Better Measurements for CLO Equity Performance

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The ultimate goal of every investment analyst is to make or suggest intelligent investment decisions. The ability to state this problem in such simple terms does not imply, however, that a simple solution exists. The solution—encumbered by many assumptions and approximations—requires a difficult comparison of return versus risk of the new investment in which the risk analysis depends on the existing portfolio as well as the new investment.

For debt instruments, the easier part of this analysis pertains to the return (on investment). The debt issuer has a contractual obligation to pay stipulated interest and principal amounts at specified future dates. Because the overwhelming majority of debt issuers do, indeed, honor the payment obligations, many investors treat the *stated* return as a first-order approximation to the *expected* return.[1] The greater challenge of debt analysis is the estimation of both the probability that the issuer will fail to make all scheduled payments (default) and the magnitude of loss in such an event (loss given default).[2]

For instruments that are not simple payment obligations, however, measuring or projecting the investment return is not so straightforward. In this article, we focus on collateralized loan obligation (CLO) equity as the investment instrument. The industry-standard measure of return for CLO equity is internal rate of return (IRR). After describing important properties of CLO equity, we define IRR and discuss its advantages and shortcomings. The following section then proposes an alternative return measure—return on exposure (ROX)—that we consider superior to IRR.

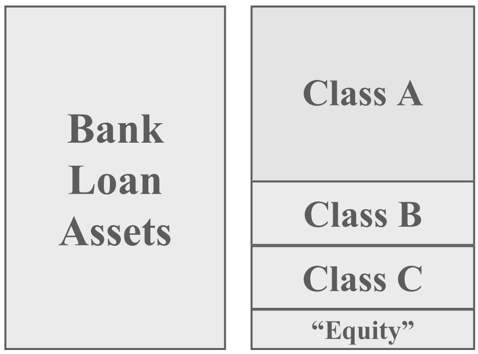
In addition to the absence of stated interest and principal payments, CLO equity differs from debt in that the payments to investors may be erratic. Even if the ultimate return is healthy, whether one measures by IRR or ROX, investors value consistency and persistency of payments. As a consequence, we create and explain a Sharpe-like measure of the ratio of excess return to variability of return—CLO#. We argue that CLO# (pronouncing "#" as "sharp") is a significant additional measure of CLO equity investment quality.

We compute IRR, ROX, and CLO# for a wide universe of past CLO equity tranches of the Creditflux CLOi deal database.[3] Our results show that ROX provides a somewhat different ranking of "best deals" relative to IRR. The best performance in CLO# terms shows significant contrast to ROX alone. We consider good performance in both ROX and CLO# measures to be important to investors.

CLO EQUITY SITS AT THE BOTTOM OF THE CAPITAL STRUCTURE

Exhibit 1 depicts a typical CLO capital structure in which the special purpose vehicle

Exhibit 1
Capital Structure of a Typical CLO



(SPV) owns bank loans as assets and issues debt tranches Class A, Class B, and Class C as well as an "equity" tranche. The debt tranches have an "order of priority," or relative subordination, as the exhibit shows. The "equity" tranche is subordinate to all debt tranches.

We've shown "equity" in quotation marks to highlight the observation that this tranche is technically and legally *not* the equity of the SPV. Rather, various structures label and define this bottom tranche as "subordinated notes," "income notes," or "preference shares." Choices for SPV incorporation, domicile, and structure seek to achieve exemptions from tax withholding and consolidation of assets with the sponsor or any investor. Hence, a charitable trust typically owns the legal equity of the SPV, and all residual cash flows remain at the level of the subordinated notes (or income notes or preference shares, as the case may be).[4]

Henceforth, we drop the quotation marks from "equity" to designate this bottom tranche. In an economic and investing sense, this tranche *is* equity in that, ultimately, it receives all interest and principal proceeds from the assets beyond the funds necessary to pay obligations to debt tranches and other fees. Similar to debt and equity investments of a corporate entity, the CLO debt holder has no claim to payments in excess of stated interest and principal, whereas the equity investor has much wider variability of potential return.

IRR IS THE INDUSTRY STANDARD

Almost certainly for reasons of simplicity, IRR is the dominant concept in most discussions of investment return. It is common to hear investors say that they "have a 15% return threshold" for a particular investment in which IRR is the unstated methodology for determining the "15% return." External to the financial world, when a company considers investing in a new production plant, it will base its decision on the IRR calculation that pits the projected increase in net income against the invested cost of the plant. IRR is ubiquitous.

