.chicagofed.org/-/media/publications/economic-perspectives/2024/ep2024-5.pdf?sc_lang=en

[28] Osman Ahmed, *"Collateralized Loan Obligations (CLO),"* *Wall Street Oasis*, October 2024, https://www.wallstreetoasis.com/resources/skills/credit/collateralized-loan-obligations-clo

[29] Connor Stack, Erik Moss, Matthew Macdonald, and Nidhl Patel, *"Demystifying Collateralized Loan Obligations (CLOs),"* *BlackRock*, March 2025, https://www.blackrock.com/us/financial-professionals/insights/what-are-clos

Figure 6

ATTRACTIVE YIELDS RELATIVE TO HISTORIC DRAWDOWNS



Source: BlackRock, JP Morgan, Bloomberg. Yields as of 1/31/2025. High Yield corporates are the Bloomberg US HY Corporate index, AAA CLOs are the JP Morgan CLOIE AAA Index, BBB CLOs are the JP Morgan CLOIE BBB Index, Investment Grade and BBB Corporates are the respective Bloomberg US Corporate Indices. Drawdowns are the largest trailing 20 business day period over the prior ten years using daily returns. Index performance is for illustrative purposes only. Index performance does not reflect any management fees, transaction costs, or expenses. Indexes are unmanaged and one cannot invest directly in an index. Past performance does not guarantee future results. Index performance does not represent actual Fund performance. For actual fund performance, please visit each Fund's product page.

While CLOs have historically enjoyed higher recovery rates than public bonds, the market faces limited default data, making it more difficult to model outcomes. A key development in recent years has been the widespread adoption of covenant-lite (cov-lite) loans, which are leveraged loans with weaker covenant enforcement. A cov-lite contract only requires a firm to meet with its financial covenants when the firm is taking specific actions, such as issuing new debt, selling assets, or completing a merger, unlike traditional loan contracts where they need to comply with contractual financial covenants on an ongoing basis. Most common covenant is the leverage ratio, which measures the firm's debt relative to earnings before interest, taxes, depreciation, and amortization (EBITDA). Without maintaining covenants on an ongoing basis, borrowers can potentially deteriorate for longer periods without tripping a covenant breach and leading to higher loss severity. This is discussed in Section 7 as well.

According to S&P,[30] first-lien covenant-lite loans have increased from 20% to nearly 100% since 2011. S&P's review of 65 first-lien loans that defaulted between 2015 and 2020 shows an average recovery rate of 68%, which is about 10% lower than the average recovery rate of 79% for non-covenant-lite loans.

ABS is another financial investment that is collateralized by loans, leases, credit card balances, or receivables. Because there are hundreds of underlying assets, it can be difficult to evaluate the risk, which increases the importance of due diligence.[31] Historically, some structured products backed by high-yield, high-risk bonds were marketed as innovative and relatively safe, but their risks were not always fully understood.[32] Similarly, the performance of ABS depends heavily on the characteristics of the underlying assets, such as lease terms, prepayment behavior, default experience, collateralization levels, and loan-to-value ratios and the underlying risks can vary significantly across asset types.

But although difficult to evaluate and model, the wide spread of asset classes can make ABS less volatile than other assets. Mechanisms can be put in place to protect ABS investors from losses due to default, including over-collateralization (having more assets than needed to cover the securities), reserve accounts (funds set aside to cover losses), and guarantees. These credit enhancements can stabilize cash flows by absorbing losses.

5.2 PREPAYMENT RISK

When interest rates decline, prepayments and refinancing would drive volatility and risk in RMBS. Prepayments, which occur when borrowers pay off their loans early, would change expected MBS performance since principal is received sooner than priced for.[33] Refinancing, in which homeowners replace existing mortgages with new loans at lower interest rates, would reduce total interest received and ultimately lowers the yield to investors.

Similarly, ABS borrowers may repay their loans earlier than expected, altering the timing and amount of cash flows. This is common in assets like auto loans and mortgages. But when interest rates fall, borrowers are more likely to refinance or pay off their loans early, leading to higher prepayment rates that can reduce expected cash flows and affect the yield of the ABS.

CLO debt is typically a floating interest rate, so interest owed to debt holders increases with rising rates. Higher interest rates can lead to payment challenges for borrowers, resulting in delinquencies or defaults and less cash flow for CLO investors. When interest rates decrease, leveraged bank loan issuers may refinance floating rate loans, which reduces the CLO portfolio's principal value and forces CLO managers to reinvest proceeds in new opportunities.

5.3 LIQUIDITY RISK

Liquidity risk can be a significant concern for these complex assets, but the degree of liquidity varies between different asset classes and their structures.

Agency MBS backed by government-sponsored enterprises (e.g., Fannie Mae, Freddie Mac, Ginnie Mae) are among the most liquid fixed income instruments. This is largely due to the existence of the To-Be-Announced (TBA) market,

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[30] *Global Leveraged Finance Handbook, 2022-2023, S&P Global Ratings*, https://www.spglobal.com/_assets/documents/ratings/research/101579970.pdf
[31] CFI Team, "Asset-Backed Securities," *Corporate Finance Institute (CFI),* https://corporatefinanceinstitute.com/resources/fixed-income/asset-backed-securities-abs/
[32] Abelson, Max. Kelly, Jason. Carey, David. "Renegades of Junk: The Rise and Fall of the Drexel Empire," *Bloomberg Business*, April 2015, https://www.bloomberg.com/graphics/2015-drexel-burnham-oral-history/
[33] David Varano, "Why It's a Perfect Storm for Mortgage-Backed Securities," *Intercontinental Exchange (ICE),* September 2024, https://www.ice.com/insights/fixed-income-data/why-its-a-perfect-storm-for-mortgage-backed-securities

which enables forward trading of standardized MBS pools even before the actual securities are delivered. The TBA market allows large volumes of MBS to be traded efficiently and anonymously, providing significant depth and tight bid-ask spreads.

In contrast, non-agency MBS lack the standardization and support of the TBA (To-Be-Announced) market and therefore are traded much less frequently. The TBA market was established by the Securities Industry and Financial Markets Association (SIFMA). It allows agency MBS to be traded on a forward basis before the actual mortgage pools are delivered, which provide high liquidity and price transparency through standardized settlement dates and contract terms. The liquidity of non-agency MBS is typically more limited, and their pricing is more opaque, especially in times of market stress when investors tend to flee to safer and more liquid instruments. This makes non-agency MBS more vulnerable to wider bid-ask spreads, higher trading costs, and price volatility.

In repo markets, agency MBS also benefit from strong funding liquidity because they are widely accepted as collateral, particularly in tri-party repo arrangements. Their perceived low credit risk and support from federal agencies make them highly attractive for short-term borrowing. As a result, agency MBS can typically be funded at low repo haircuts and tight spreads.

However, non-agency MBS often face higher haircuts and limited repo access, especially during periods of stress. During the 2008 financial crisis, the sudden withdrawal of funding liquidity for non-agency MBS was a key driver of forced selling and valuation collapses, as noted in the Crisis and Response.[34]

ABS, meanwhile, are generally considered less liquid than investment-grade corporate bonds. The factors contributing to the liquidity risk of ABS include market depth, tranche seniority, underlying collateral, and complexity of the structure. Senior tranches are usually more liquid than subordinate tranches due to higher demand, and underlying pools that are well-diversified (e.g., auto loans from many borrowers) tend to offer higher liquidity than concentrated and riskier pools (e.g., subprime loans). ABS with clear structure and historical performance data are more liquid than highly bespoke structures.

Liquidity risk has a substantial impact on both ABS cash flows and valuation. In severe liquidity crunches, borrowers of underlying loans may face financial hardship, which can potentially lead to default and reduced cash flows, particularly for subordinate tranches. Liquidity risk also influences the pricing of ABS. In turbulent market environments, investors demand higher spread to hold less liquid ABS, which leads to lower market prices. Less liquid structures or tranches (especially subordinate ones) face deeper discounts during market turbulence.

For example, the ABS market experienced significant liquidity contraction during the 2008 financial crisis, and forced sales at distressed prices led to significant mark-to-market losses. That drove the creation of the Federal Reserve's Term Asset-Backed Securities Loan Facility (TALF) and Commercial Paper Funding Facility (CPFF)[35] to restore functioning by addressing severe liquidity risk. A more recent study commissioned by the Association of Financial Markets in Europe (AFME)[36] shows that senior tranche ABS in the European Market since 2016 have been consistently more liquid than covered bonds, even during the 2020 COVID-19 crisis.

