

Market Commentary

- **Loan BWICs**, principally from liquidating hedge funds, pushed U.S. loan prices to the mid-60s and European loan prices to the low 70s. Loan prices are now more in line with CLO prices, meaning that CLO liability marks aggregate to an amount closer to the mark of their asset portfolios. The weighted average price of CLO liabilities averaged about 60 three weeks ago when loans were trading around 80. Although there is little transparency in CLO pricing, CLO asset and liability marks are now closer with loans trading around 65. See CLO spreads below.
- **What does it take to liquidate a cash flow CLO?** Leveraged loan liquidations have come from market value CLOs, total return swap lines, and leveraged hedge funds. But loan market participants worry about an additional influx from the much larger universe of cash flow CLOs. CLOs whose senior AAA tranches have a monoline wrap have the most sensitive liquidation rules and terms vary from CLO to CLO. But assuming a 45% market value for defaulted loans, a CLO would be in danger of liquidation if ~41% of its collateral defaulted. Assuming the same 45% market value, a CLO would be in danger of liquidation if ~49% of its collateral was downgraded below B3/B-. Combinations of defaults and downgrades would also put a CLO at risk for liquidation, but ultimately it would be up to the monoline or senior AAA CLO holders to decide whether to liquidate a cash flow CLO.
- **Lehman's triple-A derivative product companies.** In our Sept. 18 *CDO Insight*, we described Lehman's bankruptcy as a real-world test of esoteric 1990s structural technology. Would Lehman's two vehicles performed as planned and fulfill their obligations? Apparently not. Both vehicles have filed for bankruptcy and S&P rates both CC on negative watch.

Spreads for U.S. and European CLOs Backed by Broadly Syndicated Loans

Rating	Nov 2006	Aug 2007	Mar/Apr 2008	Jun 2008	Nov 2008
AAA	38-43	175-225	400	150-200	500-700
AA	65-75	250-325	600	300-375	1000+
A	140-160	425-500	850	500-600	1400+
BBB	350-425	650-850	1000	700-800	1900+

Distressed Loan Prices, Overflowing Triple-C Buckets, and CLO Returns...Page 2

Douglas Lucas
 douglas.lucas@ubs.com
 +1-212-713 3440

Danny Newman
 danny.newman@ubs.com
 +1-212-713 2207

Cash CDO Business Contacts
Keith Grimaldi
 +1-203-719-1621
Simon Perry
 +44-20-7567 7386

Synthetic CDO Business Contacts
Paul Czekalowski
 +44-20-7567 7321
Chris Mackenzie
 +1-203-719 7370

Distressed Loan Prices, Overflowing Triple-C Buckets, and CLO Returns

When market participants model CLO returns, they focus primarily on defaults and recoveries. But in today's environment, two other factors demand attention: the size of the CLO's triple-C asset bucket and the price at which the CLO reinvests in new collateral loans.

Given today's depressed loan prices, a dollar can buy \$1.05, \$1.10, even \$1.15 or more of loan par. The increased par amount also provides more dollars of interest income every coupon period. But overflowing triple-C buckets can cut off cash flow to lower CLO tranches and redirect it to senior tranches. This article will look at the separate and joint effects of reinvestment prices and triple-C buckets on different CLO tranches.

We find that low reinvestment prices help CLO tranches withstand higher defaults and lower recoveries, but the benefit is muted for senior tranches. Equity benefits the most. High triple-C buckets obviously help senior tranches by diverting cash flow their way. But a high triple-C bucket also helps lower debt tranches in constant default rate modeling by cutting off reinvestment and potential losses on *reinvested* principal. For equity, low reinvestment prices help more than high triple-C buckets hurt.

We first show the effect of reinvestment price and triple-C buckets separately. Then, we go through each CLO tranche and look at joint effects.

Reinvestment Scenarios

"Cheap" loans allow CLO managers to build collateral par and earn more dollars of interest coupon. We studied a few 2007 CLOs in our analysis, and present the results of one representative CLO. [NOTE: When we say "we modeled," we mean that Moody's Wall Street Analytics (MWSA) was kind enough to model the many scenarios we requested and provide us with many different types of output. Tranche by tranche results are available for download from Moody's Wall Street Analytics at <http://wsainc.com/UBS>.¹] Exhibit 1 (right) shows the 26 default and recovery scenarios MWSA ran on the CLO under study. Note that as CDR increases, our assumed recovery rates decrease, reflecting what we think the reality would be.

