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Enhancing Portfolio Governance in CLO Markets: A Data-Driven Framework for Structured Credit Monitoring

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Abstract

The article examines a data-driven approach to enhancing portfolio governance in the collateralized loan obligation market amid increasing market complexity, regulatory pressure, and the accelerating digitalization of risk analytics. The relevance of the study is that traditional, structured credit monitoring, which relies on static reports and is limited to daily snapshots, no longer ensures the timely identification of credit drift, latent trajectories of collateral deterioration, and operational deviations. The purpose of the article is to provide a theoretical substantiation and conceptualization of a monitoring framework that combines Day-over-Day analysis with historical retrospection, market data, compliance metrics, and external events. The scientific novelty of the work lies in the transition from point-in-time observation to a historically contextualized analytical system capable not merely of recording changes, but of interpreting them within the logic of trends, macro-cycles, and stress scenarios. It is concluded that integrating expanded data, automation, and AI tools increases monitoring transparency, strengthens the predictive capacity of control, and lays a foundation for more precise, explainable, and resilient management of CLO portfolios. The article will be useful to financial market researchers, portfolio managers, risk analysts, compliance specialists, and fintech solution developers.

Keywords: *Structured Credit, CLO, Portfolio Monitoring, Day-Over-Day, Credit Risk, Compliance.*

INTRODUCTION

The contemporary landscape of structured credit markets is characterized by an unprecedented combination of scale and complexity (Kundu, 2022). The U.S. collateralized loan obligation market has become an important segment for institutional investors, offering attractive yields amid multilayered protection mechanisms (Griffin & Nickerson, 2023). However, the active development of the market and the emergence of new products, such as CLO ETFs and private credit instruments, impose heightened requirements on portfolio management quality.

The relevance of this study stems from the need to modernize structured credit monitoring systems. Under the conditions of 2024–2025, when dynamic changes in interest rates and an active phase of borrower refinancing are observed, traditional approaches to asset oversight, based on static trustee reports, do not allow for a real-time assessment of risk dynamics (Stindl, 2023). The central problem lies in the information lag and the absence of historical context in daily analytical summaries, which constrain portfolio managers' ability to make well-grounded decisions amid high volatility.

The aim of the work is to formulate and substantiate a concept of data-driven structured credit monitoring that integrates historical retrospection into the framework of daily Day-over-Day analysis.

The scientific novelty of the research lies in substantiating the transition from point-in-time monitoring to a historically informative analytical system. The author's contribution is to integrate the DoD concept with expanded databases, enabling the recording of position changes and their interpretation through the prism of long-term trends and macroeconomic cycles.

MATERIALS AND METHODS

The present study is based on the basis of an analysis of theoretical, applied, and regulatory-oriented sources devoted to the CLO market, structured credit management, risk analytics, and the automation of financial monitoring. The material base consisted of academic publications on the structural mechanics of corporate securitization and the quality of rating signals in CLOs, which made it possible to capture the logic of tranching, the role of protective layers, and the specific behavior of collateral under complex market regimes (Kundu, 2022; Griffin & Nickerson, 2023). A substantial role was played by studies on portfolio risk

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management based on large financial data and on intraday market risk forecasting, since it was precisely these works that established the conceptual foundation for the transition from static observation to denser, contextually enriched Day-over-Day monitoring, sensitive both to short-term shifts and to accumulated historical patterns (Jung et al., 2022; Stindl, 2023). Additional empirical context was provided by industry materials on the state of the CLO market in 2025, including trends in refinancing, spread compression, and changing investment behavior among market participants (Trivedi, 2025).

Methodologically, the study combines comparative analysis, conceptual modeling, and interpretive integration of heterogeneous data streams. At the center of the approach lies an expanded DoD model, within which daily changes in portfolio indicators are considered together with historical depth of observation, credit quality dynamics, spread movements, cash flows, agent notices, and the parameters of compliance tests WARF, WAS, and WARR. Such an architecture renders monitoring more sensitive to weak signals of deterioration and enables assessing not only the presence of a deviation, but also its trajectory, density, recurrence, and potential impact on deal structure (Jung et al., 2022; Griffin & Nickerson, 2023). The methodology also includes an analysis of the capabilities of Agentic AI and automated systems for processing unstructured data for the purposes of pre-trade compliance, information extraction from legal documents, and the reduction of operational error, while simultaneously taking into account the risks of algorithmic opacity and model limitations in stress scenarios (Rizinski & Trajanov, 2026; Brożek et al., 2023).