Regarding CLOs, Broadly Syndicated Loans (BSL) pool together loans made to large, generally public companies where the underlying loans are syndicated and actively traded in public or quasi-public secondary markets. Most BSL

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[34] *Crisis and Response, Federal Deposit Insurance Corporation (FDIC),* . https://www.fdic.gov/resources/publications/crisis-response/book/crisis-response-chapter-1.pdf

[35] Adam Ashcraft, Allan Malz, and Zoltan Pozsar, *"The Federal Reserve's Term Asset-Backed Securities Loan Facility."*

[36] *Comparing ABS and Covered Bond Liquidity, Risk Control Limited,* commissioned by the *Association for Financial Markets in Europe (AFME),* https://www.riskcontrollimited.com/insights/comparing-abs-and-covered-bond-liquidity/

CLOs invest in senior secured loans that have liquid price discovery and regular trading volumes. However, this liquidity can dry up rapidly during market stress. Secondary market activity may slow sharply, bid-ask spreads may widen, and both the underlying loan and the CLO tranches can experience mark-to-market losses.

In contrast, Direct Lending (DL) CLOs often invest in loans to smaller, private companies that are not regularly traded, and CLO managers typically reinvest loan repayments. But when liquidity is poor, finding suitable reinvestment opportunities becomes harder, which can reduce portfolio yield and impact future cash flows.

Traditionally, private credit funds, including direct lending loans, typically invest in illiquid assets and can lock up capital for long periods, which helps manage liquidity on the surface. As noted in the International Association of Insurance Supervisors' (IAIS) report,[37] newer "semiliquid" fund structures are starting to allow limited redemptions, and those redemption windows could open the door to liquidity issues in times of stress. On top of that, many of these private credit funds use Payment-in-Kind (PIK) loans, where borrowers can skip cash interest payments by adding it to the loan balance, meaning less cash and more pressure if redemptions pick up. Then there are capital calls, where insurers might suddenly be asked to put up cash when the fund needs it, often with little notice or control over timing. While some funds try to manage this by setting up credit lines with banks, it is unclear how well those arrangements would hold up in a true market downturn. All of this makes liquidity risk something insurers are recommended to keep a close eye on in the private credit space. (See Section 8 for methods to quantify liquidity risk.)

5.4 INTEREST RATE RISK AND ECONOMIC ENVIRONMENT

Due to the floating rate nature of CLO debt (most CLOs have floating rate coupons, whereas only some ABS are structured as floating rate), changes in interest rates affect interest income and payments to investors. For floating-rate structures, coupon payments fluctuate with interest rates so that the market value is less sensitive to interest rate movement.

For fixed-rate ABS, rising market interest rates with fixed coupons tend to be less popular, as secondary market values may fluctuate more as investors demand higher market yields. The mark-to-market can be highly sensitive to the interest rate, similar to traditional corporate bonds. Additionally, the cash flows from ABS depend on the performance of the underlying assets and borrower behavior. When interest rates decrease, prepayments of the underlying loans increase, which can lead to investors receiving lower than expected payments, and subject them to reinvestment risk under a lower interest rate environment.

Interest rate risk has a particularly pronounced impact on MBS due to the embedded prepayment option held by borrowers. When rates fall, homeowners can refinance their mortgages at lower rates, causing higher prepayment rates and principal returning to investors sooner than anticipated—this is known as prepayment risk or "call risk." Investors may need to reinvest these principal payments at lower yields, reducing expected returns. When interest rates rise, prepayments slow down as the principal is repaid over a longer period, exposing investors to "extension risk" and the potential opportunity cost of being locked into lower-yielding assets while new market yields rise.

The overall economic environment—including factors like employment rates, consumer confidence, perceived value of collateral, and economic growth—influences the performance of the underlying assets. For example, higher unemployment rates can lead to higher default rates on consumer loans. The specific sectors represented in the ABS portfolio (e.g., auto loans, student loans, credit card receivables) can also experience varying levels of

[37] *Public Consultation Draft: Issues Paper on Structural Shifts in the Life Insurance Sector, International Association of Insurance Supervisors (IAIS),* March 2025. Public-consultation-Draft-Issues-Paper-on-structural-shifts-in-the-life-insurance-sector.pdf

performance based on economic conditions. For instance, a downturn in the auto industry can increase default rates on auto loans.

5.5 VALUATION UNCERTAINTY

Because illiquid complex assets are not frequently traded, lack transparent pricing, and often involve bespoke structure, valuing them at fair value is especially challenging. An IAIS report[38] has noted a range of valuation methods for complex assets such as Discounted Cash Flows (DCF), earnings multiples (e.g., applying a multiple of earnings to estimate a company's value), and replacement cost approach.

However, each method introduces its own risk. For example, DCF requires assumptions about future cash flows and discount rates, which can be highly subjective. Market disruptions, such as geopolitical or macroeconomic shocks, would make fair valuation even more difficult. Insurers forced to sell during these times may realize prices well below their accounting valuations, especially if many firms try to sell similar assets at once. The IAIS also raises the issue of potential conflict of interest in valuation. In-house teams may have better access to detailed information but risk a lack of independence. Outsourcing to third parties can help ensure objectivity but may still lead to agency conflicts when compensation is linked to performance or valuation outcomes.

5.6 UNDERLYING COLLATERAL REINVESTMENT RISK OF CLOS

For CLOs, reinvestment risk arises during the reinvestment period when CLO managers are allowed to use proceeds from loan repayments or prepayments to purchase new collateral.[39] But the market conditions at the time of reinvestment may be less favorable than when the CLO was initially constructed, resulting in new collateral loans with lower spreads, shorter maturities or weaker credit quality. These changes can erode the CLO's average spread, reduce excess interest payment for subordinated tranches, and ultimately impact returns across the entire capital structure. Reinvestment risk can be amplified during volatile or tightening credit market where high-quality loan supply is limited. Asset managers are forced to choose between accepting lower yields or taking on higher credit risk.

5.7 SERVICING QUALITY AND MANAGER EXPERIENCE

Because experienced managers are typically more adept at underwriting, structuring, and actively managing complex portfolios, they often better anticipate credit issues, proactively manage covenants, and engage with distressed borrowers.

Strong servicers (particularly in ABS or RMBS) ensure timely collections, accurate reporting, and efficient resolution of delinquencies or defaults, which directly affects the cash flow stability and recovery rates of the structure. Poor service, however, may lead to delayed interventions, higher loss severities, and increased default rates that erode investor returns, especially in junior tranches.

In structures like CLOs or private credit funds, managers typically have reinvestment discretion. Experienced managers can be more likely to source higher-quality or better-priced assets, avoid concentration in riskier sectors or borrowers, and navigate late-cycle risk by adjusting underwriting standards or reducing leverage.

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[38] *Public Consultation Draft: Issues Paper on Structural Shifts in the Life Insurance Sector, International Association of Insurance Supervisors (IAIS),* March 2025, Public-consultation-Draft-Issues-Paper-on-structural-shifts-in-the-life-insurance-sector.pdf

[39] Osman Ahmed, "Collateralized Loan Obligations (CLO)," *Wall Street Oasis,* October 2024, https://www.wallstreetoasis.com/resources/skills/credit/collateralized-loan-obligations-clo

Section 6 Market Value Volatility of Complex Assets

Understanding the market value volatility of complex assets is critical for insurers and regulators, as it directly influences insurers' assets available for sale, capital position, and financial stability. The market valuation of complex assets differs significantly from that of public corporate bonds in both volatility and transparency. A key factor driving this difference is the valuation methodology. Complex assets are often valued using model-based approaches which rely on assumptions, internal cash flow projections, and comparable rather than observable market prices. These models typically introduce valuation lags, timing risk, and subjective inputs that can understate real-time volatility. As a result, during normal periods, complex assets may appear more stable than public corporates simply because they are not marked-to-market as frequently or rigorously.

Studies show that volatility of complex assets is often artificially dampened compared to public corporates; this is likely because complex assets are valued less frequently, while the value of public corporates is generally visible in real time. This lag and reliance on models "smooths" the reported price series and can mask the true extent of value changes. One study that looked at the 10 largest and most liquid private equity funds in London suggests PE funds are more volatile than might be commonly perceived, concluding that "traditional reporting by these PE funds has their NAV average at 14% volatility, about 0.9 times the market average of 16%. By annualizing the volatility of the stock trading price, one can see that the market volatility is closer to 24%, or 1.5 times the market average."[40] Although the study focuses on private equity rather than private fixed income assets, the findings highlight that less frequent valuations and reliance on model-based pricing can artificially smooth reported volatility.

The Moody's Analytics study[41] on Private Credit and Systematic Risk reinforces that the observed market value volatility of private credit assets—such as direct lending CLO and other illiquid structured credits—is often understated compared to public corporate bonds, especially during stress events which force actual sales or mark-to-market revaluations. Drawdowns for private credit and structured assets can be deeper and more abrupt than for public corporate bonds. During these events, market liquidity evaporates quickly for complex or opaque assets, resulting in wider bid-ask spreads and larger price declines relative to similarly rated public corporates.