To give context to the CDRs in Exhibit 1, 5% CDR approximates the highest cumulative default rate of U.S. institutional loans since that market developed in 1995. Loans originated in 2000 had a cumulative default rate over 4.5 years of

Exhibit 1. Default and Recovery Scenarios

CDR %	Loan Recovery %	Bond Recovery %
0	na	na
0.5	90	60
1	87	57
1.5	84	54
2	82	52
2.5	79	49
3	76	46
3.5	73	43
4	71	41
4.5	68	38
5	65	35
5.5	64	34
6	63	33
6.5	62	32
7	61	31
7.5	60	30
8	59	29
9	58	28
10	57	27
12	56	26
14	55	25
16	54	24
18	53	23
20	52	22
22	51	21
25	50	20

¹ For details on Moody's DCV Service, see "Discounted Cashflow Values: A Tool to Enhance Transparency in the Structured Finance Valuations Process," in *Moody's Credit Values White Paper*, November 2007.

21.0%.² Loan underwriting had significantly deteriorated and 2000-vintage loans were exposed to the U.S. recession of 2000-1. The 21.0% cumulative default rate of 2000-vintage loans compares to an average of 7.7% across all other vintages 1995-2003. In our cash flow modeling, a 5% CDR over 4.5 years produces a cumulative default rate of 20.6%. The 65% loan recovery rate we associate with 5% CDR is the average recovery rate of loans defaulting 2001-3.

Another default “landmark” in Exhibit 1 is 10% CDR. Over four years, this CDR produces a 34.4% cumulative default rate, which is a little higher than the 33.9% high-yield bond default rate that prevailed in the depths of the Great Depression 1932-35.³ Over five years, this same 10% CDR produces 41% cumulative defaults, equal to the worst five-year B-rated high-yield bond default rate since 1970.⁴ Higher default rates, further down the rows in Exhibit 1, have no basis in historical experience for either leveraged loans or high-yield bonds.

In the modeling, we default reinvestments, prepay loans and bonds at 15% and 5%, respectively, and assume that collateral assets mature at the CLO’s maturity.

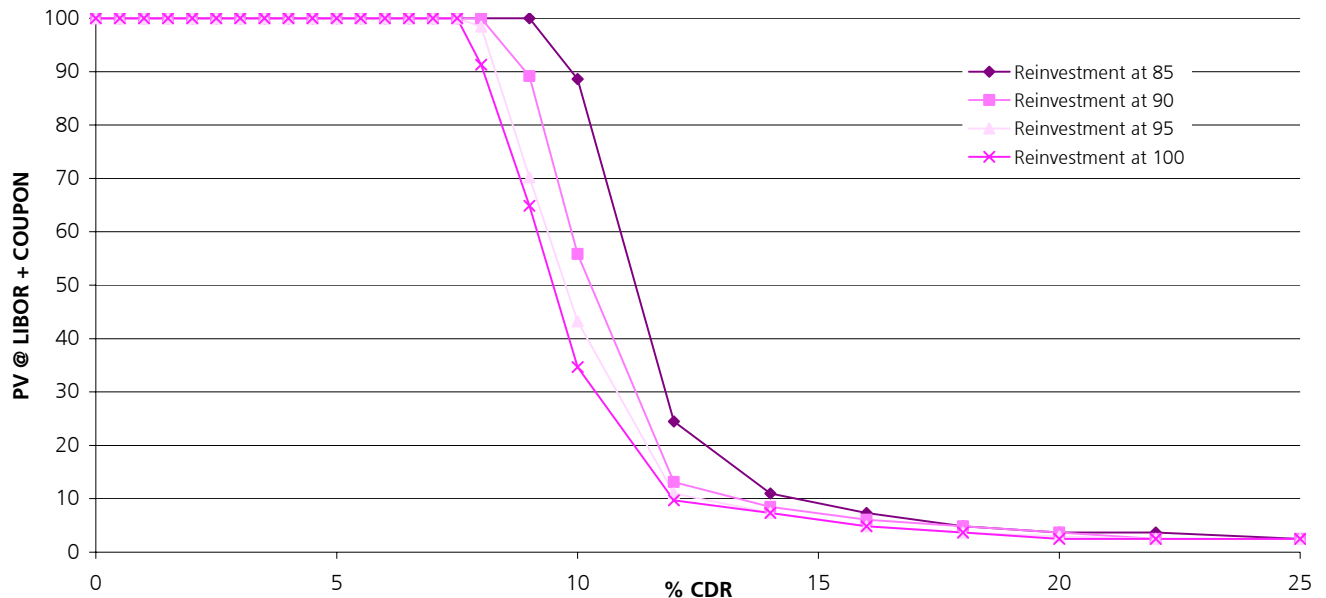
Exhibit 2 (next page) charts the present value of Baa2 tranche cash flows discounted at LIBOR + that tranche’s coupon spread (Y-axis) at different CDRs (X-axis). The four curves represent different reinvestment cases and all scenarios assume a 0% triple-C bucket. The exhibit shows how different reinvestment scenarios affect the returns of the Baa2 tranche of the CLO. For CDRs below 8.0%, the CLO has a PV of 100 in all four reinvestment assumptions. The interpretation is that since we are discounting at LIBOR + the coupon spread of the CLO, the CLO is paying all required principal and interest. At 8.0% CDR, a coupon break occurs in the 100% price reinvestment case. This is shown by its PV being less than 100 on the Y-axis. But in the 85% price reinvestment case, the tranche doesn’t break coupon until 10% CDR. Hence, *lower reinvestment prices allow the Baa2 tranche to withstand greater defaults and still pay required principal and interest.*