RESULTS AND DISCUSSION

The CLO market demonstrated high adaptability to changes in monetary policy. In 2024, CLO issuance volume exceeded 400 billion dollars, driven by significant refinancings and resets that enabled issuers to reduce borrowing costs amid narrowing credit spreads (Trivedi, 2025). The resilience of this asset class is ensured by a complex, multilayered protection structure, which remains the foundation for effective portfolio management.

The principal layers of protection in the CLO structure include several interrelated mechanisms. They are designed to reduce the risk of losses for investors and to ensure the stability of payments on obligations.

The first mechanism is associated with subordination and tranching. Cash flows are distributed according to an established hierarchy, commonly referred to as the payment waterfall. Senior tranches are paid first. For ABS tranches, senior tranches are those of the highest credit quality, such as AAA. Junior tranches and equity tranches have the first risk of loss. The loss is then borne by the riskiest layers first, so that senior investors are afforded more protection.

The second mechanism is called overcollateralization or OC. In this case, the volume of assets in the portfolio exceeds the volume of liabilities to bondholders. This excess forms an additional buffer. That buffer is used to support bond payments when part of the assets loses value or ceases to generate the expected cash flows.

The third important protective element consists of portfolio diversification. Such a structure reduces the portfolio's dependence on the condition of any single company. As a result, the default of one or even several borrowers does not usually lead to catastrophic losses for the entire deal.

Below is a visualization of a typical payment allocation mechanism, which forms the basis for liquidity monitoring (see figure 1).

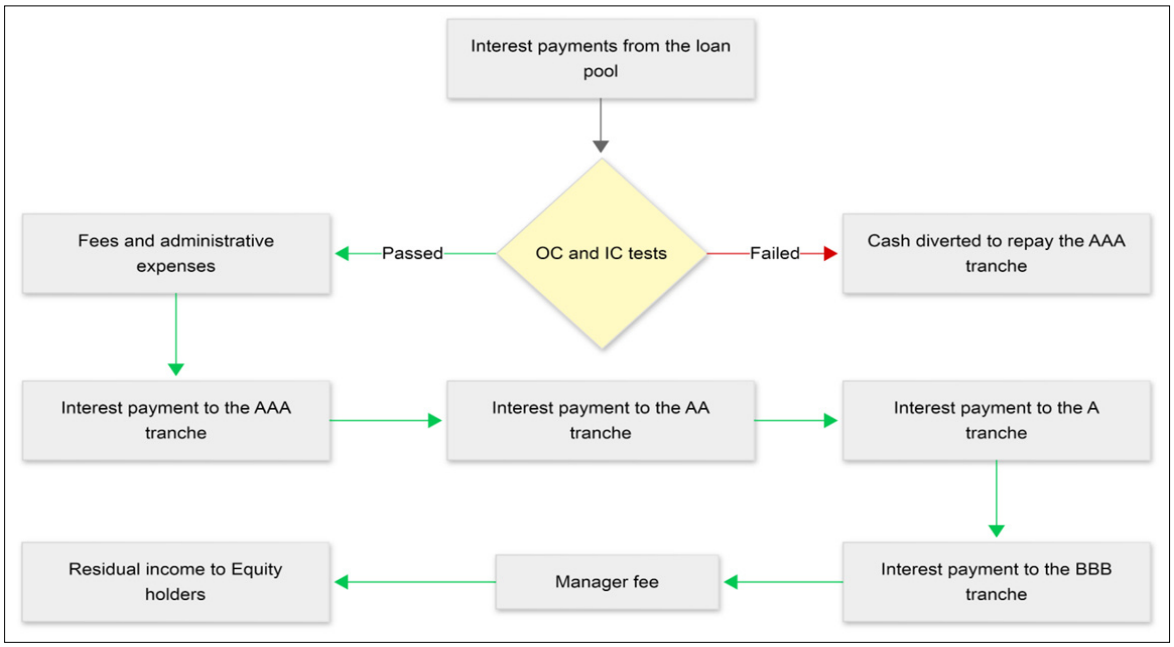

Fig. 1. The interest rate waterfall diagram in the CLO structure

The central element of the proposed concept is an enhanced Day-over-Day, DoD, monitoring framework. In its traditional form, DoD is a simple comparison of current portfolio indicators with those of the previous day (Jung et al., 2022). However, the author's extension of this model presupposes the integration of historical data directly into the manager's analytical interface.

The transformation of DoD from an instrument of change registration into an instrument of analytics is achieved through several interrelated components, each of which expands its functional capabilities and strengthens the interpretive value of the resulting data.

The first component is associated with the historical depth of analysis. In this case, daily changes are considered not in isolation, but in comparison with long-term average values and asset volatility. Such an approach allows assessing current indicator movements within a broader temporal context and understanding more precisely the extent to which the observed deviation is statistically significant.