The lag in recognition of value changes due to infrequent pricing, and model-driven NAVs introduces significant "model and timing risk." Moody's warns that investors in complex or private assets may not immediately recognize shifts in value, and "by the time adverse value changes are recognized, the magnitude of losses can be unexpectedly severe."[42] Conversely, public corporates, with deep markets and real-time pricing, show mark-to-market volatility that is more transparent and less subject to delayed shocks.

Furthermore, valuation dispersion among similar complex asset classes is greater than public corporates due to structural differences (e.g., tranche hierarchy, embedded leverage, underlying collateral quality) and the lack of standardized reporting frameworks. These factors contribute to higher uncertainty in mark-to-model estimates. For example, two CLO tranches with similar credit ratings may show vastly different market behavior based on manager quality, portfolio concentration, and reinvestment practices.

Public corporate bonds—even those with high yield or lower credit quality—benefit from standardized ratings, deep and frequently traded markets, and transparent price discovery. Corporate bond price volatility is well-reflected in daily spreads by market participation. Bid-ask spreads, even in stress, widen less on a relative basis than those for structured credit.

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[40] Daniel Rasmussen, "When Private Funds Are Publicly Traded," *Verdad Capital,* https://mailchi.mp/verdadcap/when-private-funds-are-publicly-traded
[41] *Private Credit & Systemic Risk, Moody's,* June 2025.
[42] *Private Credit & Systemic Risk, Moody's,* June 2025.

Moody's also uses systemic risk and network modeling to show that the entire interconnected credit system—now including a larger share of private credit funds, nonbanks, and insurers—experiences synchronized spikes in volatility during periods of stress. The report's principal component analysis shows that these assets are increasingly connected and can transmit shocks more broadly and suddenly than in prior decades.

Section 7 Performance in Economic Shock Events

The performance of complex assets is closely linked to broader macroeconomic conditions, making macroeconomic indicators fundamental inputs for risk assessment, risk management, pricing, and stress testing of portfolios containing complex assets.

Because these instruments are based on pools of underlying loans (e.g., residential mortgages, auto loans, corporate credit), they are highly sensitive to shifts in economic fundamentals. Periods of strong economic growth, low unemployment, and stable interest rates typically support low default rates and consistent cash flows, thereby enhancing the credit performance and pricing of structured securities. Adverse economic conditions, however, such as rising unemployment, declining income, or tighter credit markets, can impair the performance of the underlying assets and lead to increased delinquencies, downgrades, and price volatility.

Interest rates have a dual impact on complex assets: on one hand, rising rates can reduce the value of longer-duration tranches due to heightened duration risk; on the other, they can reduce prepayment risk, thus altering the timing and magnitude of expected cash flows.

Complex assets have demonstrated varying degrees of resilience and vulnerability during financial crises, largely depending on the asset type, structure, and economic conditions. The 2007–2008 Global Financial Crisis (GFC) is a prominent example.

Certain segments of private-label RMBS experienced severe losses during the GFC due to weak underwriting standards, aggressive loan-to-value ratios, and limited structural protections. An NAIC study[43] on private-label RMBS documents that many investors, particularly in the 2005–2007 vintage, incurred large losses due in part to misrepresentation, weak covenants, and insufficient investor protections. The study emphasizes that the pre-crisis private-label RMBS market lacked minimum standards around underwriting, representation and warranty enforcement, and transparency, contributing to investor losses.

With the reforms introduced after the GFC, the so-called “RMBS 2.0” structures have performed much more robustly than their pre-crisis predecessors. One of the most significant changes has been the tightening of underwriting standards for the underlying mortgages, including stricter verification of borrower income, higher minimum credit scores, and more conservative loan-to-value ratios. In addition, structural protections were materially enhanced. Transactions now generally feature higher levels of subordination, larger credit enhancement cushions, and improved cash flow triggers that help redirect payments to senior investors when collateral performance deteriorates. As a result, RMBS 2.0 securities have demonstrated resilience even in more challenging market environments, such as during the COVID-19 pandemic. Figure 8 shows much lower impairment counts during COVID-19 for RMBS rated post 2009 compared with legacy RMBS.

On the CMBS side, “CMBS 2.0” is characterized by more conservative underwriting, stricter structural protections, and greater investor scrutiny. Compared to CMBS 1.0, loss rates in CMBS 2.0 vintages have been much lower. For example, Trepp report[44] shows that vintages 2010 through 2016 saw cumulative losses typically in the 1–2% range, a marked improvement from the double-digit losses seen in many 2007–2008 deals. However, Moody’s report[45] shows post-2009 U.S. CMBS has experienced higher impairment rates compared to other post-2009 structured

[43] *Private-Label Securitization Market Challenges and the Implications for Insurers and Insurance Regulation, NAIC*, December 2016
[44] “The CMBS Eras Tour: Part 2 – The Reformation Era of CMBS 2.0,” *Trepp*, March 2025, https://www.trepp.com/trepptalk/the-cmbs-eras-tour-part-2-the-reformation-era
[45] *Impairment and loss rates of structured finance securities: 2009-2024, Moody’s Ratings*, 2025

securities. As shown in Figure 8, total principal impairment since 2014 is 183, with U.S. CMBS accounting for 119 out of 183.

CLOs have demonstrated far more resilience than other assets, weathering both the GFC and the 2020 COVID-19 pandemic.

The first generation of CLO (CLO 1.0)—which emerged in the 1990s and represented a small segment of the structured finance market before the 2008 crisis, which was then dominated by the more well-known RMBS and Collateralized Debt Obligations (CDO)—in part enjoyed better outcomes than other complex assets during the GFC because their collateral was diversified across multiple industries rather than being concentrated in a single sector.

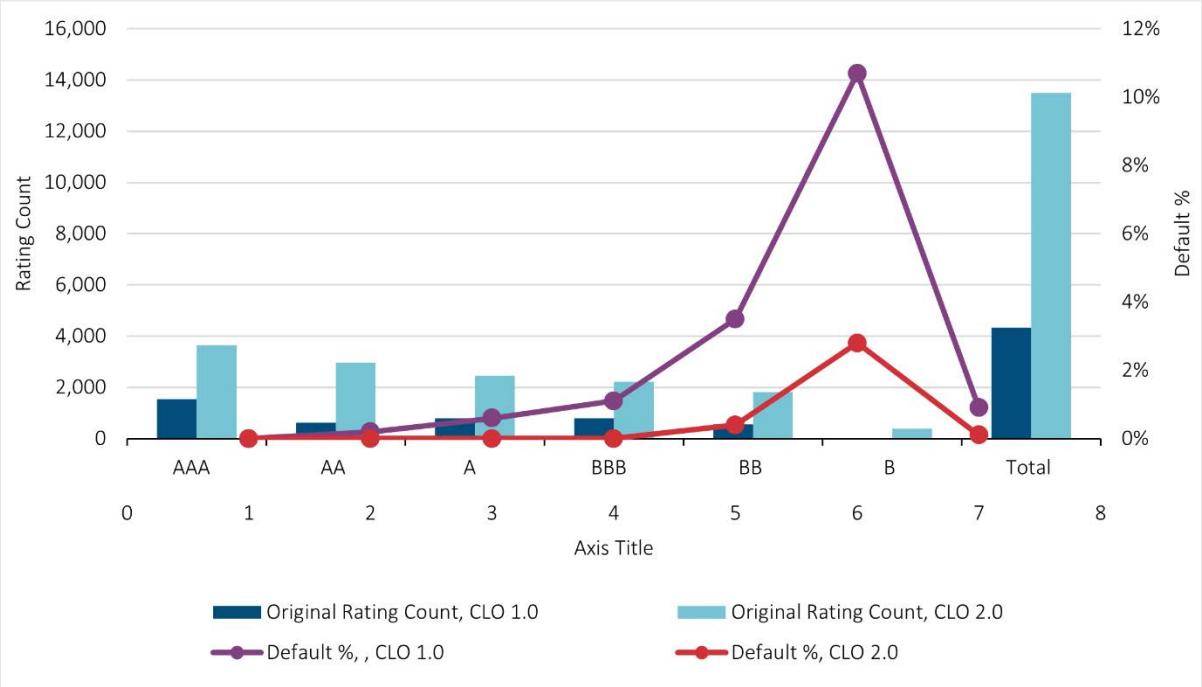
In response to the crisis, subsequent generations—CLO 2.0 (2010–2013) and 3.0 (from 2014 onward, following the Volker Rule resulting from the Dodd-Frank Wall Street Reform and Consumer Protection Act)—introduced key structural improvements by removing weaker features and enhancing strengths. These enhancements included stricter underwriting criteria, improved credit quality of the underlying pools, and strengthened credit support for the overall structure. The collateral pool was also limited primarily to bank loans, with high-yield bonds capped at 5% to 10% of the pool and assets rated CCC or below similarly capped. Additionally, the reinvestment period in which loan interest and proceeds could be reinvested into additional loans was shortened to a two-to-five-year window, allowing managers to shed risky assets or capitalize on market opportunities. CLOs also evolved into non-mark-to-market structures with enhanced collateral tests.