There exists a degree of ambiguity in the IRR definition. Let's first write an implicit equation for yield y:

$$\sum_j \frac{p_j}{(1+y)^{t_j}} = 0 \qquad (1)$$

In Equation 1, the p_j are payments to the investor at time t_j (measured in years). There must be at least one payment *from* the investor (which will make this value of p_j negative) and at least one payment *to* the investor (positive value of p_j). The typical situation is that the investor makes one payment. This is the initial investment (let's say p_0 is negative \$10 million) with $t_0 = 0$. The investor then expects to receive a series of future payments (all with $p_j > 0$ and $t_j > 0$). The value of y that satisfies Equation 1 is one form of the IRR.

The definition of IRR is ambiguous because there are many ways to choose the yield compounding convention of Equation 1. Equation 1 assumes annual compounding. The version incorporating quarterly compounding is

$$\sum_j \frac{p_j}{\left(1+\frac{y}{4}\right)^{4t_j}} = 0 \qquad (2)$$

For common values of p_j and t_j, the solutions to Equations 1 and 2 differ. The IRR of Equation 1 will be larger than that of Equation 2 with typical parameters. Labeling the quarterly and annual IRR values as IRR_4 and IRR_4, respectively, the relationship between the two is roughly

$$(1+IRR_4/4)^4 = 1+IRR_1$$

Stated more precisely, the ambiguity of IRR centers on the chosen method for determining the present value (PV) of future cash flows. We'll touch on this point later, when we remark that ROX employs a different concept for PV of cash flows.

IRR HAS SEVERAL CLEAR DISADVANTAGES

We focus on Equation 2 as the definition of IRR (the value of y that satisfies Equation 2). An apparent disadvantage is that Equation 2 is difficult to solve. On a spreadsheet, however, the Microsoft Excel function XIRR permits convenient solution. In other software applications, the numerical methods of bisection and Newton iteration, among others, suffice for rapid calculations.[5]

A significant but not fatal problem with IRR is that it is a fixed rate that is completely ignorant of current market interest rates. For example, imagine that a pension fund manager has a "rule" that the fund will invest in CLO equity when she projects an IRR of 15% or higher. This year's transactions only show 13% IRR, so the manager declines to invest. When next year's deals come in at 16%, the pension fund invests. But CLO equity is sensitive to market interest rates (LIBOR and swap curves). The increase in IRR may be entirely due to increasing LIBOR/swap rates. Hence, establishing a simple IRR benchmark is not reasonable. One feasible remedy for this flaw is to measure return as the difference between the computed IRR and a fixed-rate alternative (such as a risk-free return or the investor's cost of funds).

A more substantial black mark for IRR is that it gives nonsensical results for investments that perform weakly or suffer losses. Sophisticated analyses of risk and return look deeply at the "loss cases." It is precisely here that IRR has less meaning. Consider some straightforward examples.

A truly weak and failed investment would have a manufacturing company invest \$100 million now and, over time, recover just this \$100 million and nothing more. To simplify the example, imagine the \$100 million comes back only at the end of 10 years. Upon inspection of Equation 2, the value of y that satisfies Equation 2 is 0%. That is, the IRR is 0%. The return on investment is zero. The company put in \$100 million and recovered just this \$100 million. But imagine that, instead, the company had gotten back its \$100 million in 1 year rather than in 10 years. Equation 2 still has the same solution: The IRR is 0%. While it would be far better to be paid back after 1 year than it would be to wait 10 years, the IRR measure fails to make a distinction.

Now change this to an example with a clear loss. The two possibilities are that after investing \$100 million, the company recovers only \$50 million after either 10 years or after 1 year. Now the two IRR values are −6.9% and −64%, respectively! The observation that both returns are negative is sensible because "loss" and "negative return" are synonymous. But the IRR is far more negative for the choice that all investors would prefer. It's more burdensome financially to wait an additional 9 years to recover any amount—whether less than, equal to, or greater than the original investment.[6]

IRR SHORTCOMINGS ARE WIDELY KNOWN

Numerous authors have expounded the disadvantages of IRR in recent years—although these stated drawbacks differ somewhat from ours.[7] In the prior section, we focused on the inapplicability to floating-rate instruments and the confusion in loss scenarios because our interest in CLO equity makes these points highly pertinent. Yet, the earlier work is relevant because much of it compares IRR to alternative measures based on present value (PV). The improvements we suggest in following sections are also PV-based.

