An Introduction to CLO Credit Model

Loy Weng
Yield Book Mortgage Research
212-314-1125
loy.weng@lseg.com

Luke Lu
Yield Book Mortgage Research
212-314-1113
an.lu@lseg.com

Table of Contents

Yield Book

Summary

A Collateralized Loan Obligation (CLO) is a structured securitization product that provides financing to non-investment grade companies and caters to debt and equity investors with varying credit risk appetites. The Yield Book CLO credit model is a loan level model which predicts the monthly likelihood of loan default over the life of the loan, time-to-resolution and ultimate recovery rate based on loan specific attributes and macroeconomic environment. We are not aware of an analogous model that enables calculation of default and loss at the level of loans underlying a CLO portfolio. This paper provides a high level overview of the CLO credit model in terms of modeling framework, model drivers and model performance.

1. Overview and approach

A CLO is a funding vehicle that buys a portfolio of diversified leveraged loans as assets and issues a series of debt tranches at various credit ratings and an unrated equity tranche. A recently published primer on CLOs by Yield Book ([1]) provides an in-depth overview for the underlying leveraged loan portfolio and the deal structure, covering various credit enhancement schemes and the role of CLO managers in dynamic asset management. This paper will skip the detailed discussion on the CLO product and only focus on the credit model for the underlying leveraged loans of CLO.

The CLO credit model consists of two components: default rate model and loss recovery model. The default rate model is developed with statistical regression and post-regression multiplicative adjustments to predict the likelihood of default based on specific loan attributes along with market inputs and macroeconomic variables. The recovery model is a simple deterministic model based on historical loss recovery level and certain loan attributes.

2. Modelling data

The raw data used for model development is mainly from three sources:

- CLO Trustee reports (collected by Refinitiv) – performance history of 15K distinct loans from January 2004 to April 2022
- Refinitiv LPC daily loan price data
- US unemployment rate.

The data is pre-processed, including non-linear transformations for certain model drivers (e.g., original loan spread, loan size, time-to-maturity), to be ready for statistical regression and model calibration.

For the model setup, a wide range of relevant variables were considered, and we finally settled down to the following list:

- **Loan price** – *historical monthly market price of the loan, which has negative impact to the projected default rate, i.e. higher price lower default rate, if everything else equal*
- **Issue rating** – *historical monthly issue rating rate from Moody's, S&P or Fitch, which has negative impact to the projected default rate, if everything else equal*
- **Loan seniority** – *senior secured vs the rest, and the model projects lower default rate for senior secured loans, if everything else equal*
- **Lien type** – *first lien vs the rest, and the model projects lower default rate for first lien loans, if everything else equal*
- **Original loan spread** – *loan spread over the rate index (1m Libor, 3m Libor, etc), which has positive impact to the projected default rate, i.e. higher spread higher default rate, if everything else equal*
- **Covenant-lite flag** – *an indicator for less restrictive covenants which are contractual terms designed to protect lenders and require loan issuers to meet certain financial tests or maintain certain operational and financial performance standards, and model projects lower default rate for cov-lite loans, if everything else equal*
- **Facility size** – *facility size of the loan, which has negative impact to the projected default rate, if everything else equal*
- **Industry sectors** – *major industry sectors (e.g., oil & gas, non-precious metal, hotel & leisure, retail etc.), and the model projects higher default rates for these sectors than the rest, if everything else equal*

- **Time to maturity** – *remaining months before maturity, and the model projects higher default rate as a loan approaches maturity, if everything else equal*
- **Unemployment rate** – *US unemployment rate from Bureau of Labor Statistics, which has positive impact to projected default rate, if everything else equal*
- **Loan coupon rate** – *loan spread + index, and the model projects higher default rate if the coupon rate goes up due to rising index rate, if everything else equal.*

The modeling data variables and the corresponding sources are summarized in Exhibit 1.