2 Steve Miller, Robert Polenberg, Aditi Mahendroo, *1Q08 Institutional Loan Default Review*, S&P LCD, April 2008.

3 Lea V. Carty and Dana Lieberman, *Historical Default Rates of Corporate Bond Issuers, 1920-1996*, Moody’s Investors Service, January 1997; page 9 for the worst four-year period 1932-1935. W. Braddock Hickman, the grandfather of default study research, found a rate of 48.9% over the same period in *Corporate Bond Quality and Investor Experience*, NBER, 1958. The considerable difference could be because Moody’s focused on Moody’s-rated bonds.

4 Kenneth Emery *et al*, *Corporate Default and Recovery Rates, 1920-2007*, Moody’s, February 2008.

Exhibit 2. Baa2 Cash Flows Discounted at LIBOR + Coupon Spread Under Different Reinvestment Prices



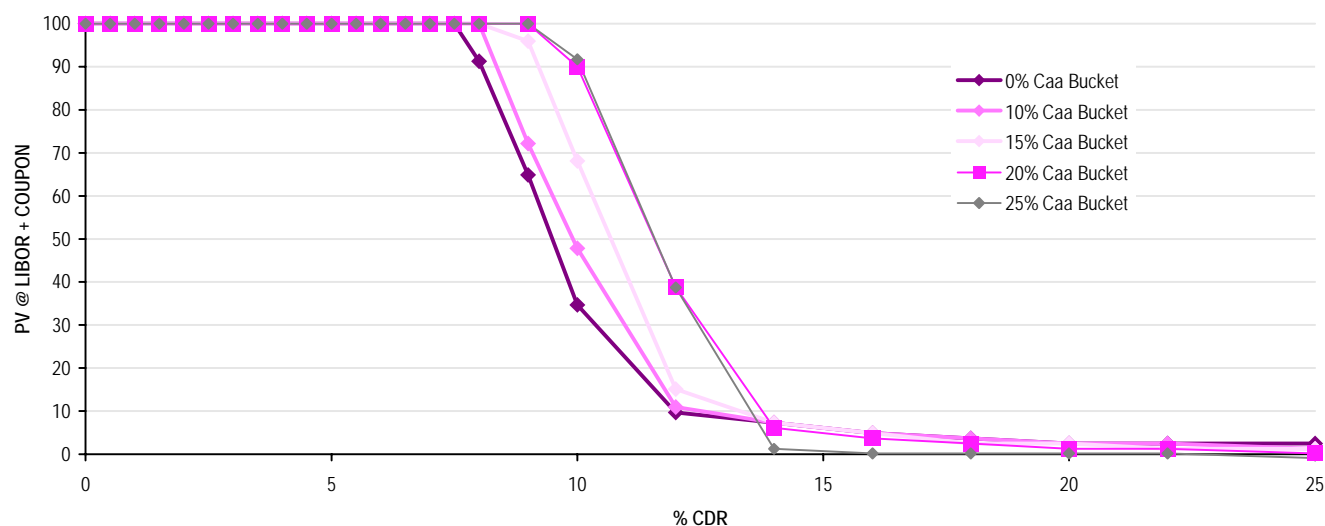
Source: Moody's Wall Street Analytics, UBS

Triple-C Bucket Scenario

Most CLO structures react to the presence of triple-C-rated loans in their asset portfolio via over-collateralization tests. Generally, any amount of triple-C assets above a specified percentage of total collateral assets (5-7.5%, typically) is treated as “triple-C excess” and counted at market value in the tests. This increases the chances of over-collateralization tests being tripped and redirecting cash flow away from subordinate tranches to more senior tranches. We looked at the effect of different sized triple-C buckets upon CLO returns assuming that the CLO’s triple-C bucket tolerance was 7.5% of total assets and that the market value of excess triple-C assets was 65%. We also assumed, for now, that reinvestment was made at par.

