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BENCHMARKS FOR ASSET SWAPPED PORTFOLIOS

Introduction

Many investors are permitted to take credit positions but are required to match their interest rate exposure to their funding source (say, 3-month LIBOR). For example, some bank and insurance investment managers are required to manage their portfolio to a short duration target for asset-liability management reasons, but are free to exercise their credit skills by selecting assets likely to perform well. In addition, leveraged investors *(e.g.*, hedge funds) often concentrate on credit exposure but minimize interest rate exposure by managing their portfolio duration to that of their 3-month LIBOR funding.

One way these managers can exercise credit selection skills while minimizing term structure exposure is to buy credit product on an "asset swap" basis. Asset swaps are synthetic financial instruments that allow an investor to own a fixed-rate bond (and its credit exposure) and swap the fixed coupons for floating-rate coupons.[1] In essence, asset swaps give an investor the opportunity to take credit exposure with little term structure risk. In the current environment of relatively wide credit spreads (and calls for tightening spreads) and low interest rate levels (and calls for rising rates),[2] asset swaps are poised to become more popular, as they permit an investor to take positions directly targeted to these market views.

A problem for asset swap investors is how to benchmark their performance so that it will potentially recognize their credit selection skill. Presently, there is no index of asset swap performance. Using 3-month LIBOR as a benchmark is inadequate because it reflects only a single credit (*i.e.*, swap spreads) and does not represent the wide array of credit decisions available to the investment manager. To be able to highlight a manager's credit selection skill, the benchmark must represent a "neutral" credit portfolio so that a manager's deviations from neutral have the potential to outperform the benchmark.

A benchmark for asset swapped portfolios would offer a couple of advantages. First, the availability of such a benchmark may make investment managers more willing to engage in asset swaps, as their expertise could now be quantified. Second, the publication of asset swap benchmarks and their performance may attract the attention of senior bank management and plan sponsors who may be more willing to give investment authority for such trades if there is a systematic way to monitor performance.

The purpose of this note is to suggest a way to construct a performance benchmark for investors who buy spread product on an asset swap basis. The recent introduction of the Lehman Swap Indices[3] offers an opportunity to construct a benchmark for asset swappers using information now made available by the swap indices. While the proposed benchmark

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[1] For an introduction to asset swaps, please refer to *Introduction to Asset Swaps*, January 2000.

[2] Jack Malvey, Lehman Brothers *Relative Value Conference*, January 17, 2002.

[3] *The Lehman Brothers Swap Indices*, January 2002.

does not always precisely replicate an asset swapped portfolio, its close approximation and easy construction may entice managers to begin benchmarking the performance of their asset swapped portfolios.

This note proceeds as follows: First, an asset swap is defined and its value and return calculated. Second, we show how the bellwether swap indices can be used to approximate the performance of an asset swap position. Next, we suggest a way to construct a benchmark for an asset swapped portfolio. Finally, we present performance data for various asset swap benchmarks using this methodology.

Asset Swaps

In a typical asset swap, the asset swap buyer buys a bond from the asset swap seller and pays a price of par irrespective of the current full price of the bond. Simultaneously, the asset swap buyer enters into a swap to pay the bond's fixed coupons in return for payments based on LIBOR plus the asset swap spread (A). The swap has the same maturity as the bond. The value of A (a constant) is set so that the net value of the swap plus the bond equals 100. To see this structure more clearly, let

$L_j(t_i)$ = value at time j of 3-month LIBOR set at time i-1;
C = coupon on the fixed-rate bond in the asset swap;
P_0 = full price of the bond at time 0;
A = asset swap spread; and
$z_j(t_i)$ = discount factor from the par swap curve
at time j for cash flow to be received at time i.

At the initiation of the asset swap, the buyer pays 100 in return for the bond plus an interest rate swap wherein the buyer pays the bond's coupon in return for 3-month LIBOR plus the asset swap spread A. Consequently, the value of A is determined by the following equation (assuming, for simplicity, no differences in payment frequencies):

$$100 = P_0 + \sum_{i = 1\ldots N} (L_0(t_i) + A)z_0(t_i) - \sum_{i = 1\ldots N} Cz_0(t_i).$$

If the full market price of the bond at the initiation of the asset swap is par, then the swap portion has no initial value. However, to the extent that the full price of the bond exceeds (is less than) par, the swap must have negative (positive) initial value. If the bond's full price is par ($P_0 = 100$) then the value of A represents the asset's spread over the LIBOR curve and is equivalent to a floating-rate note from the same issuer for the same term. However, if the price is greater than par, then A will be lower to reflect the fact that the asset swapper obtains the bond at a discounted price and pays for this discount with a lower value of A over the life of the swap. If the price of the bond is less than par, then A will be higher to compensate the buyer, over time, for paying an initial premium for the bond.