The earliest prior comparison of a PV method to IRR of which we are aware is that of Lorie and Savage [1955] more than 60 years ago. This article compared IRR and the calculated total PV of hypothetical business investments and found different rankings for the two measurement choices. The authors preferred the PV method because it relates more directly to the impact on shareholder value of the firm. That is, the excess of the PV measure over the invested amount is arguably the benefit to shareholders of making the investment under consideration.

Another study with a similar conclusion is that of Weeks et al. [1994], who analyzed the costs and benefits of various professions. The education for the profession (attorney, physician, business) is the initial investment and lifetime earnings are the return on investment. The authors find the rankings of "best profession" to be dependent on choice of measurement (IRR or excess PV of lifetime earnings beyond education costs). Business school graduates prevail under IRR, while lawyers and specialist physicians lead the pack with net PV.

ROX IS A BETTER MEASURE OF RETURN

As we stated earlier, the acronym ROX denotes "return on exposure." As a short summary, ROX resembles the "spread to LIBOR" of an investment. ROX is similar to discount margin (DM) when we apply it to a floating-rate bond. But, like IRR, we can compute ROX for any arbitrary set of cash flows. The cash flows need not be "bond-like" to determine the ROX whereas spread to LIBOR and DM are analytical concepts specific to bonds.

Because the ROX concept is similar to spread to LIBOR, we solve the problem of having an investment look better in one year than in another purely due to an increase in general interest rates (e.g., LIBOR). Furthermore, the name itself helps users understand that ROX has meaning for synthetic risk positions as well as the more conventional funded (cash) risk positions. In synthetic positions, there is no explicit investment. Rather, the investor has (unfunded) risk exposure. We apply ROX deliberately to portfolios holding both funded and unfunded risk positions due to its utility in treating both of these cash and synthetic exposures.

As with IRR, we can calculate ROX for past cash flows to determine the realized return or apply ROX to projected cash flows to assist investment analysis. Unlike IRR, we need historical LIBOR values or forward LIBOR values, respectively, to compute realized or projected ROX.

Writing the ROX for a single investment position rather than a portfolio, we have

$$\text{ROX} = \sum_{j=0} z_j \, p_j / \phi_0 \, D \qquad (3)$$

As before, p_j of Equation 3 are the payments the investor makes (negative values) or receives (positive values) over time, and z_j are zero coupon discount factors (which we usually shorten to just "discount factors"). Unlike the IRR of Equations 1 and 2, we need not choose a compounding convention, such as annual or quarterly.

The symbols ϕ_0 and D of Equation 3 are exposure par amount and spread duration, respectively. This spread duration for our purposes is

$$D = \sum_{j=1} z_j (t_j - t_{j-1}) \phi_{j-1} / \phi_0 \qquad (4)$$

Here, t_j are the time points for the investment period. The remaining (amortizing) par of the investment at time t_j is ϕ_j.

Notice that the ROX of Equation 3 is just the PV of all payments received minus the PV of all funded investments (this latter being the $j = 0$ term) divided by the sum-product of exposure par amount and duration. The numerator is zero when the PV of payments received equals the PV of invested amounts. In this case, the ROX is zero, which means that the (funded) investment return is LIBOR-flat (e.g., LIBOR + zero). Roughly speaking, an investment should return LIBOR-flat when it has near-zero risk. Hence, ROX is a natural measure of return in tandem with an appropriate measure of risk. Expected ROX should always increase as the risk of an investment increases.

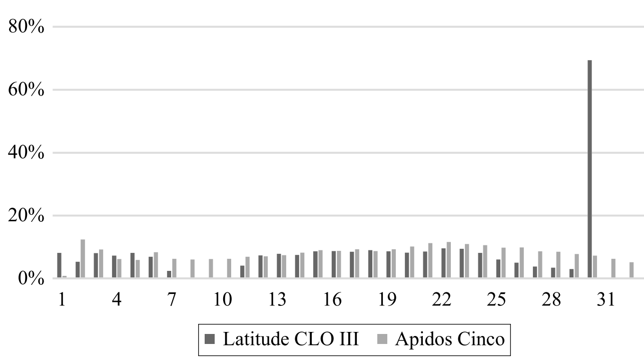
VARIABILITY OF CLO EQUITY CASH FLOWS AND THE CLO# MEASURE

Payments to CLO equity tranches are volatile because they are generally the difference between the recent period's asset and liability payments. The par amounts of these assets and liabilities may be a factor of 10 greater than the equity par. Thus, the residual is amplified relative to the equity. In addition, numerous CLO waterfall features may, temporarily or permanently, turn off cash flows to equity. This on–off feature can make equity returns erratic even for transactions in which the ultimate total return is attractive.