Exhibit 3 (next page) shows the present value of Baa2 tranche cash flows discounted at LIBOR + the tranche’s coupon spread (Y-axis) at different CDRs (X-axis) and different triple-C bucket levels. Again, we see that the curves have different coupon break points. The 0% triple-C bucket scenario breaks coupon at 8% CDR, while the 25% triple-C bucket scenario breaks at 11% CDR. Hence, *a higher triple-C bucket allows this tranche to withstand greater defaults and still pay required principal and interest*. One may be surprised to find this effect so far down the CLO’s capital structure, and be even more surprised to learn that we find the same effect in the CLO’s Ba2 tranche. We’ll explore this phenomenon in detail later.

Exhibit 3. Baa2 Cash Flows Discounted at LIBOR + Coupon Spread Under Different Triple-C Buckets



Source: Moody's Wall Street Analytics, UBS

Combined Effect

We now show the *combined* effect of reinvestment prices and triple-C buckets upon all the tranches of a CLO. For each CLO tranche, we find the highest CDR the tranche can withstand and still pay all required principal and interest.

Super Senior Aaa Tranche

The super senior Aaa tranche of the CLO we examined never breaks coupon under any CDR/reinvestment/triple-C bucket scenario we studied. Even in the highly stressed 25% CDR and 50% loan recovery scenario, the senior most tranche was still able to repay all its principal and coupon in any reinvestment and triple-C bucket scenario.

Aa1, Aa2, and A2

Exhibit 4 (next page) shows that higher triple-C buckets help the Aa1 tranche withstand higher CDR stress. (Note that this is a junior AAA tranche per S&P.) At 100 reinvestment/0 triple-C bucket, the tranche breaks coupon at 18% CDR, but when the triple-C bucket rises to 25%, the tranche can withstand 20% CDR before breaking coupon. This can be attributed to the fact that a higher triple-C bucket creates a lower over-collateralization ratio, which in turn may trigger cash diversion and pay down the principal of senior CLO tranches. Due to early principal repayment, senior tranches have lower WALs and can withstand higher CDRs. A similar trend can be seen for Aa2 and A2 tranches as well. Note that reinvestment prices have no effect on the Aa1 tranche. This is because at CDRs of 18-20%, reinvestment is cut off, making reinvestment price moot. Reinvestment prices make a little difference for Aa2 and A2 tranches when CDR is 10-14%.

Exhibit 4. Coupon Break CDRs for Aa1, Aa2 and A2 Tranches

Aa1		Reinvestment Price %			
		100	95	90	85
Caa Bucket Size %	0	18	18	18	18
	10	20	20	20	20
	15	20	20	20	20
	20	20	20	20	20
	25	20	20	20	20

Aa2		Reinvestment Price %			
		100	95	90	85
Caa Bucket Size %	0	14	16	16	16
	10	16	16	16	16
	15	16	16	16	16
	20	16	16	16	16
	25	18	18	18	18

A2		Reinvestment Price %			
		100	95	90	85
Caa Bucket Size %	0	10	10	10	12
	10	10	10	10	12
	15	12	12	12	12
	20	12	12	12	12
	25	12	12	12	12

Source: Moody's Wall Street Analytics, UBS

We test all combinations of reinvestment prices and triple-C buckets in our exhibits. However, it makes sense to consider the probable correlation of reinvestment prices and triple-C buckets. It is likely that when reinvestment prices are low, triple-C buckets will be swollen. The economic conditions that cause a lot of loan downgrades are the very ones that will depress loan prices, and *vice-versa*. If loan prices are high, we expect CLO triple-C buckets to be modest. The most likely combinations of triple-C buckets and loan reinvestment prices in our exhibits are those lying along the diagonal from upper left to lower right.

Baa2

As we go down the CLO capital structure, a high triple-C bucket helps tranches less. After all, these are the tranches that cash flow is being diverted *from*. This can be seen in Exhibit 5 (next page) when we look at coupon break CDRs for the Baa2 CLO tranche. Although the triple-C bucket assists the Baa2 CLOs to withstand higher CDRs, the range of CDRs, 7.5-9.0%, is tight across the scenarios.