Meanwhile, the leveraged loan market shifted from requiring both maintenance and incurrence covenants to resembling the high-yield bond market with incurrence covenants only. Maintenance covenants require borrowers to meet ongoing financial performance standards, while incurrence covenants are triggered only by specific actions that change a borrower's financial position. If covenants are breached, lenders can demand early repayment, impose penalties, or seize collateral. Maintenance covenants removal provides borrowers with greater flexibility and fewer risks of technical defaults but increases risk for lenders. These changes were driven in part by increased demand and participation from non-professional investors.

Figure 7 shows the historical performance summary of CLOs issued before and after the GFC. CLOs issued prior to the GFC demonstrated strong credit performance during the crisis, with very few lifetime defaults. CLOs issued after the GFC exhibited even stronger performance compared to their pre-crisis counterparts, due to the credit enhancements implemented.

Figure 7

PERFORMANCE SUMMARY OF CLOS ISSUED BEFORE AND AFTER THE GFC – RATING COUNT AND DEFAULT %



Source: Guggenheim Investments, Standard and Poor's. Data as of 9.30.2023 (Understanding-Collateralized-Loan-Obligations-2023.pdf)

Similar to CLOs, the reforms following the GFC led to enhanced underwriting standards, increased transparency, and stronger deal structures, which ultimately resulted in improved default rates for ABS, CMBS, and RMBS. Figure 8 shows the material impairments of structured securities rated on or after January 1, 2009, which is significantly lower than the impairments of structured securities rated before GFC, as shown in Figure 9.

Figure 8

MATERIAL IMPAIRMENTS BY IMPAIRMENT YEAR AND SECTOR – RATED POST JANUARY 1, 2009

PRINCIPAL IMPAIRMENTS									
IMPAIRMENT YEAR	US ABS	US RMBS	US CMBS	GLOBAL CDOS EX CLOS	GLOBAL CLOS	EMEA SF EX CDO & OTHER	INT SF EX CDO & OTHER	OTHER SF	TOTAL
2014	0	0	1	0	0	0	0	0	1
2015	0	0	1	0	0	0	1	0	2
2016	0	0	4	0	0	0	5	0	9
2017	0	0	5	0	0	0	2	0	7
2018	0	0	2	0	0	0	0	0	2
2019	0	0	0	0	3	0	0	0	3
2020	0	0	30	0	13	2	0	0	45
2021	0	0	16	0	2	0	0	0	18
2022	0	0	14	0	6	2	0	0	22
2023	7	0	32	0	8	4	0	0	51
2024	2	0	14	1	6	0	0	0	23
TOTAL	9	0	119	1	38	8	8	0	183

INTEREST IMPAIRMENTS									
IMPAIRMENT YEAR	US ABS	US RMBS	US CMBS	GLOBAL CDOS EX CLOS	GLOBAL CLOS	EMEA SF EX CDO & OTHER	INT SF EX CDO & OTHER	OTHER SF	TOTAL
2014	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0
2022	1	0	1	0	3	3	0	0	8
2023	0	3	5	0	6	7	1	0	22
2024	0	0	0	0	0	0	0	0	0
TOTAL	1	3	6	0	9	10	1	0	30

Source: Moody's Ratings

Figure 9

MATERIAL IMPAIRMENTS BY IMPAIRMENT YEAR AND SECTOR – RATED SINCE 1993

PRINCIPAL IMPAIRMENTS									
IMPAIRMENT YEAR	US ABS	US RMBS	US CMBS	GLOBAL CDOS EX CLOS	GLOBAL CLOS	EMEA SF EX CDO & OTHER	INT SF EX CDO & OTHER	OTHER SF	TOTAL
2014	10	497	68	6	0	15	2	0	598
2015	6	365	53	5	2	16	3	0	450
2016	9	252	74	2	3	2	6	0	348
2017	2	264	83	5	4	2	2	0	362
2018	1	229	22	8	1	5	0	0	266
2019	5	180	17	1	4	0	0	0	207
2020	0	126	44	1	13	4	0	0	188
2021	2	64	22	2	2	1	0	0	93
2022	2	31	15	0	6	2	0	0	56
2023	12	48	34	1	8	4	0	0	107
2024	4	51	17	1	6	0	0	0	79
TOTAL	513	32835	3069	4341	111	214	159	44	41286

INTEREST IMPAIRMENTS									
IMPAIRMENT YEAR	US ABS	US RMBS	US CMBS	GLOBAL CDOS EX CLOS	GLOBAL CLOS	EMEA SF EX CDO & OTHER	INT SF EX CDO & OTHER	OTHER SF	TOTAL
2014	0	72	3	1	0	1	0	0	77
2015	1	44	1	0	0	0	2	0	48
2016	0	50	4	0	0	0	0	0	54
2017	0	65	4	0	0	1	0	0	70
2018	1	98	2	0	0	0	1	0	102
2019	0	134	2	0	0	1	0	0	137
2020	2	40	1	1	0	0	0	0	44
2021	3	25	1	0	0	0	0	0	29
2022	6	119	2	3	3	3	0	0	136
2023	4	317	8	0	6	8	1	0	344
2024	0	0	1	0	0	0	0	0	1
TOTAL	41	1160	33	97	9	23	4	0	1367

Source: Moody's Ratings

7.1 CORRELATION AMONG COMPLEX ASSETS

Although complex assets are typically backed by diverse underlying cash flows, they often exhibit significant co-movement, especially during periods of market stress. Although backed by different asset pools (e.g., consumer loans vs. mortgages vs. corporate loans), these securities often exhibit shared sensitivity to credit risk, interest rate volatility, and liquidity conditions. Importantly, correlations among complex assets tend to rise during downturns due to shared exposures to credit risk, interest rate fluctuations, and liquidity constraints. This behavior highlights the importance of assessing not only average correlations but also their dynamics under stressed market conditions.

Correlation measures the strength and direction of the linear relationship between the pairwise returns, indicating how closely the returns move together and in which direction. A positive correlation means that the returns tend to increase or decrease together, while a negative correlation means the returns move in opposite directions—as one return increases, the other tends to decrease.

Given structured securities are backed by a pool of underlying loans or receivables, they provide significant diversification benefits. A report published by Oaktree Capital[46] notes that returns on CMBS have little correlation with high yield bonds or CLOs. More generally, they find returns on ABS have low correlation with leveraged loans and CLOs. During stable market environments without periods of stress or disruption, correlations tend to remain moderate, allowing for partial diversification within structured credit portfolios. Yet during downturns, correlation levels can spike due to systemic factors, reducing the effectiveness of intra-sector diversification.[47] A This reinforces the importance of dynamic correlation analysis when managing portfolios concentrated in complex assets.

According to the IAIS's published report,[48] potential conflicts of interest may arise when life insurers are affiliated with private equity (PE) firms. The IAIS notes that as PE firms take ownership stakes in insurers, they may influence how assets are invested by investing them in their own funds or in private credit deals. This can create tension between the insurer's long-term goals and the PE firm's focus on generating short-term returns. Furthermore, insurers might feel pressure to commit capital quickly, especially around fund closings, and could end up in higher-risk or less-liquid investments that don't align with their liability profile. A potential mismatch in time horizons also can exist; PE firms typically aim to exit investments in a few years, while insurers are focused on meeting policyholder obligations that can stretch decades. Things get even more complicated when both the insurer and the PE sponsor have interests in different layers of the same deal, like equity vs. senior debt. Add in potential information gaps, complex fee structures, and valuation uncertainty, and the result can be a setup where the PE firm could benefit at the expense of the insurer and its policyholders, if risks aren't carefully managed.

7.2 CORRELATION WITH TRADITIONAL ASSETS

In addition to relationships between complex assets, the correlation between complex assets and traditional asset classes plays a critical role in overall portfolio diversification.

Under normal market conditions, structured products tend to exhibit low-to-moderate correlation with equities, and even lower correlation with sovereign bonds. However, during periods of financial stress, correlations between complex credit assets and equities often increase sharply as both credit and equity markets respond simultaneously

[46] *Strategic Primer: Investment in Structured Credit, Oaktree Capital*, 2019, https://www.oaktreecapital.com
[47] Mico Loretan and William B. English, *"Evaluation of 'Correlation Breakdowns' During Periods of Market Volatility."*
[48] *Public Consultation Draft: Issues Paper on Structural Shifts in the Life Insurance Sector, International Association of Insurance Supervisors (IAIS),* March 2025, Public-consultation-Draft-Issues-Paper-on-structural-shifts-in-the-life-insurance-sector.pdf

to deteriorating macroeconomic conditions. In contrast, high-quality government bonds, particularly U.S. Treasuries, often retain their role as safe-haven assets, maintaining negative or near-zero correlation with structured products.