The second component is determined by the way changes are contextualized. The automatic matching of rating or price changes with macroeconomic events or issuer-specific news enables linking numerical dynamics to external factors. As a result, changes acquire analytical content and become more intelligible in terms of their causes.

The third component includes a predictive dimension. Accumulated data are used to simulate the effect of potential trades on portfolio compliance tests. This adds additional applied value to DoD, as it begins to be used to assess the potential consequences of future decisions and to support a more well-grounded management of portfolio structure. Data for the DoD model are obtained from various sources requiring complex integration and standardization, as shown in Table 1.

Table 1. Key data components for the DoD framework

Data Type	Source	Role in DoD Monitoring
Ratings and WARF	Moody's, S&P, Fitch	Tracking credit quality drift
Prices and WAS	Octaura, Markit, Bloomberg	Analysis of market valuation and yield
Cash Flows	Trustee Reports, CDONet	Verification of payment and test accuracy
Agent Notices	Agent Bank Notices	Timely recording of corporate events

The integration of historical data enables managers to overcome the limitations of point-in-time vision. For example, if the weighted average rating factor increased by 5 points over the day, the system should indicate whether this is a one-off event, such as the downgrade of a single large issuer, or part of a trend toward deterioration in quality within a specific sector of the economy.

CLO portfolio management is directly linked to compliance with collateral quality tests. In this area, managers rely on flexibility matrices developed by rating agencies. These matrices enable a more precise balance between portfolio yield and the level of accepted credit risk.

The key credit risk metric is WARF, that is, Weighted Average Rating Factor. An increase in this indicator indicates deterioration in the portfolio's credit quality. In practical analysis, the dynamics of WARF are of fundamental importance, as they enable assessment of how aggregate collateral risk is changing and of the extent to which the portfolio structure retains an acceptable level of resilience.

The WAS indicator, or Weighted Average Spread, reflects portfolio yield. Managers face a pronounced problem of spread compression. This circumstance required substantially more precise portfolio management, since preserving arbitrage under such conditions became a more difficult task and depended on the quality of investment decision calibration.

The WARR indicator, or Weighted Average Recovery Rate, characterizes the expected recovery rate in the event of default. In its assessment, the use of Moody's data, which are based on trading prices at the moment of default, is regarded as a more conservative and, at the same time, more precise approach than historical average values. Such a method enables a more restrained estimate of potential value recovery, thereby strengthening the reliability of portfolio analysis. Figure 2 shows the decision-making process based on compliance matrices.

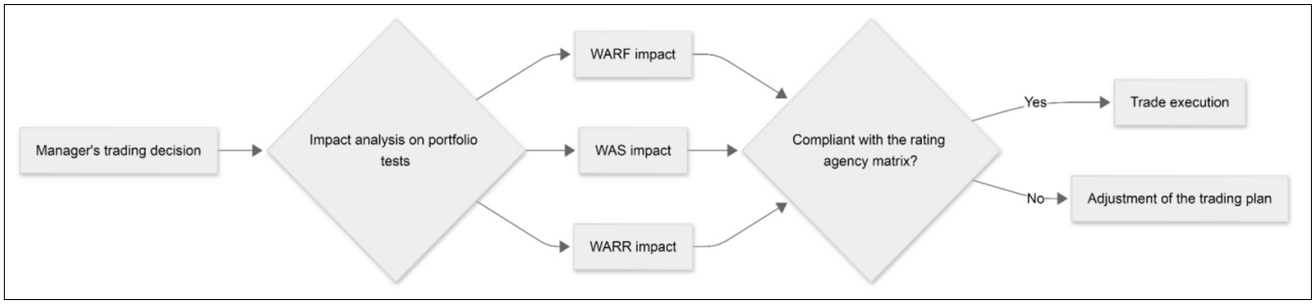

Fig. 2. Decision-making process based on compliance matrices

The implementation of advanced technologies is becoming a mandatory condition for survival in the CLO market. Modern platforms use elements of agentic AI to automate the most labor-intensive processes (Rizinski & Trajanov, 2026).

The AI-oriented approach offers several substantial advantages, particularly in a complex operational and regulatory environment. One of these advantages is the automation of pre-trade compliance. It ensures the immediate verification of hypothetical trades against hundreds of indenture rules. As a result, the control process becomes faster, more consistent, and more resilient to deviations under high workload and a large number of control parameters.

Additional significance is attached to the ability to work with unstructured data. In this case, large language models are used to extract information from complex legal documents and bank notices. Such processing enables the systematic extraction of meaningful elements from texts distinguished by complex structure, high formulation density, and a significant volume of contextual detail.