Exhibit 5. Coupon Break CDRs for Baa2 Tranche

Baa2		Reinvestment Price %			
		100	95	90	85
Caa Bucket Size %	0	7.5	7.5	8	9
	10	8	8	8	9
	15	8	8	8	9
	20	9	9	9	9
	25	9	9	9	9

Source: Moody's Wall Street Analytics, UBS

Ba2

One might assume that increasing the triple-C bucket would harm the Ba2 tranche, causing it to break at a lower CDR, because of cash flow being diverted away from it. But Exhibit 6 (below) shows coupon break CDRs staying the same or increasing as triple-C buckets increase. In the most surprising case, at a 90% reinvestment price, the Ba2 tranche breaks at 5.5% CDR when the triple-C bucket is 0%, but at 7.5% CDR when the triple-C bucket is 25%.

Exhibit 6. Coupon Break CDRs for Ba2 Tranche

Ba2		Reinvestment Price %			
		100	95	90	85
Caa Bucket Size %	0	4.5	5.5	5.5	7.5
	10	5	5.5	5.5	7.5
	15	5	5.5	5.5	7.5
	20	5	5.5	6	7.5
	25	5	7.5	7.5	7.5

Source: Moody's Wall Street Analytics, UBS

What is going on? The answer lies in the fact that *as triple-C bucket rises, the dollar amount of collateral loan loss decreases because reinvestment is cut off.*

Exhibit 7 (next page) shows the dollar amount of collateral losses at different triple-C bucket levels and different CDR scenarios, assuming loan reinvestment is at 90%. We can see that across all CDR scenarios, as we increase the triple-C bucket to 20% or higher, the actual loss amount of collateral decreases. In the 8% CDR scenario, as the triple-C bucket is increased from 0% to 25%, collateral dollar loss goes down from \$149.15 million to \$58.82 million, *i.e.* it decreases by 61%. The reason is that the higher triple-C bucket trips over-collateralization tests, which results in cash flow being diverted to pay down the principal of higher tranches instead of being invested in new collateral assets. Thus, the collateral amount to which the CDR is applied keeps getting smaller. Actual collateral dollar loss is reduced, which helps all tranches.

Exhibit 7. Dollar Amount of Collateral Loss for Reinvestment at 90% Price Scenario

% CDR	Caa Bucket Size %				
	0	10	15	20	25
0.0	-	-	-	-	-
0.5	14,191,381	14,191,381	14,191,381	14,020,574	13,096,899
1.0	7,751,778	7,751,778	7,751,778	7,645,915	7,064,532
1.5	13,382,341	13,382,341	13,382,341	13,189,237	12,136,873
2.0	20,149,479	20,149,479	20,150,347	19,846,712	18,202,065
2.5	28,178,982	28,178,982	28,184,474	27,741,419	25,386,833
3.0	37,344,058	37,344,058	37,358,088	36,747,807	33,550,313
3.5	47,583,840	47,583,840	47,611,697	46,857,599	40,917,695
4.0	58,656,005	58,656,005	58,704,139	57,744,540	50,280,580
4.5	70,817,706	70,817,706	70,894,777	69,647,835	58,115,675
5.0	83,832,223	83,832,223	83,948,376	82,465,184	65,911,787
5.5	93,648,512	93,648,512	93,800,097	92,177,530	67,965,345
6.0	103,665,612	103,665,612	103,858,802	99,226,308	67,094,778
6.5	113,984,724	114,131,225	114,671,131	101,361,850	60,832,172
7.0	125,391,577	125,573,847	126,172,106	61,978,065	55,439,570
7.5	137,262,953	137,515,063	138,169,977	54,513,458	54,513,458
8.0	149,148,982	149,600,663	150,630,975	58,821,285	58,821,285
9.0	105,631,795	104,345,199	168,577,678	66,178,831	66,178,831
10.0	104,453,850	102,531,998	98,108,998	73,553,449	73,553,449
12.0	111,124,629	105,819,705	96,574,877	86,477,880	86,477,880
14.0	121,719,378	115,439,288	106,117,931	98,955,409	98,955,409
16.0	129,817,297	122,579,830	114,521,308	111,003,280	111,003,280
18.0	135,819,260	135,755,441	126,641,089	122,639,416	122,639,416
20.0	148,675,473	139,285,667	138,344,572	133,882,237	133,882,237
22.0	160,894,827	149,299,255	149,572,533	144,750,489	144,750,489
25.0	164,094,476	164,094,476	164,180,416	158,877,588	158,877,588

Source: Moody's Wall Street Analytics, UBS

Equity Tranche

Increasing the triple-C bucket affects the cash flows of the equity tranche in different ways. It:

- diverts cash flow away from equity tranche as the OC trigger is tripped, hurting equity;
- lowers reinvestment by diverting cash flow to pay down debt tranche principal, again hurting equity;
- reduces actual collateral dollar losses by limiting reinvestment, which helps equity.