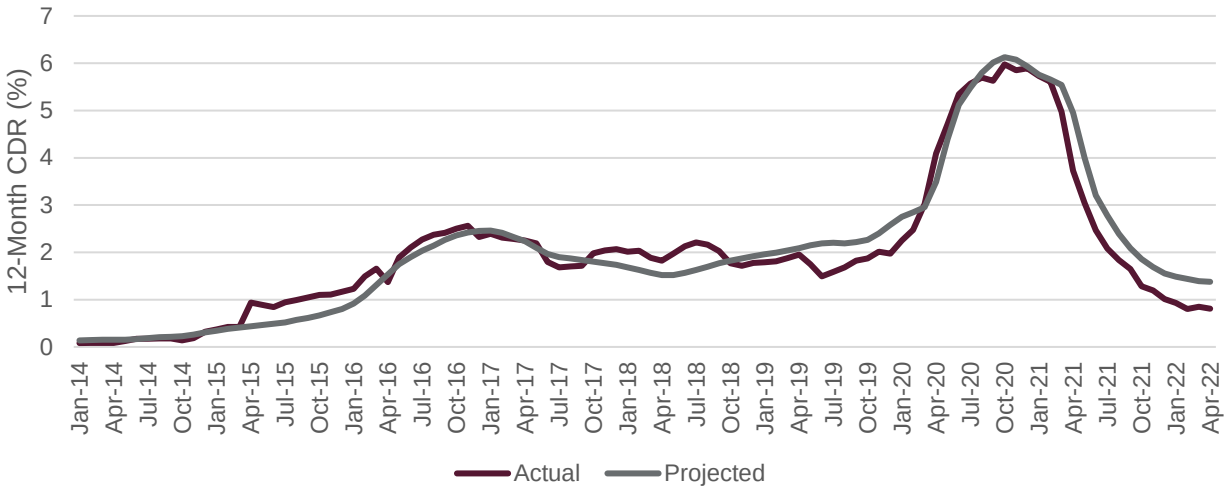
Exhibit 1 – Modeling Data Summary

Data Category	Variables	Source
Default indicator	Default flag	CLO Trustee report / Refinitiv
Static loan attributes	Cov-lite flag Seniority Lien type Original loan spread Industry sectors Facility size	
Dynamic loan attributes	Time to maturity Issue rating	
Market input	Loan price	Refinitiv LPC
	Rate indices	Yield Book
Macroeconomic data	US unemployment rate	Bureau of Labor Statistics

3. Model performance

The default rate model is evaluated based on statistical significance and business intuition. One popular metric for measuring a model's discriminative power of differentiating default from non-default is the Area Under the Curve (AUC) Receiver Operator Characteristic (ROC) score. The out-sample AUC score for the CLO credit model is 92%, indicating a strong discriminatory power by industry standard. In below, we show the model projected 12-month CDRs track the actual annual default rates well (Exhibit 2).

Exhibit 2 – Actual and projected default rate since 2014



Source: Refinitiv, Yield Book (April 2022).

4. Loss recovery

Due to data constraints, a full-fledge statistical model for the ultimate recovery rate is not feasible. Instead, the recovery model is designed as a simple rule-based model which applies loan specific adjustment by seniority, lien type, cov-lite flag, facility size and industry sectors, on top of a baseline recovery rate which is calculated based on average realized loss recovery level since 2021. The time-to-resolution is also calculated based on historical average and is assumed to be constant across all loans.

5. Model output

The outputs of the models are monthly CDRs, time-to-resolution after default, and loss recovery rate for each individual loan, all of which are fed to the CLO cash flow engine to project future cash flows for CLO bond analytics.

6. Model usage

The model is applicable to CLO leveraged loans. It can be used with pre-defined scenarios and customized scenarios of key model drivers (e.g., loan price shock, rating upgrade/downgrade, and interest rate shocks) at different levels of granularity. For example, user can apply an instantaneous price shock of 20% down and two notches downgrade to all loans within a deal. User can also apply any scenario to a set of loans based on loan attributes like industry (oil and gas), price (<90), rating (B-/B3) and facility size (<300mm) etc. The model output under different customized scenarios will feed into the cashflow engine for a wide range of analytics measures for different deal tranches.

References

[1] https://www.yieldbook.com/f/s/pdf/an_introduction_to_clos.pdf

About Yield Book

Yield Book is a trusted and authoritative source for fixed income analytics that enables market makers and institutional investors to perform complex analysis of their portfolios, benchmarks, trading decisions, historical performance, and risk. Yield Book products offer analytical insight into an extensive range of financial products in the fixed income space including governments, agencies, corporates, high yield, emerging markets, mortgages, ABS, CMBS, CMOs, CLOs, and derivatives. The platform utilizes dedicated centralized servers that help ensure reliable, prompt data delivery. Yield Book forms part of London Stock Exchange Group (LSEG)'s Data and Analytics division.

To learn more, email sales@yieldbook.com; request a demo; visit yieldbook.com; or call your regional Client Service Team office

Americas
+1 646 989 2200

EMEA
+44 20 7334 8963

Asia-Pacific
Tokyo +81 3 6411 1015
APAC +866 2 8979 4966