The asset swap buyer assumes full credit exposure to the bond. If the bond defaults, the asset swap buyer remains responsible for the fixed side of the interest rate swap and suffers to the extent that any recovery is less than par.

Consider the investor buying a bond on an asset swap basis. The initial (time 0) value of his position is

$$V_{A,0} = P_0 + \sum_{i=1\ldots N} (L_0(t_i) + A - C)z_0(t_i) = 100. \quad (1)$$

Assuming that the following relationship holds,

$$[1+ L_j(t_i)/100] = [z_j(t_{i-1})/z_j(t_i)],$$

we can rewrite $V_{A,0}$ as:

$$V_{A,0} = P_0 + (A - C)\sum_{i=1\ldots N} z_0(t_i) + L_0(t_1)z_0(t_1) + 100[z_0(t_1) - z_0(t_N)].$$

The value of the position at time T is:

$$V_{A,T} = P_T + (A - C)\sum_{i=1\ldots N} z_T(t_i) + L_0(t_1)z_T(t_1) + 100[z_T(t_1) - z_T(t_N)].$$

If we define the bond's price as $P_t = \sum_{i=1,N} Cv_t(t_i) + 100v_t(t_N)$, where $v_t(t_i)$ reflects the issuer's discount curve, which is a function of the benchmark (*e.g.*, U.S. Treasury) discount curve and an issuer spread, then the change in the value of the asset swap position is given by

$$\begin{aligned} V_{A,T} - V_{A,0} = {} & \{\sum_{i=1\ldots N} C(\Delta v(t_i) - \Delta z(t_i)) + 100(\Delta v(t_N) - \Delta z(t_N))\} \\ & + \{\sum_{i=1\ldots N} A\Delta z(t_i) + L_0(t_1)\Delta z(t_1) + 100\Delta z(t_1)\}, \end{aligned} \quad (2)$$

where $\Delta z(t_i) = z_T(t_i) - z_0(t_i)$, etc.

The change in the value of the position can be broken into two components. The first component (in brackets) reflects the exposure of the bond's cash flows to movements in the issuer discount curve, $\Delta v(t_i)$, relative to the LIBOR curve $\Delta z(t_i)$. The second component (in brackets) reflects the return on a LIBOR-based floating rate asset. Note that if the bond's spread tightens, holding everything else constant, then the position benefits, and *vice versa*. Note also that the return on the asset swap is not exposed directly to changes in the level of long-term interest rates, but only to relative movements between long issuer discount rates and long LIBOR discount rates. Overall, a bond bought on an asset swap basis gives the investor a position with relatively long spread duration but relatively short interest rate duration.

Using the Lehman Bellwether Swap Indices to Replicate an Asset Swap

The Lehman Brothers *Global Family of Indices* does not yet publish asset swap returns. In the meantime, the idea here is to use published Lehman index data to approximate an asset swap position. Specifically, we replicate an asset swap position by combining a position in the underlying fixed-rate bond with positions in various Lehman bellwether swap indices. We show that such a combination closely replicates an asset swap and can be used to construct asset swap performance benchmarks.

A bellwether swap index is defined as the fixed leg of a par interest rate swap. Consequently, a bellwether par swap index of term N has the following value at time 0:

$$S_0 = \sum_{i=1\ldots N} SR_0(t_N)z_0(t_i) + 100z_0(t_N) = 0, \text{ where}$$

$SR_j(t_N)$ = par swap rate at time j for a par swap of term N.

Suppose an investor pays the full value (P_0) for a bond, goes short the bellwether swap index with the same maturity, and goes long the 3-month bellwether swap index.[4] The initial value, $V_{B+S,0}$, of this bond plus bellwether swap combination position is

$$V_{B+S,0} = P_0 + L_0(t_1)z_0(t_1) + 100z_0(t_1) - \sum_{i=1\ldots N} SR_0(t_N)z_0(t_i) - 100z_0(t_N). \quad (3)$$

The difference between the initial value of the asset swap, $V_{A,0}$, and the bond plus bellwether swap combination, $V_{B+S,0}$, is given by

$$D_0 = V_{A,0} - V_{B+S,0} = \sum_{i=1\ldots N} (A - C + SR_0(t_N))z_0(t_i).$$

In the special case that $P_0 = 100$, it can be shown that $D_0 = 0$. In general, however, the difference D_0 is relatively small. A – C reflects the (negative) term LIBOR curve (adjusted for the difference between 100 and P_0) at the initiation of the asset swap. The term $SR_0(t_N)$ also reflects the term LIBOR curve at the initiation of the asset swap. Consequently, the difference between (A – C) and $SR_0(t_N)$ is likely to be relatively small. At time T, the difference in value of the asset swap and the bond plus swap combination is

$$D_T = V_{A,T} - V_{B+S,T} = \sum_{i=1\ldots N} (A - C + SR_0(t_N))z_T(t_i).$$

The change in the value difference is given by

$$\Delta D = \sum_{i=1\ldots N} (A - C + SR_0(t_N))\Delta z(t_i), \quad (4)$$

which is likely to remain small, as it reflects the change in the present value of the difference between 100 and P_0 at the initiation of the asset swap. Consequently, we approximate an asset swap as a combination of the bond plus two swap indices. This is how we propose to construct performance benchmarks for asset swapped portfolios.