We assume that the price paid for the CLO's equity tranche is the undiscounted amount of its next two years' cash flow, assuming 2% CDR, 82% recovery, 0% triple-C bucket, and reinvestment at a loan price of 100%. This sum is used to

compare the present values of future cash flows in all triple-C/reinvestment scenarios. Looking at the LIBOR-break CDRs in Exhibit 8 (below), we see that increasing the triple-C bucket in lower loan price scenarios hurts the equity tranche. For example, keeping loan price constant at 85 cents to a dollar, we see that with 0% triple-C bucket, the equity can take 10% CDR stress before breaking either LIBOR or principal, but as we increase the triple-C bucket to 20%, equity breaks LIBOR and principal at 6.5% CDR.

Exhibit 8. LIBOR Break CDRs for Equity

Equity	Reinvestment Price %				
		100	95	90	85
Caa Bucket Size %	0	4.5	6.5	8	10
	10	4.5	6.5	8	10
	15	4.5	6.5	8	10
	20	4.5	6	6.5	6.5
	25	4.5	5.5	6	6.5

Source: Moody's Wall Street Analytics, UBS

Overall, the negative effect of the diverted cash flow and low reinvestment exceeds the positive effect of lower dollar collateral loss, resulting in a higher triple-C bucket hurting the equity tranche.

Shortening WAL with Higher Triple-C Buckets

We showed in our 5/27/08 *CDO Insight* how higher CDRs can *increase* the total return of CLO tranches. Collateral defaults trip over-collateralization triggers, causing cash flow to be redirected to pay down senior tranche principal and shorten those tranches' weighted average lives. Tranches purchased at a discount (and all are, now) earned that discount over a shorter period, increasing their total return. Large triple-C buckets have the same effect.

Exhibit 9 (below) shows the shortening of average life in years when the triple-C bucket increases from 0% to 25%. We show results in the 10% CDR case, where all tranches receive their full principal and coupon. The average lives of the tranches shown decrease 0.6 to 5.6 years when the triple-C bucket increases from 0% to 25%.

Exhibit 9. Decline in WAL as the Caa bucket increases from 0% to 25%, 10% CDR

Tranche	Reinvestment Price %			
	100	95	90	85
Aaa	1.0	1.2	1.8	5.6
Aa1	0.7	0.8	1.1	4.9
Aa2	0.6	0.7	1.1	5.2
A2	0.8	1.0	1.4	5.6

Source: Moody's Wall Street Analytics, UBS

The shortening of WAL is greatest in the 85% reinvestment case. This is because in the 0% triple-C case, the low cost of loans allows CLO tranches to pass their over-collateralization tests more easily, avoid principal pay down, and remain outstanding longer. But when the triple-C bucket is 25%, the tranches fail their OC tests more easily, are prohibited from reinvestment, and the benefit from a low reinvestment cost is negated.

Conclusion

Rising triple-C bucket levels affect CLO tranche cash flows. This is due to the fact that in most CLOs, the haircut associated with the triple-C bucket triggers over-collateralization tests and affects cash flows to the tranches.

We found that increasing the triple-C bucket size affects different debt tranches differently. For the CLO we studied, the senior-most tranche never had a coupon break across any of the different stress scenarios. For the Aa1, Aa2 and A2 tranches, increasing triple-C bucket helped these tranches withstand higher stress. The trend was similar, albeit less pronounced in the Baa2 tranche, as the positive effect of diverted cash flow decreases as we come down the capital structure.

Surprisingly, for the Ba2 tranche also, a rising triple-C bucket helped the tranche withstand more stress. This can be attributed to the fact that as the triple-C bucket grows, the dollar amount of loss in collateral decreases due to low the level of reinvestment of amortizing collateral. The constant default rate is applied to a smaller amount of remaining collateral assets.