A KKR study[49] shows the positive return correlation between complex assets (Private Credit and Private ABF) and traditional assets (Global PE, U.S. Loans, U.S. High Yield, and Real Estate). Private ABF has the lowest pairwise correlation across these assets, except for its correlation with U.S. Loans and U.S. High Yield. In those cases, the lowest correlations for U.S. Loans are with Infrastructure and Real Estate, while the lowest correlation for U.S. High Yield is with Real Estate.

Correlations are calculated based on quarterly returns between 7/1/17 and 9/30/22. The average correlation for each listed asset class represents the average of its correlations with the other six listed asset classes. Each asset class is modeled as follows: Global Private Equity (Cambridge Private Equity Index), Real Estate (Cambridge Real Estate Index), Infrastructure (Cambridge Infrastructure Index), Private Credit (Cambridge Private Credit Index), U.S. High Yield (ICE BofA U.S. High Yield Index), U.S. Loans (Morningstar LSTA U.S. Leveraged Loan TR USD), KKR ABF (KKR Private Credit ABF Composite, investments originated post-January 1, 2017). The Cambridge Private Credit Index includes 738 funds in the Credit Opportunities, Senior Debt, Subordinated Capital, Distressed Securities, and Control-Oriented Distressed Securities.

Additionally, it illustrates the correlations among the market movements of U.S. direct lending, Treasuries, U.S. Aggregate bonds, investment grade bonds, high yield bonds, leveraged loans, and asset-based finance, based on their respective gross returns from Q3 2017 through Q3 2023. U.S. direct lending has low correlation with Investment Grade Bonds, but higher correlation with High Yield Bonds, Leveraged Loans, and Asset-Based Finance.

Gross performance is based on gross quarterly returns of the following indices: U.S. Direct Lending (Cliffwater Direct Lending Index), Treasuries (Bloomberg U.S. Treasury Index), U.S. Agg (Bloomberg U.S. Agg TR Unhedged USD Index), Investment Grade Bonds (Bloomberg U.S. Corporate Index), High Yield Bonds (Bloomberg Corporate HY Index), Leveraged Loans (Morningstar LSTA U.S. Leveraged Loan Index), and Asset-Based Finance (KKR Private Credit ABF Composite).

Understanding these cross-asset correlation patterns is essential for institutional investors seeking to optimize risk-adjusted returns across diverse asset classes.

[49] *Asset-Based Finance: A Fast-Growing Frontier in Private Credit, KKR*, www.kkr.com

Section 8 Liquidity Risk Quantification

Understanding the liquidity risk of different complex asset classes is a critical aspect of risk management for insurance companies. Most financial institutions define liquidity as being able to easily enter or exit a position in a security at or near the current market value of the security. Two of the most quantifiable measures of liquidity are trading volume and transaction cost. Another measure of liquidity is the round-trip cost, which is defined as the price difference between a given trader buying (selling) a certain amount of a security and selling (buying) the same amount of this security within a particular time period.[50]

Recent data indicate that most segments of the public structured securities market remain highly liquid. For example, Ginnie Mae (2025)[51] notes that liquidity in the agency MBS continues to be healthy overall with average daily trading volume ranging from $200 billion to $350 billion over the past decade. Although this is lower than the trading volume observed in the U.S. Treasury market (ranges from $500 to $1,105 billion), this amount of trading volume is still considered liquid. Worth noting, the average daily trading volume of agency MBS is higher than average daily trading volume of corporate bonds at around $50 billion. The average daily trading volume of non-agency MBS is around $1,780 million.

The markets for public ABS, CMBS, and CLO structured securities overall are liquid as well, although not as liquid as the agency MBS market. An analysis of securitized asset liquidity produced by SIFMA[52] showed that U.S. ABS has average daily trading volume of $2,150 million, which increased 17% from last year. Guggenheim[53] notes that secondary trading volume in investment-grade CLO tranches have been fairly stable year over year, implying that the market allows risk transfer even during tougher conditions. The growth of CLO ETFs with higher retail and institutional demand also increased liquidity.[54]

Determining trade volume for private bonds or private structured securities, however, is more challenging, because they are not actively traded. Thus, one likely cannot look up the current trading activity for the private assets in the marketplace to determine their current trading volume and transaction costs. Looking at historical trading volume data may also be insufficient, because it may not be predictive of the security's future liquidity in the market. One potential approach to estimate future trading volume for private securities is to build a regression model based on factors that can predict liquidity. This method was employed by ICE Data Services (2016)[55] for forecasting future trading volume of a security. It was determined that relevant factors for predicting future trading volume include past trading activity, quantity of market quotes, and bond characteristics such as issuer, sector, and time since issuance.

Another metric a company could use to get a sense of a private security's liquidity risk is to quantify its illiquidity premium. For example, the investor can compare the yields of privately issued securities with yields of comparable securities that have a more liquid market. The difference between these two yields is the illiquidity premium, and in some cases this premium can be significant. In a historical study of the yields of privately issued bonds, Boni and Manigart[56] determined that this illiquidity premium averaged about 70 to 90 basis points (bps) per year. The illiquidity premium can be a good proxy for the amount of liquidity risk in a security, since this premium represents

[50] Friewald, Nils, Rainer Jankowitsch, and Marti G. Subrahmanyam, "Liquidity, Transparency, and Disclosure in the Securitized Product Market,"https://www.stern.nyu.edu/sites/default/files/assets/documents/con_038499.pdf
[51] *Global Markets Analysis Report, Ginnie Mae,* July 2025, www.ginniemae.gov
[52] *Fixed Income Market Structure, Securities Industry and Financial Markets Association (SIFMA),* www.sifma.org
[53] *Understanding Collateralized Loan Obligations (CLOs), Guggenheim Investments,* July 2025, www.guggenheiminvestments.com
[54] *2025 U.S. and Canada Structured Finance Outlook, S&P Global Ratings,* December 2024, www.spglobal.com
[55] *Liquidity Risk Assessment in Bond Markets, ICE Data Services,* 2016.
[56] Boni, Leslie, and Sophie Manigart, "Private Debt Fund Returns, Persistence, and Market Conditions," https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3932484

additional return the investor of the security requires to compensate for the additional risk of holding onto an illiquid asset.

In addition to individual metrics (such as trade volume and bid/ask spread) for understanding the liquidity risk of a single security, insurance companies can also perform liquidity stress testing on their full balance sheet to determine if their exposure to more complex and less liquid structured assets will have a detrimental effect on the company's ability to fund future liability payments. The IAIS provides guidance on liquidity stress testing,[57] such as determining extreme economic scenarios that could trigger a large amount of policyholder withdrawals and surrenders. During such a stress scenario, it is important that the insurer's liquidity ratio (defined as Liquidity Source/Liquidity Needs) is at a sufficiently high level to guarantee the liability payments can be funded.

The IAIS notes that the average liquidity ratio of insurers in 2020 was approximately 200%.[58] When determining the liquidity ratio, it is important to also consider if access to short-term secured funding sources, such as repurchase agreements, will be adversely affected in the stress scenario. It is also important to determine how the market value of the liquid assets will change in the stress scenario. For example, a large increase in rates will have a severe adverse impact on the market value of the fixed income assets that can be sold, thus limiting the cash that can be generated from selling these assets.

By projecting stressed cash flow, insurers can better be prepared for potential liquidity shortfalls that may occur. If the company identifies liquidity vulnerability, it can consider adjusting its asset allocation to more liquid assets to improve its ability to fund future liability payments. For example, suppose a stress liquidity scenario involving a 200 bp increase in rates causes a funding shortfall by triggering a sharp increase in lapse rates. If the insurer determines that moving 5% of its asset portfolio from private CLOs to liquid Treasury bonds brings up the firm's liquidity ratio to an appropriate level, the insurer may adjust its asset portfolio to hold more liquid assets.

[57] *Application Paper on Liquidity Risk Management, International Association of Insurance Supervisors (IAIS),* 2020, https://www.iais.org/uploads/2022/01/200629-Application-Paper-on-Liquidity-Risk-Management.pdf
[58] *Public Consultation Document on the Development of Liquidity Metrics (Phase 2), International Association of Insurance Supervisors (IAIS),* https://www.iais.org/uploads/2022/01/211118-PCD-on-the-Development-of-Liquidity-Metrics-Phase-2-PUBLIC.pdf

Section 9 Use and Implication of Complex Assets in Europe and the UK

9.1 CAPITAL REQUIREMENTS AND PRUDENT PERSON PRINCIPLE

Investor interest in complex assets is limited in Europe and the UK, largely due to strict solvency capital requirements—Solvency II in the EU and Solvency UK in the UK. Despite this, there remains some interest in securitized assets, including investments in STS (simple, transparent, and standardised[59]) securitizations and more complex structures that often use Special Purpose Vehicles (SPVs).

Under the Standard Formula, securitizations are treated within the spread (credit) risk component of capital requirements. This involves applying a stress-factor approach, where a prescribed percentage shock is applied to the market value of the asset. The shock is calibrated to represent a 1-in-200-year event (equivalent to a 99.5 percentile Value-at-Risk over one year) in terms of spread widening or credit loss.