Construction of an Asset Swap Performance Benchmark

Because the asset swap buyer assumes the credit exposure of the bond he asset swaps, a performance benchmark must be able to recognize his credit selection skill. If the investor were not required to have term structure exposure equal to that of, say, 3-month LIBOR, the asset swapper's natural benchmark would be a traditional index for the class of fixed-income

[4] The bellwether swap indices are constructed to look like a fixed-rate bond by adding a 3-month LIBOR investment to offset the floating-rate leg of a par interest rate swap. Here, to transform the asset swap investor's position from fixed rate to floating, we have to subtract the 3-month LIBOR investment from the N-maturity bellwether swap index.

spread product that he normally buys. Consequently, the index of the investor's normal asset class (*e.g.*, the Lehman Credit Index) must be a component of the asset swap performance benchmark. However, the fixed-rate bond index alone would be inappropriate for the asset swapper who chooses to assume only the risk of 3-month LIBOR plus the spread over LIBOR. Ideally, his benchmark would be an index of all bonds in the index held on an asset swapped basis. For example, if a manager can asset swap any bond in the Intermediate Lehman Credit Index, then a neutral position would be for the manager to asset swap all bonds in the index. The comparison of the actual asset swapped portfolio with this benchmark would reflect credit (and sector) selection skill.

Theoretically, we could construct a bond plus bellwether swap combination for each bond in the index and then weight each combination by the bond's market value in the index. However, to simplify the exercise, we make use of the Lehman Mirror Swap Indices.

The Mirror Swap Indices are portfolios of six bellwether swap indices plus cash.[5] The mirror portfolio weights are chosen so that the mirror swap index has the same key rate duration profile as the index it is trying to mirror. For example, Figure 1 shows the weights for the component bellwether swap indices in the December 2001 mirror swap index for the Lehman Intermediate Credit Index.

Mirror swap indices can be constructed for any standard Lehman or custom fixed-rate index.

To construct a performance benchmark for asset swaps, we create a custom index combining the appropriate fixed-income index, a short position in the index's mirror swap index, and a long position in the 3-month bellwether swap index:

asset swap performance benchmark =
  fixed-rate bond index
– index's mirror swap index
+ 3-month bellwether swap index.

[5] For details, please refer to *The Lehman Brothers Swap Indices.*

Figure 1. **Mirror Swap Index for the Intermediate Credit Index**
December 2001

Bellwether Swap Index	Weight
0.5-Year	15%
2-Year	38
5-Year	42
10-Year	19
20-Year	0
30-Year	0
Cash	-15
	100

For example, suppose the asset swapper can buy any A-rated or better corporate bond in the Lehman U.S. Credit Index on an asset swapped basis. In this case, his asset swap performance benchmark is defined as:

Credit Index (A-rated or better)
– mirror swap index for this index
+ 3-month bellwether swap index.

Instead of the 3-month bellwether swap index, the investor could substitute another short-term asset (*e.g.,* 1-month LIBOR) as the long position. This might be appropriate if the investor has a different funding requirement than 3-month LIBOR.

Figure 2 presents monthly asset swap benchmark performance numbers for various fixed-rate bond classes that are often bought on an asset swapped basis.

These performance numbers highlight the credit exposure of asset swaps as they performed poorly during the September 2001 credit spread widening. However, they rebounded substantially in November-December 2001 as credit spreads tightened even though interest rates rose substantially.

Asset swap performance indices can also be customized to suit a portfolio manager's investment guidelines. For example, if a manager can hold half the portfolio in A-rated intermediate corporates and the other half in AAA-rated CMBS, then the two asset swap performance indices can be weighted accordingly and combined to produce an asset swap benchmark directly relevant for the manager.

Conclusion

A large number of investors have authority to take views on the spread markets but must match a short duration target (usually 3-month LIBOR). Unfortunately, there is no performance benchmark available for these investors that would highlight their portfolio management skills. The lack of a performance benchmark also hinders expansion of asset swap activity, as supervisors and plan sponsors have difficulty objectively evaluating the performance of their asset swap investment managers.

The recent introduction of the swap indices has made Lehman's Global Family of Indices potentially relevant to a new class of investors who buy spread product on an asset swapped basis. We suggest in this note that the traditional fixed-income indices can be combined with the new swap indices to produce an appropriate asset swap performance benchmark.