Finally, for the equity tranche, an increasing triple-C bucket has multiple effects, but overall the negative effect of the diverted cash flow and low reinvestment exceeds the positive effect of lower collateral dollar loss. Higher triple-C buckets hurt the equity tranche, although perhaps not as much as some would assume.

**We thank
Siddharth Mathur
for his contribution to this article.**

Douglas Lucas, Executive Director, Head of CDO Research

+1-212-713 3440
douglas.lucas@ubs.com

Daniel Newman, Associate Director, CDO / CRE Research

+1-212-713 2207
danny.newman@ubs.com

Analyst Certification

Each research analyst primarily responsible for the content of this research report, in whole or in part, certifies that with respect to each security or issuer that the analyst covered in this report: (1) all of the views expressed accurately reflect his or her personal views about those securities or issuers; and (2) no part of his or her compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by that research analyst in the research report.

Required Disclosures

This report has been prepared by UBS Financial Services Inc., an affiliate of UBS AG (UBS).

For information on the ways in which UBS manages conflicts and maintains independence of its research product; historical performance information; and certain additional disclosures concerning UBS research recommendations, please visit www.ubs.com/disclosures.

Global Disclaimer

This report has been prepared by UBS Financial Services Inc., an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS. In certain countries, UBS AG is referred to as UBS SA.

This report is for distribution only under such circumstances as may be permitted by applicable law. Nothing in this report constitutes a representation that any investment strategy or recommendation contained herein is suitable or appropriate to a recipient's individual circumstances or otherwise constitutes a personal recommendation. It is published solely for information purposes, it does not constitute an advertisement and is not to be construed as a solicitation or an offer to buy or sell any securities or related financial instruments in any jurisdiction. No representation or warranty, either express or implied, is provided in relation to the accuracy, completeness or reliability of the information contained herein, except with respect to information concerning UBS AG, its subsidiaries and affiliates, nor is it intended to be a complete statement or summary of the securities, markets or developments referred to in the report. UBS does not undertake that investors will obtain profits, nor will it share with investors any investment profits nor accept any liability for any investment losses. Investments involve risks and investors should exercise prudence in making their investment decisions. The report should not be regarded by recipients as a substitute for the exercise of their own judgement. Any opinions expressed in this report are subject to change without notice and may differ or be contrary to opinions expressed by other business areas or groups of UBS as a result of using different assumptions and criteria. Research will initiate, update and cease coverage solely at the discretion of UBS Investment Bank Research Management. The analysis contained herein is based on numerous assumptions. Different assumptions could result in materially different results. The analyst(s) responsible for the preparation of this report may interact with trading desk personnel, sales personnel and other constituencies for the purpose of gathering, synthesizing and interpreting market information. UBS is under no obligation to update or keep current the information contained herein. UBS relies on information barriers to control the flow of information contained in one or more areas within UBS, into other areas, units, groups or affiliates of UBS. The compensation of the analyst who prepared this report is determined exclusively by research management and senior management (not including investment banking). Analyst compensation is not based on investment banking revenues, however, compensation may relate to the revenues of UBS Investment Bank as a whole, of which investment banking, sales and trading are a part.

The securities described herein may not be eligible for sale in all jurisdictions or to certain categories of investors. Options, derivative products and futures are not suitable for all investors, and trading in these instruments is considered risky. Mortgage and asset-backed securities may involve a high degree of risk and may be highly volatile in response to fluctuations in interest rates and other market conditions. Past performance is not necessarily indicative of future results. Foreign currency rates of exchange may adversely affect the value, price or income of any security or related instrument mentioned in this report. For investment advice, trade execution or other enquiries, clients should contact their local sales representative. Neither UBS nor any of its affiliates, nor any of UBS' or any of its affiliates, directors, employees or agents accepts any liability for any loss or damage arising out of the use of all or any part of this report. For financial instruments admitted to trading on an EU regulated market: UBS AG, its affiliates or subsidiaries (excluding UBS Securities LLC and/or UBS Capital Markets LP) acts as a market maker or liquidity provider (in accordance with the interpretation of these terms in the UK) in the financial instruments of the issuer save that where the activity of liquidity provider is carried out in accordance with the definition given to it by the laws and regulations of any other EU jurisdictions, such information is separately disclosed in this research report. UBS and its affiliates and employees may have long or short positions, trade as principal and buy and sell in instruments or derivatives identified herein.