Another important advantage is connected with the reduction of operational errors. Automatic data mapping across various systems eliminates the risk of manual entry and incorrect Excel models. As a result, the accuracy of information processing increases, the probability of technical and methodological distortions decreases, and the operational infrastructure itself becomes more reliable and more predictable.

Full transition to automation is fraught with danger, with regulators and researchers warning of the black box risk, when AI decision-making logic cannot be externally audited (Brożek et al., 2023). Furthermore, the systemic fragility of the models could become apparent in periods of extreme market turbulence, when historical correlations break down.

CLO portfolio management in the near term will be shaped by significant regulatory changes. Primary attention is focused on the updating of the risk-based capital methodology for insurance companies, which are the largest investors in CLO tranches.

The new approaches, whose implementation is expected in 2026, presuppose tighter capital requirements for mezzanine tranches. This measure reflects the aspiration toward a stricter assessment of the risks associated with instruments occupying an intermediate position in the capital structure and exhibiting heightened sensitivity to deterioration in underlying asset quality.

Substantial significance is also attached to the use of cash flow modeling across the full spectrum of CLO deals. Such an approach broadens the analytical basis of assessment and moves it beyond reliance on credit ratings alone. As a result, analysis becomes deeper, since it takes into account cash flow dynamics in different segments of the deal structure and allows a more precise interpretation of the instrument's potential resilience under different scenarios.

Particular attention is devoted to default correlation within the portfolio. This requires managers to provide more detailed and higher-quality reporting. The increase in disclosure requirements is connected to the need to assess internal asset interrelations more precisely and to better understand how stress events may propagate within the portfolio structure. There was also the transition from LIBOR to SOFR which required the adjustment of credit spreads and the updating of all cash flow monitoring models.

While all data-driven monitoring frameworks provide distinct advantages, their implementation within financial institutions is often challenging, with data quality and fragmentation posing major challenges for them to overcome. Vast volumes of information are stored in isolated, outdated systems, often designated as siloed legacy systems. Such a data architecture significantly complicates aggregation, reconciliation, and subsequent standardization, thereby reducing the overall efficiency of analytical processes and making it more difficult to build an integrated monitoring system.

A serious constraint is also the high cost of ownership. The development and maintenance of proprietary monitoring systems require significant investment in IT infrastructure and cybersecurity. These costs encompass both the creation of the technological environment and its continuous support, updating, and protection, making such solutions particularly resource-intensive for financial organizations.

Additional complexity is created by the shortage of qualified personnel. The need for synergy between deep expertise in credit analysis and skills in big data and artificial intelligence creates a pronounced shortage of specialists at the intersection of finance and technology. As a result, the search for, training of, and retention of such employees become separate strategic tasks for institutional market participants.

Particular importance also attaches to the issue of ethical and legal responsibility. In the event of an incorrect trading decision made by artificial intelligence, the problem of legal responsibility or liability remains unresolved. This circumstance compels firms to retain a human in the loop. Such a model enables preservation of control over critical decisions and reduces risks associated with process automation in an insufficiently defined legal and ethical framework.

CONCLUSION

The article confirms that effective portfolio management in the CLO market in 2024–2026 is impossible without a transition to dynamic, data-driven monitoring systems. The proposed Day-over-Day framework, enriched with historical context, enables significant increases in operational transparency and the precision of risk assessment.

The key conclusions of the work show that the integration of historical data into the daily operational cycle, or DoD, transforms monitoring from a passive observation function into an active analytical instrument. Such an approach enables early identification of credit drift. Therefore, monitoring tends to have rather applied and potential dimensions and is directed at early identification of deterioration in credit quality and management decision support at an early point in time.

The technology stacks that provide cloud, agentic AI, and automated notice-processing capabilities help businesses comply with RBC and Basel III's stringent regulatory requirements. The entire technology stack is necessary for scaling and thereby for compliance with these increasingly stringent requirements, especially to enable greater operational efficiency.

In the longer view, the success of portfolio management will be determined by organizations' ability to overcome barriers to data fragmentation and ensure the explainability of algorithmic decisions. It is precisely this factor that becomes a central condition for further development, since the reliability of analytical conclusions, the transparency of the models used, and the ability to interpret results are acquiring ever greater significance in both professional and regulatory environments.

The practical significance of the study lies in providing a roadmap for modernizing structured credit oversight systems. The proposed model enables optimizing portfolio yield by leveraging compliance matrices more effectively and adapting to market changes in a timely manner. The achievement of the study's objectives confirms that technological superiority is becoming as important a factor of return as traditional credit analysis.

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