Exhibit 2 graphs the quarterly equity cash flows for two comparable CLO transactions as fractions of original par amount. Both equity tranches have healthy per annum IRR and ROX values—roughly 25% and 19%, respectively.

Both the Latitude CLO III and Apidos Cinco transactions shown in Exhibit 2 have matured with excellent equity investment performance. (See the next section

EXHIBIT 2
Comparison of Equity Cash Flows



for the CLO equity performance of a wider universe.) Clearly the cash flows for Latitude in Exhibit 2 are more bond-like than those of Apidos due to the large final payment. Apidos cash flows resemble an annuity rather than a bond with bullet amortization. Neither IRR nor ROX attempt to measure this degree of bond-versus-annuity character of equity cash flow.

To capture and quantify both the ultimate total return of a CLO equity tranche and the volatility of cash flows, we define the CLO# measure as the mean excess return divided by the standard deviation of period excess returns. In effect, this is a Sharpe ratio concept applied to cash flows rather than to changes in value.[8] For N payment periods, the excess returns ξ_j are simply the actual payments p_j minus the LIBOR interest on outstanding residual par:

$$\xi_j = p_j - \psi_{j-1} L_{j-1}(t_j - t_{j-1}),\ j = 1, \ldots, N \qquad (5a)$$

$$\psi_0 = \phi_0, \psi_j = \psi_{j-1} - \xi_j,\ j = 1, \ldots, N \qquad (5b)$$

In Equation 5a, L_{j-1} is the LIBOR setting for the time period t_{j-1} to t_j. Equation 5b shows our creation of a residual par ψ_j. Although there's no meaningful distinction between interest and principal for equity cash flows, we do need to track the effective return of invested funds. Thus, we imagine that excess returns pay down this residual par. This residual par is essentially a funding note for the purchase of the equity tranche. Augmenting the Equation 5a definition of ξ_j, we subtract the ending residual par ψ_N for the excess return ξ_N.

Given this specification for the excess returns ξ_j of CLO equity cash flows, our volatility measure is

$$\text{CLO\#} = \text{Mean}\{\xi_j\}/\text{Std Dev}\{\xi_j\} \qquad (6)$$

Evaluating this result for our two CLO equity investments of Exhibit 2, we find CLO# values of 3.0 and 0.69 for Apidos Cinco and Latitude CLO III, respectively. When comparing the CLO# of two transactions, larger is better when investment returns are similar. The next section presents a list of matured CLO equity investments sorted by best ROX and CLO#.

APPLICATION TO LARGE LIBRARY OF PAST EQUITY TRANCHES OF CLOi

From the *Creditflux* CLOi deal database, we have chosen 226 matured transactions based on currency (USD), year of closing (2003 and later), and other considerations pertaining to available data. Exhibit 3 plots the ROX of the CLO equity investments. The mean ROX is essentially identical to the median at 3.4%. The sample standard deviation is 8.9%. A headline result, then, is that the realized mean of CLO equity returns of the past roughly 10 years is LIBOR + 3.4%.

Exhibit 4 shows a portion of a table of the equity return measures for the 226 Creditflux CLOi database deals. We sort the results by ROX and present just the 10 best performing deals. In lieu of actual deal names in the far left column, we've assigned integers from 1 to 226 to the deals with the order based on IRR rather than ROX. Thus, the sequence of deal numbers shows the degree to which ROX and IRR correlate with one another. There is certainly high correlation, but it's also clear that top-10 lists based on ROX and IRR are not identical.

Exhibit 5 sorts all 226 CLO transactions and presents just the 10 best performing tranches in terms of CLO#.