United Kingdom and the rest of Europe: Except as otherwise specified herein, this material is communicated by UBS Limited, a subsidiary of UBS AG, to persons who are eligible counterparties or professional clients and is only available to such persons. The information contained herein does not apply to, and should not be relied upon by, retail clients. UBS Limited is authorised and regulated by the Financial Services Authority (FSA). UBS research complies with all the FSA requirements and laws concerning disclosures and these are indicated on the research where applicable. **France:** Prepared by UBS Limited and distributed by UBS Limited and UBS Securities France SA. UBS Securities France S.A. is regulated by the Autorité des Marchés Financiers (AMF). Where an analyst of UBS Securities France S.A. has contributed to this report, the report is also deemed to have been prepared by UBS Securities France S.A. **Germany:** Prepared by UBS Limited and distributed by UBS Limited and UBS Deutschland AG. UBS Deutschland AG is regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin). **Spain:** Prepared by UBS Limited and distributed by UBS Limited and UBS Securities España SV, SA. UBS Securities España SV, SA is regulated by the Comisión Nacional del Mercado de Valores (CNMV). **Turkey:** Prepared by UBS Menkul Degerler AS on behalf of and distributed by UBS Limited. **Russia:** Prepared and distributed by UBS Securities CJSC. **Switzerland:** Distributed by UBS AG to persons who are institutional investors only. **Italy:** Prepared by UBS Limited and distributed by UBS Limited and UBS Italia Sim S.p.A.. UBS Italia Sim S.p.A. is regulated by the Bank of Italy and by the Commissione Nazionale per le Società e la Borsa (CONSOB). Where an analyst of UBS Italia Sim S.p.A. has contributed to this report, the report is also deemed to have been prepared by UBS Italia Sim S.p.A.. **South Africa:** UBS South Africa (Pty) Limited (Registration No. 1995/011140/07) is a member of the JSE Limited, the South African Futures Exchange and the Bond Exchange of South Africa. UBS South Africa (Pty) Limited is an authorised Financial Services Provider. Details of its postal and physical address and a list of its directors are available on request or may be accessed at <http://www.ubs.co.za>. **United States:** Distributed to US persons by either UBS Securities LLC or by UBS Financial Services Inc., subsidiaries of UBS AG; or by a group, subsidiary or affiliate of UBS AG that is not registered as a US broker-dealer (a "non-US affiliate"), to major US institutional investors only. UBS Securities LLC or UBS Financial Services Inc. accepts responsibility for the content of a report prepared by another non-US affiliate when distributed to US persons by UBS Securities LLC or UBS Financial Services Inc. All transactions by a US person in the securities mentioned in this report must be effected through UBS Securities LLC or UBS Financial Services Inc., and not through a non-US affiliate. **Canada:** Distributed by UBS Securities Canada Inc., a subsidiary of UBS AG and a member of the principal Canadian stock exchanges & CIPF. A statement of its financial condition and a list of its directors and senior officers will be provided upon request. **Hong Kong:** Distributed by UBS Securities Asia Limited. **Singapore:** Distributed by UBS Securities Pte. Ltd or UBS AG, Singapore Branch. **Japan:** Distributed by UBS Securities Japan Ltd to institutional investors only. Where this report has been prepared by UBS Securities Japan Ltd, UBS Securities Japan Ltd is the author, publisher and distributor of the report. **Australia:** Distributed by UBS AG (Holder of Australian Financial Services License No. 231087) and UBS Securities Australia Ltd (Holder of Australian Financial Services License No. 231098) only to "Wholesale" clients as defined by s761G of the Corporations Act 2001. **New Zealand:** Distributed by UBS New Zealand Ltd. An investment adviser and investment broker disclosure statement is available on request and free of charge by writing to PO Box 45, Auckland, NZ. **China:** Distributed by UBS Securities Co. Limited. **Portugal:** Prepared by UBS Limited and distributed by UBS Limited and UBS Bank, SA, Sucursal em Portugal. UBS Bank, SA, Sucursal em Portugal, is regulated by Comissão do Mercado de Valores Mobiliários (CMVM). Where an analyst of UBS Bank, SA, Sucursal em Portugal has contributed to this report, the report is also deemed to have been prepared by UBS Bank, SA, Sucursal em Portugal.

The disclosures contained in research reports produced by UBS Limited shall be governed by and construed in accordance with English law.

UBS specifically prohibits the redistribution of this material in whole or in part without the written permission of UBS and UBS accepts no liability whatsoever for the actions of third parties in this respect. © UBS 2008. The key symbol and UBS are among the registered and unregistered trademarks of UBS. All rights reserved.