Solvency II and Solvency UK treat securitization positions differently from regular corporate bonds, generally applying higher capital charges due to their complexity. Originally, the Standard Formula classified securitizations as Type 1 (high-quality with a credit quality of BBB or above, senior, and listed), Type 2 (not meeting Type 1 criteria), and re-securitizations. This led to higher capital charges for securitizations compared to similar-quality corporate bonds, making them less attractive to insurers. In 2019, these categories were replaced by senior STS, non-senior STS, and non-STS, better aligning with STS regulations. While capital charges for senior STS securitizations became more comparable to corporate bonds, non-senior STS and non-STS charges remained high.

STS securitizations are specifically designed to meet criteria for simplicity, transparency, and standardization. These typically involve pools of homogeneous assets, clear tranching of risk, and straightforward documentation. Solvency II and Solvency UK define a broad range of assets as securitizations—including agency and non-agency RMBS and CMBS, CLOs, and other ABS such as those backed by student loans or equipment leases. However, assets that do not qualify for STS status face significant capital charges under the Standard Formula, sometimes in excess of 50% of the asset's value.

Across Europe, most insurers do not provide a clear picture of their holdings of complex assets—but anecdotally these assets represent a small proportion of insurers' investments,[60] with most insurers' portfolios focused mostly on MBS and CMOs. As mentioned already, insurers face prohibitively high capital requirements unless they can classify complex assets as "senior STS securitizations" (a designation which some CLOs do not meet, for example).

In the EU, there is ongoing momentum for reform. The recently proposed amendments to the Solvency II Delegated Regulations (expected to take effect in February 2027) [61] aim to lower capital charges for STS securitizations of double-digit order, and introduce more granular requirements based on credit rating, duration, and seniority. A snapshot of the capital charges for different asset classes (all with an assumed modified duration of five years) under current Solvency II rules and proposed amendments for securitizations is provided in the table below:

[59] Regulation (EU) 2017/2402 of the European Parliament and of the Council of 12 December 2017 laying down a general framework for securitization and creating a specific framework for simple, transparent, and standardized securitization.
[60] *Consultation Paper on the Advice on the Review of the Securitisation Prudential Framework in Solvency II, European Insurance and Occupational Pensions Authority (EIOPA),* 2022, https://www.eiopa.europa.eu/system/files/2022-06/consultation_paper_on_cfa_on_securitisation_prudential_framework_in_solvency_ii.pdf
[61] The proposed amendments to the Solvency II Delegated Regulation consultation, https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13690-Insurance-and-reinsurance-firms-review-of-technical-rules-Solvency-II-_en

Figure 10
CAPITAL CHARGES FOR DIFFERENT ASSET CLASSES UNDER STANDARD FORMULA

Standard Formula SCR	Current Solvency II Rules			Proposed Changes to Solvency II Rules		
5-year duration	AA	BBB	B	AA	BBB	B
Covered bonds	4.5%	n/a	n/a	4.5%	n/a	n/a
Bonds/loans	5.5%	12.5%	37.5%	5.5%	12.5%	37.5%
STS senior	6.0%	14.0%	47.0%	4.5%	12.5%	37.5%
STS non-senior	17.0%	39.5%	100.0%	13.0%	35.5%	100.0%
Non-STS (other)	67.0%	98.5%	100.0%	45.0%	94.0%	100.0%

Source: Article 178 of Solvency II Delegated Regulations and proposed amendments to the Solvency II Delegated Regulations.

Note: Lower capital charges under proposed changes to Solvency II rules are marked in light blue.

While current capital requirements under the Standard Formula offer a modest advantage to insurers investing in senior STS securitizations with a credit rating,[62] insurers also have the option to assess capital requirements using their own Internal Model which enables them to apply tailored capital treatments, reflecting their own risks and business model. the use of an Internal Model requires permission[63] from the insurer's regulator however, which involves a complex and lengthy process. As a result, in practice, it tends to be only the larger or more specialized insurers that have Approved Internal Models.

Complex assets, which often feature unique structures, multiple tranches, and intricate risk mitigation techniques, are inherently harder to make STS-compliant. Consequently, some life insurers, especially in the UK, have formed SPVs to securitize assets that would not otherwise benefit from favourable capital treatment.

Finally, it is worth noting that a defining characteristic across Solvency II and Solvency UK are the requirements for the Prudent Person Principle,[64] which amongst other things, requires insurers to only invest in assets whose risks they can properly identify, measure, monitor, control, and report.

9.2 MATCHING ADJUSTMENT DISCOUNTING AND ASSET ELIGIBILITY

Under Solvency II and Solvency UK, liabilities are generally discounted at the risk-free rate (or an extrapolation of this). An exception to this is the "Matching Adjustment" under which if liability and asset cashflows are fixed and closely matched, the discount rate can be increased to reflect the additional, credit risk adjusted, return on the assets held. The Matching Adjustment is commonly used by UK insurers writing annuity-in-payment (or deferred annuity-in-payment) liabilities and can lead to a very material reduction in liabilities.

[62] In the UK, Standard Formula capital requirements for STS securitizations are set out in Article 3D21 Spread Risk On Securitisation Positions: Calculation Of The Capital Requirement of the PRA Rulebook, https://www.prarulebook.co.uk/pra-rules/solvency-capital-requirement---standard-formula/

[63] See Bank of England PRA Rulebook, Solvency Capital Requirements – Internal Models, 2. Permission to Use Full and Partial Internal Models.

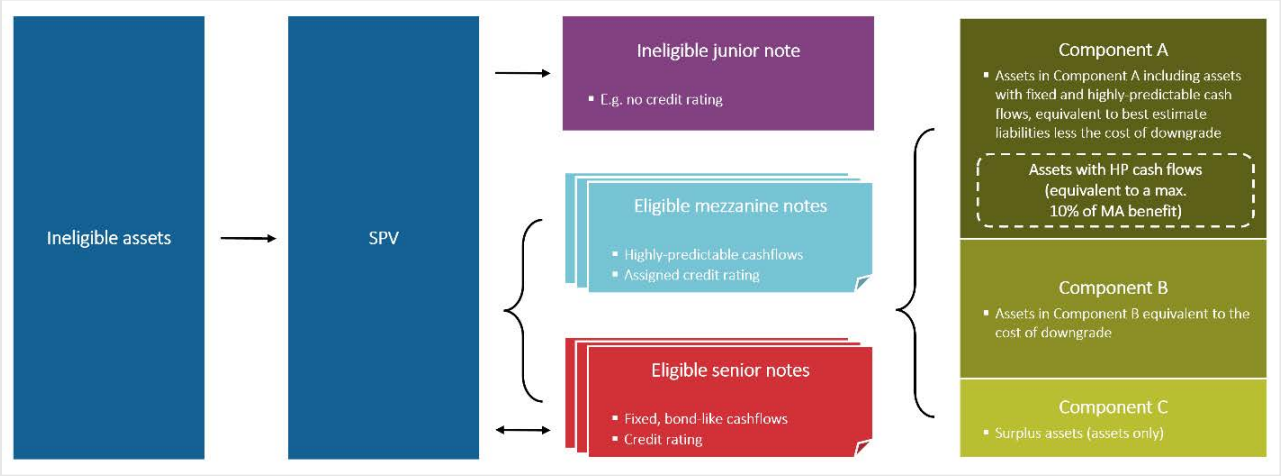
[64] For Solvency II in the EU, please see Article 132, https://www.eiopa.europa.eu/rulebook/solvency-ii/article-2219_en, in the Solvency II Directive. For Solvency UK, please see the Investments, https://www.prarulebook.co.uk/pra-rules/investments/20-08-2025, articles of the PRA Rulebook, and *Supervisory Statement 1/20 Solvency II: Prudent Person Principle*, https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2024/ss120-november-2024-update.pdf

However, assets included in a Matching Adjustment portfolio must be "eligible," meaning that as a minimum, they are required to have a credit rating and fixed cash flows.[65]

Although the use of SPVs under Solvency II and Solvency UK is not yet widespread, there are significant structures in the UK, particularly focused on Matching Adjustment portfolios for annuity liabilities.[66] Retail Equity Release Mortgages are commonly securitized, and some structures also involve callable bonds. A typical example of a securitization used by UK life insurers for a Matching Adjustment portfolio is shown below:

Figure 11

ILLUSTRATIVE STRUCTURE OF A MATCHING ADJUSTMENT SECURITIZATION OF INELIGIBLE ASSETS INTO ELIGIBLE SENIOR NOTES (AND INELIGIBLE JUNIOR OR EQUITY NOTE)



Source: Milliman

Notes:

- A Matching Adjustment portfolio is divided into three components:
  - Component A consists of the market value of assets that, after adjusting for default risk, align with liability cash flows;
  - Component B represents the market value of assets needed to offset the cost of downgrades associated with assets in Component A; and
  - Component C comprises surplus assets, which may be retained for purposes such as new business, risk management, or asset-liability management.
- Within a Matching Adjustment portfolio, the Best Estimate liabilities are always equal to the combined market value of assets in Component A and Component B.