Figure 2. **Various Asset Swap Performance Benchmarks**
Monthly Performance, January 2001-December 2001

	Intermediate Credit				Intermediate Corp BBB			
	Fixed-Rate Index Return	- Mirror Swap Index Return	+ 3-Month Bellwether Swap Index Return	= Synthetic Asset Swap Performance Index Return	Fixed-Rate Index Return	- Mirror Swap Index Return	+ 3-Month Bellwether Swap Index Return	= Synthetic Asset Swap Performance Index Return
Jan-01	2.12	1.95	0.68	0.85	2.35	1.97	0.68	1.06
Feb-01	0.98	1.08	0.48	0.39	1.06	1.10	0.48	0.44
Mar-01	0.83	0.68	0.45	0.59	0.78	0.66	0.45	0.57
Apr-01	-0.19	-0.30	0.48	0.59	-0.34	-0.37	0.48	0.51
May-01	0.76	0.50	0.42	0.69	0.75	0.47	0.42	0.70
Jun-01	0.44	0.09	0.36	0.72	0.52	0.06	0.36	0.82
Jul-01	2.34	2.52	0.35	0.17	2.57	2.67	0.35	0.25
Aug-01	1.14	1.23	0.35	0.27	1.13	1.29	0.35	0.19
Sep-01	0.62	2.84	0.44	-1.77	-0.37	2.96	0.44	-2.89
Oct-01	1.78	1.84	0.26	0.20	1.82	1.94	0.26	0.14
Nov-01	-0.77	-1.69	0.19	1.11	-1.12	-1.88	0.19	0.96
Dec-01	-0.64	-0.80	0.19	0.35	-0.78	-0.93	0.19	0.35

	High Yield BB				ABS			
	Fixed-Rate Index Return	- Mirror Swap Index Return	+ 3-Month Bellwether Swap Index Return	= Synthetic Asset Swap Performance Index Return	Fixed-Rate Index Return	- Mirror Swap Index Return	+ 3-Month Bellwether Swap Index Return	= Synthetic Asset Swap Performance Index Return
Jan-01	3.83	1.97	0.68	2.54	1.66	1.80	0.68	0.54
Feb-01	1.52	1.15	0.48	0.85	0.98	0.95	0.48	0.52
Mar-01	0.39	0.59	0.45	0.25	0.64	0.73	0.45	0.35
Apr-01	1.02	-0.46	0.48	1.96	0.08	-0.01	0.48	0.56
May-01	1.78	0.47	0.42	1.73	0.68	0.56	0.42	0.54
Jun-01	-0.48	0.05	0.36	-0.18	0.32	0.20	0.36	0.48
Jul-01	1.69	2.76	0.35	-0.72	1.97	2.00	0.35	0.32
Aug-01	1.35	1.34	0.35	0.36	1.13	1.04	0.35	0.44
Sep-01	-4.95	2.92	0.44	-7.43	1.99	2.39	0.44	0.04
Oct-01	2.71	2.02	0.26	0.95	1.41	1.59	0.26	0.08
Nov-01	2.90	-1.96	0.19	5.05	-1.03	-1.19	0.19	0.36
Dec-01	-0.18	-0.94	0.19	0.96	-0.38	-0.43	0.19	0.24

	CMBS				MBS			
	Fixed-Rate Index Return	- Mirror Swap Index Return	+ 3-Month Bellwether Swap Index Return	= Synthetic Asset Swap Performance Index Return	Fixed-Rate Index Return	- Mirror Swap Index Return	+ 3-Month Bellwether Swap Index Return	= Synthetic Asset Swap Performance Index Return
Jan-01	1.70	2.10	0.68	0.28	1.56	1.75	0.68	0.49
Feb-01	1.15	1.28	0.48	0.36	0.57	0.89	0.48	0.16
Mar-01	0.28	0.55	0.45	0.18	0.58	0.70	0.45	0.33
Apr-01	-0.26	-0.67	0.48	0.89	0.14	0.08	0.48	0.54
May-01	0.43	0.41	0.42	0.45	0.66	0.56	0.42	0.52
Jun-01	0.11	-0.04	0.36	0.51	0.21	0.20	0.36	0.37
Jul-01	2.80	3.06	0.35	0.08	1.78	2.14	0.35	-0.01
Aug-01	1.57	1.44	0.35	0.48	0.88	0.99	0.35	0.24
Sep-01	1.95	3.30	0.44	-0.91	1.50	2.17	0.44	-0.23
Oct-01	2.02	2.13	0.26	0.15	1.38	1.34	0.26	0.30
Nov-01	-1.76	-2.26	0.19	0.70	-0.92	-0.28	0.19	-0.45
Dec-01	-0.79	-1.17	0.19	0.58	-0.38	-0.34	0.19	0.15

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