EXHIBIT 3
Distribution of CLO Equity ROX for 226 Transactions

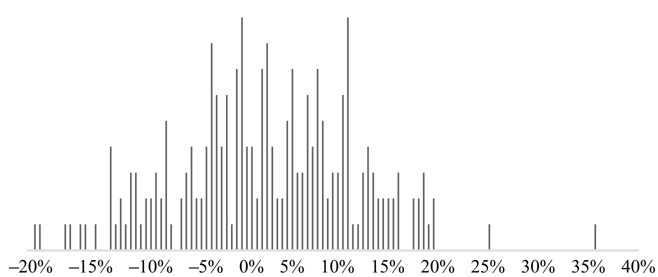


EXHIBIT 4
Comparison of IRR, ROX, and CLO# Values

Deal	Closing	IRR	ROX	CLO#
1	2006	40.9%	36.1%	2.59
2	2007	30.2%	25.6%	1.48
3	2007	25.8%	20.2%	3.41
6	2007	24.6%	20.0%	2.66
22	2007	18.6%	19.5%	0.60
11	2005	21.3%	19.2%	0.58
7	2011	22.8%	19.0%	0.74
8	2007	22.7%	18.9%	0.69
18	2007	19.8%	18.6%	0.48
5	2007	25.3%	18.5%	3.04

Exhibit 5

Comparison of Equity Cash Flows Sorted by CLO#

Deal	Closing	Last Payment	IRR	ROX	CLO#
42	2011	10/20/2015	16.2%	8.6%	4.80
121	2011	10/21/2015	6.4%	3.5%	4.56
3	2007	11/27/2015	25.8%	20.2%	3.41
28	2006	12/12/2012	18.2%	11.4%	3.13
5	2007	11/16/2015	25.3%	18.5%	3.04
9	2007	12/21/2015	22.7%	16.5%	3.03
14	2007	11/18/2015	20.8%	14.6%	2.98
33	2005	4/27/2015	17.8%	9.0%	2.80
6	2007	12/22/2015	24.6%	20.0%	2.66
29	2005	11/18/2013	18.0%	10.5%	2.66

Interestingly, this selection by ratio of excess returns to variability of returns produces a significantly different sense of "best deals" than either ROX or IRR alone. All of these "top 10" have attractive ROX values, but the ordering of deal performance differs greatly.

SUMMARY

After describing CLO equity tranches as an investment class, we explained in some detail the industry-standard IRR calculation to measure, either retrospectively or on a pro forma projected basis, investment performance. This IRR technique has the advantage of familiarity to investors. Yet, it also has the shortcoming of failing to distinguish performance in high and low interest rate environments. IRR also gives non-intuitive relative assessments when investments are at zero or negative yields.

As an improvement, we propose return on exposure as a retrospective or prospective measure of CLO equity performance. Most importantly, ROX is more suitable to typical CLO structures in which most assets pay LIBOR-based interest and most debt payment obligations (senior to equity, of course) require LIBOR-based payments. Equity returns will naturally rise and fall with LIBOR fluctuations. ROX is a superior return measure for CLO equity because it will effectively remove the influence of LIBOR movements. It is performance above LIBOR that is meaningful to investors.

As one further observation, CLO equity cash flows are not "bond-like." There is no distinction between interest and principal for the equity payments. One expects equity cash flows to be far more volatile than those of any CLO debt tranche because equity payments are differences between larger par value asset and liability cash flows. Investors, however, prefer low volatility over high volatility, all else equal. Skillful CLO managers and well-designed structures may well impact transactions through lower volatility in equity payments. For this reason, we propose, derive, and explain the CLO# measure as an additional assessment for CLO equity performance.

To demonstrate all three measures (ROX, IRR, CLO#), we download necessary deal information from the Creditflux CLOi database for 226 matured transactions. Through tables and graphs, we present our findings. One particularly interesting result is that mean CLO equity returns beginning with the 2003 vintage have been roughly LIBOR + 3.4%.

ENDNOTES

[1]In truth, one should set the expected return as the stated return minus the expected default loss. The latter term is almost always much smaller than the former.

[2]See, for example, Ganguin and Bilardello [2004] and Maxwell Consulting's "Credit Risk Assessment and Management" video series (2016), available at http://www.maxwell-consulting.com/Credit-Risk-Video.html.

[3]This expansive database of both past and current CLO transactions is available online at http://cloi.creditflux.com.

[4]See Gorton and Souleles [2005].

[5]See, for example, Press et al. [2007].

[6]This statement is strictly correct only if we stipulate the "normal world" that general interest rates available to the investor will be positive rather than zero or negative.

[7]See, for example, Gabriel Filho et al. [2016]; Jubasz [2011]; and Bora [2015].

[8]See, for example, "Understanding the Sharpe Ratio" (Investopedia, 2013), online at http://www.investopedia.com/articles/07/sharpe_ratio.asp.

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