[65] Effective 2024, fixity requirements have been relaxed in the UK. The rules require that assets in the portfolio have cash flow characteristics that are sufficiently predictable (highly predictable) and stable to justify the matching adjustment.

[66] Life insurers are required to publish use of SPVs in the Solvency and Financial Condition Reports (SFCRs). Examples of firms disclosing use of SPVs include Just Group (https://www.justgroupplc.co.uk/investors/results-reports-and-presentations), Pension Insurance Corporation (https://www.pensioncorporation.com/investors/pic-and-picg-financial-results-and-reports/regulatory-returnshttps://www.pensioncorporation.com/investors/pic-and-picg-financial-results-and-reports/regulatory-returns), and Rothesay Life (https://www.rothesay.com/about-us/financials/).

The reform to Solvency II in the UK (Solvency UK), the core elements of which were brought in over the course of 2024, and particularly the reform of the Matching Adjustment, has revised certain aspects of the capital rules applicable to UK insurers. The reforms have provided UK insurers with greater flexibility to include securitized assets, such as RMBS and CMBS, and other ABS, in MA portfolios, which may help reverse some of the factors behind the relative absence of insurers in securitization markets in the UK and Europe.

The UK reforms expanded the MA asset eligibility from (strictly) fixed cash-flows to also include assets with "highly predictable" cash flows, such as certain securitization tranches. However, current rules mean assets with highly predictable cash flows can only contribute up to 10% of the total Matching Adjustment benefit, ensuring most of the portfolio remain in fixed cash flow assets. This limited inclusion of structured assets may create opportunities for insurers to include some senior or mezzanine securitization tranches (or other structured assets) but prevents extensive reliance on them. The 10% cap reflects supervisory caution about the additional risks of cash-flow variability.

Separately, in recent years several life insurers in the UK have entered Funded Reinsurance with respect to annuity business—a type of reinsurance used to offset some of the longevity and investment risk. Some of the Funded Reinsurance transactions may feature complex assets. However, the UK regulator has recently increased scrutiny over the use of Funded Reinsurance, in part because Funded Reinsurance can involve counterparties with business models more heavily focused on private asset origination, with higher concentrations to non-traditional, complex assets which may have more correlated risk of default amongst other things.

Although predicting near-term trends is challenging, it is likely that some UK life insurers will explore adding securitized assets like CLOs to their Matching Adjustment portfolios. However, such an inclusion would require regulatory approval. It remains to be seen whether the recent reforms to Solvency II in Europe and the UK will lead life insurers to increase their investment in complex assets.

Section 10 Summary and Conclusions

This study highlights the growing role of complex and structured securities, including CLOs, ABS, RMBS, and CMBS in life insurers' portfolios, driven by yield enhancement, diversification, capital consideration, and better alignment with liability profiles. These structured securities offer higher spreads than traditional corporate bonds, but also introduce credit risk, prepayment risk, and interest rate risk to the insurers' portfolio. Bespoke structures allow insurers to tailor their exposure to specific credit, duration, or cash flow characteristics. However, these advantages come with increased model dependence, valuation uncertainty, and liquidity risk that require active management and are subject to enhanced regulatory scrutiny.

From a portfolio management perspective, insurers may benefit from strengthening their processes for evaluating structured assets beyond yields or ratings. Private structured securities often exhibit artificially smooth price movements because they are valued using internal models rather than frequent market quotations. This can mask true market value volatility, particularly during periods of stress. When liquidity tightens and market transparency diminishes, the resulting repricing can be abrupt and severe, revealing hidden risks that may have accumulated over time. Regular independent price validation, cash flow stress testing, and liquidity simulations can be integrated into portfolio monitoring to capture the full risk profile of these holdings. Insurers can also benefit from developing internal benchmarks or volatility proxies for private structured credit to supplement limited market pricing data.

The study also highlights that correlation among structured securities is moderate during normal economic environments, but it can spike up during downturns and stress. Even though CLOs, ABS, and MBS are backed by different underlying loans or receivables, they share common exposures to systemic drivers such as credit risk, interest rate volatility, and liquidity stress. As correlations increase during market stresses, the effectiveness of diversification across structured sectors can be limited. For insurers holding sizable allocations to these asset types, this finding highlights the value in model correlation dynamics rather than static averages when evaluating capital adequacy and portfolio resilience.

From a risk management standpoint, insurers can benefit from establishing clear frameworks for structured asset due diligence, manager oversight, and ongoing monitoring. Investment committees may consider evaluating not only tranche-level credit quality but also structural features such as cash flow waterfalls, triggers, and collateral composition, which can significantly affect loss allocation during stress periods. Transparency into the underlying collateral loan pool is essential for assessing embedded leverage and credit deterioration risks. Firms investing through external manager or private structures can benefit from ensuring alignment of interests and maintain independent risk oversight over deal selection and performance.

From a regulatory standpoint, both the NAIC and BMA are moving towards frameworks that help insurers better understand risks of structured assets and their underlying collaterals. The NAIC's PBBD, effective January 2025, shifts emphasis from legal form to economic substance, ensuring that only securities meeting true debt-like characteristics are qualified to be reported in Schedule D. Similarly, AG53 enhances transparency around investment spreads by requiring insurers to decompose spread into credit, liquidity, and other risk components. Meanwhile, NAIC's model-based capital treatment for CLOs and expanded SVO's oversight shift away from reliance on external ratings. The BMA has implemented the asset approval process emphasizing portfolio-level risk analysis, collateral transparency, and stress testing. Insurers may want to proactively adapt by enhancing documentation, governance, and data quality to meet higher regulatory expectations.

For insurers, the findings of this study suggest that insurers may want to find a balance between yield optimization and risk resilience. As the structured credit market grows, insurers that develop internal expertise in modeling and data analytics will gain a competitive advantage through better risk-adjusted returns, more effective capital deployment, and faster response to market opportunities. Such expertise allows firms to evaluate complex deal structure independently, negotiate more favorable terms, and identify value dislocations before they are reflected

in market pricing. Firms can also establish early-warning indicators, such as liquidity stress metrics, collateral downgrades, or bid-ask spread widening to react fast to potential market dislocations.

Looking forward, structured assets will keep playing an important role in insurers' portfolios. However, long-term success in these markets will depend on transparency, governance, and adaptability. Insurers, regulators, and asset managers may benefit from continuing to collaborate on improving data disclosure, standardizing valuation approaches, and developing better measures of liquidity and correlation risk. The ultimate goal is not to limit innovation in structured finance, but to ensure that complexity is matched by the ability to properly measure and manage the risks it brings.

Section 11 Acknowledgments

The researchers' deepest gratitude goes to those without whose efforts this project could not have come to fruition: the Project Oversight Group for their diligent work overseeing, reviewing and editing this report for accuracy and relevance.

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Bibliography

1. *U.S. Insurance Industry's Cash and Invested Assets Rise Over 5% to Close in on $9 Trillion as of Year-End 2024, NAIC Capital Markets,* https://content.naic.org/sites/default/files/capital-markets-special-reports-asset-mix-ye2024.pdf.
2. *All Eyes on Assets in Life Insurance, Milliman,* https://www.milliman.com/en/insight/all-eyes-on-assets-in-life-insurance.
3. *Life Insurers' Exposure to Commercial Real Estate, Federal Reserve Bank of Chicago,* August 2024, https://www.chicagofed.org/publications/economic-perspectives/2024/5.
4. *Private Credit: Characteristics and Risks, Federal Reserve Board,* February 2024, https://www.federalreserve.gov/econres/notes/feds-notes/private-credit-characteristics-and-risks-20240223.html.
5. *U.S. Life Insurers Head Offshore as Private Credit Upends Industry, Moody's,* June 2025, https://www.moodys.com/web/en/us/insights/data-stories/private-credit-transforms-life-insurance-industry.html.
6. *Lesson 4.3: Private Debt, Preqin Academy,* https://www.preqin.com/academy/lesson-4-asset-class-101s/private-debt.
7. *U.S. Structured Finance Chart Book: May 2025, S&P Global,* https://www.spglobal.com/_assets/documents/ratings/research/101625732.pdf.
8. *Asset-Backed Securities and CLOs Robust Issuance Expected in 2025, Guggenheim Investments,* https://www.guggenheiminvestments.com/GuggenheimInvestments/media/PDF/1Q25-FISV-ABS-CLOS.pdf.
9. Carlino, Fisher, Heinrich, and Verani. *Life Insurers' Role in the Intermediation Chain of Public and Private Credit to Risky Firms.* 2025.
10. Fringuellotti and Santos. *Insurance Companies and the Growth of Corporate Loans' Securitization.* 2025.
11. Kirti, Divya, and Natasha Sarin. "What Private Equity Does Differently: Evidence from Life Insurance." *Review of Financial Studies* 37, no. 1 (January 2024): 201–230.
12. *Life Insurance: Putting Recent Trends and Developments Into Context, BMO Commercial Bank Insights,* https://commercial.bmo.com/en/insights/life-insurance-putting-recent-trends-and-developments-into-context/.
13. *Statutory Issue Paper No. 169, NAIC*
14. *RISK-BASED CAPITAL INVESTMENT RISK AND EVALUATION (E) WORKING GROUP meeting note, 8/27/2025, NAIC*
15. *Emerging Trends in Structured Finance and Asset-Backed Securities, IQ-EQ,* https://iqeq.com/expertise/emerging-trends-in-structured-finance-and-asset-backed-securities/.
16. *Global Structured Finance 2024 Outlook, S&P Global,* https://www.spglobal.com/_assets/documents/ratings/research/101591938.pdf.
17. Rachelle Kakouris, "Riskiest Segment of Leveraged Loans Now Account for Largest Share of $1.4 Trillion Asset Class," *PitchBook,* https://pitchbook.com/news/articles/riskiest-segment-of-leveraged-loans-now-account-for-largest-share-of-14t-asset-class.

18. *Collateralized Loan Obligations (CLOs) Primer, NAIC Capital Markets,* https://content.naic.org/sites/default/files/capital-markets-primer-collateralized-loan-obligations.pdf.
19. Fuster, Andreas, David Lucca, and James Vickery. *Mortgage-Backed Securities. Federal Reserve Bank of New York,* https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr1001.pdf.
20. *Private Credit 101: Understanding Direct Lending and Asset-Based Finance, Capital Group and KKR,* https://www.capitalgroup.com/content/dam/cgc/shared-content/documents/pps-takeaways/Takeaway_Understanding_direct_lending_and_asset_based_finance.pdf.
21. "Rising Annuity Sales Driving Demand for Shorter-Duration Assets," *Insurance Business,* https://www.insurancebusinessmag.com/us/news/life-insurance/rising-annuity-sales-driving-demand-for-shorterduration-assets--alliancebernstein-528544.aspx.
22. *An Introduction to Rated Note Feeders, Seward & Kissel LLP,* https://www.sewkis.com/wp-content/uploads/intro-to-rated-note-feeders.pdf.
23. *Overview of NAV-Based Facilities and Current Market Practices, Institutional Limited Partners Association (ILPA),* https://ilpa.org/wp-content/uploads/2024/11/Part-I-Nav-Based-Facilities-Guidance.pdf.
24. Brown, Jordan. "Life Insurers' Exposure to Commercial Real Estate." *Economic Perspectives, Federal Reserve Bank of Chicago,* November 2024, https://www.chicagofed.org/-/media/publications/economic-perspectives/2024/ep2024-5.pdf.
25. Ahmed, Osman. "Collateralized Loan Obligations (CLO)." *Wall Street Oasis,* October 2024, https://www.wallstreetoasis.com/resources/skills/credit/collateralized-loan-obligations-clo.
26. Stack, Connor, Erik Moss, Matthew Macdonald, and Nidhl Patel. "Demystifying Collateralized Loan Obligations (CLOs)." *BlackRock,* March 2025, https://www.blackrock.com/us/financial-professionals/insights/what-are-clos.
27. *Global Leveraged Finance Handbook, 2022–2023, S&P Global Ratings,* https://www.spglobal.com/_assets/documents/ratings/research/101579970.pdf.
28. CFI Team. *"Asset-Backed Securities," Corporate Finance Institute (CFI),* https://corporatefinanceinstitute.com/resources/fixed-income/asset-backed-securities-abs/.
29. Max Abelson, Jason Kelly, and David Carey. "Renegades of Junk: The Rise and Fall of the Drexel Empire." *Bloomberg Business,* April 2015, https://www.bloomberg.com/graphics/2015-drexel-burnham-oral-history/.
30. Varano, David. "Why It's a Perfect Storm for Mortgage-Backed Securities." *Intercontinental Exchange (ICE),* September 2024, https://www.ice.com/insights/fixed-income-data/why-its-a-perfect-storm-for-mortgage-backed-securities.
31. *Crisis and Response, Federal Deposit Insurance Corporation (FDIC),* https://www.fdic.gov/resources/publications/crisis-response/book/crisis-response-chapter-1.pdf.
32. Adam Ashcraft, Allan Malz, and Zoltan Pozsar. *The Federal Reserve's Term Asset-Backed Securities Loan Facility.*
33. *Comparing ABS and Covered Bond Liquidity, Risk Control Limited,* commissioned by the *Association for Financial Markets in Europe (AFME),* https://www.riskcontrollimited.com/insights/comparing-abs-and-covered-bond-liquidity/.
34. *Public Consultation Draft: Issues Paper on Structural Shifts in the Life Insurance Sector, International Association of Insurance Supervisors (IAIS),* March 2025, https://www.iais.org/uploads/2025/04/Public-consultation-Draft-Issues-Paper-on-structural-shifts-in-the-life-insurance-sector.pdf.
35. Ahmed, Osman. "Collateralized Loan Obligations (CLO)." *Wall Street Oasis,* October 2024, https://www.wallstreetoasis.com/resources/skills/credit/collateralized-loan-obligations-clo.
36. Daniel Rasmussen. *"When Private Funds Are Publicly Traded," Verdad Capital,* https://mailchi.mp/verdadcap/when-private-funds-are-publicly-traded.
37. *Private Credit & Systemic Risk, Moody's,* June 2025.
38. *Private-Label Securitization Market Challenges and the Implications for Insurers and Insurance Regulation, National Association of Insurance Commissioners (NAIC),* December 2016.

39. *The CMBS Eras Tour: Part 2 – The Reformation Era of CMBS 2.0, Trepp,* March 2025, https://www.trepp.com/trepptalk/the-cmbs-eras-tour-part-2-the-reformation-era.
40. *Impairment and Loss Rates of Structured Finance Securities: 2009–2024, Moody's Ratings,* 2025.
41. *Strategic Primer: Investment in Structured Credit, Oaktree Capital Management,* 2019, https://www.oaktreecapital.com.
42. Mico Loretan and William B. English. *"Evaluation of 'Correlation Breakdowns' During Periods of Market Volatility."*
43. *Asset-Based Finance: A Fast-Growing Frontier in Private Credit, KKR,* https://www.kkr.com.
44. Friewald, Nils, Rainer Jankowitsch, and Marti G. Subrahmanyam. *"Liquidity, Transparency, and Disclosure in the Securitized Product Market,"* https://www.stern.nyu.edu/sites/default/files/assets/documents/con_038499.pdf.
45. *Global Markets Analysis Report, Ginnie Mae,* July 2025, https://www.ginniemae.gov.
46. *Fixed Income Market Structure, Securities Industry and Financial Markets Association (SIFMA),* https://www.sifma.org.
47. *Understanding Collateralized Loan Obligations (CLOs), Guggenheim Investments,* July 2025, https://www.guggenheiminvestments.com.
48. *2025 U.S. and Canada Structured Finance Outlook, S&P Global Ratings,* December 2024, https://www.spglobal.com.
49. *Liquidity Risk Assessment in Bond Markets, ICE Data Services,* 2016.
50. Boni, Leslie, and Sophie Manigart. *"Private Debt Fund Returns, Persistence, and Market Conditions,"* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3932484.
51. *Application Paper on Liquidity Risk Management, International Association of Insurance Supervisors (IAIS),* 2020, https://www.iais.org/uploads/2022/01/200629-Application-Paper-on-Liquidity-Risk-Management.pdf.
52. *Public Consultation Document on the Development of Liquidity Metrics (Phase 2), International Association of Insurance Supervisors (IAIS),* https://www.iais.org/uploads/2022/01/211118-PCD-on-the-Development-of-Liquidity-Metrics-Phase-2-PUBLIC.pdf.
53. Article 3D21 Spread Risk On Securitisation Positions: Calculation Of The Capital Requirement of the PRA Rulebook, https://www.prarulebook.co.uk/pra-rules/solvency-capital-requirement---standard-formula/
54. *Regulation (EU) 2017/2402 of the European Parliament and of the Council of 12 December 2017 Laying Down a General Framework for Securitisation and Creating a Specific Framework for Simple, Transparent, and Standardised Securitisation.*
55. *Consultation Paper on the Advice on the Review of the Securitisation Prudential Framework in Solvency II, European Insurance and Occupational Pensions Authority (EIOPA),* 2022.
56. *Proposed Amendments to the Solvency II Delegated Regulation Consultation, European Commission,* https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13690-Insurance-and-reinsurance-firms-review-of-technical-rules-Solvency-II-_en.

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