

## Products Series

# Volume 2: SIFMA/LIBOR Basis Swaps

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**Overview** The term “basis swap” typically refers to a derivative contract whereby two floating indices are exchanged between two counterparties. The contract functions as a floating-floating interest rate swap under which the bases of the two indices differ. As with most derivatives, basis swaps are commonly used for a variety of purposes by a broad number of end users and can include any number of indices. This volume will focus specifically on two indices: SIFMA and LIBOR.

**What is SIFMA?** SIFMA – as it’s used in this volume – stands for the [Securities Industry and Financial Markets Association Municipal Swap Index](#). It is a 7-day high-grade market index comprised of tax-exempt Variable Rate Demand Obligations (VRDOs)<sup>1</sup>. Calculated from hundreds of VRDOs that are aggregated and averaged using strict criteria, SIFMA is the industry standard, short-term, tax-exempt financing benchmark rate.

The buyers of short term tax-exempt paper (i.e. – VRDOs) do not pay federal taxes on the interest income received from these securities. As such, investors are willing to accept a lower rate than they would require on short term taxable paper. Just as LIBOR (the “London Interbank Offered Rate”) is the most common measure of short-term taxable rates, SIFMA is the most common measure of short-term tax-exempt rates. As shown in Figure 1 below, 65% of three month LIBOR has been a relatively good proxy for the SIFMA index over the past 25 years.

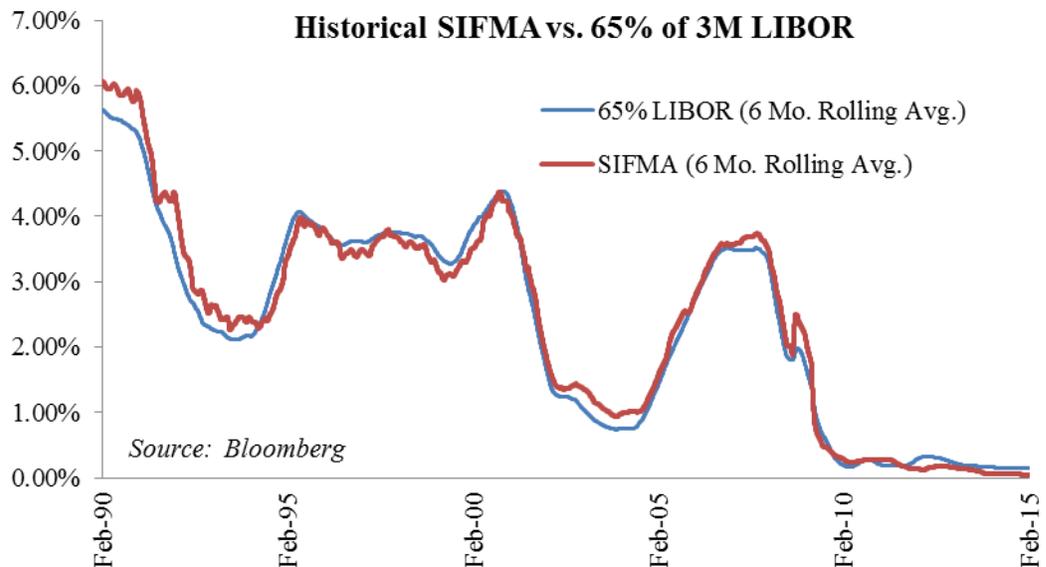


Figure 1: SIFMA versus LIBOR

<sup>1</sup> “About the Municipal Swap Index”. <http://www.sifma.org>. Securities Industry and Financial Markets Association, 9 Feb. 2015. Web.

## How the Basis Swap Works

Historically, basis swaps have been popular among large issuers of tax-exempt interest rate swaps and debt to alter their risk profile. They have also been used by taxpaying entities as a partial hedge against increasing tax rates. While these rationales will be covered later in this volume, this section will focus on a compelling reason for all borrowers: **cashflow**.

### Taxable versus Tax-exempt Swap Curve

Figure 2 below shows the tax-exempt swap curve (SIFMA swaps) versus 65% of the taxable swap curve (LIBOR swaps). Moving along the x-axis increasing the term of the swap from 3 months to 30 years, the tax-exempt curve “cheapens” relative to the taxable curve. In other words, the tax-exempt yield curve is steeper than the taxable curve.

At the front end of the curve (years 1 – 5), the ratio of SIFMA to LIBOR is very close to 65%. As shown earlier, this makes sense given that i) buyers of short-term tax-exempt paper – upon which SIFMA is based – do not pay taxes on the income and ii) today’s top marginal tax rate is 39.6%. At the long end of the curve, the 30 year ratio of SIFMA to LIBOR is 92% today. This implies that the market believes the top tax bracket 30 years from now will be approximately 8%.

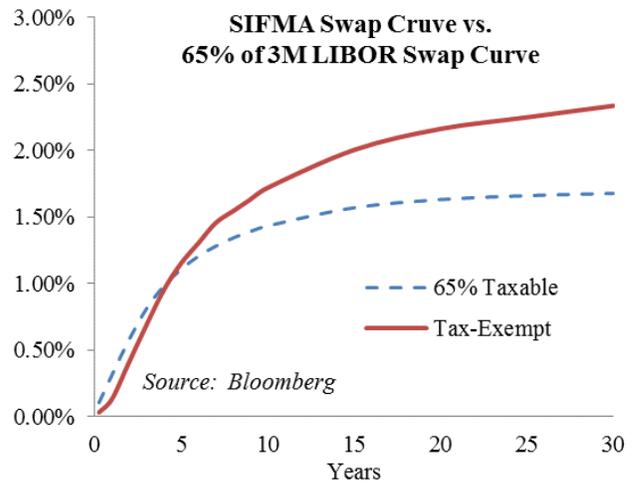


Figure 2: SIFMA versus 65% LIBOR Swap Curves

As shown in Figure 3, the top marginal tax rate in the United States over the past 100 years has seldom been lower than today, but it is beginning to rise. This evidence makes the markets’ implication for extremely low tax rates in the future unlikely.

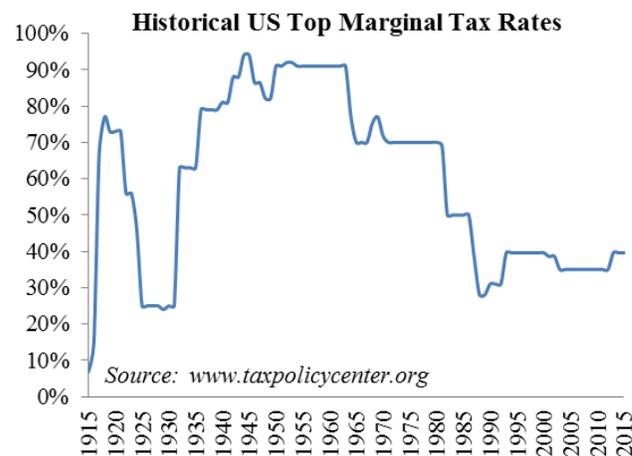


Figure 3: Top Marginal Tax Rates

**Mechanics: Taking Advantage of the Relative Steepness of the Tax-Exempt Curve**

As outlined in Figure 4 below, a borrower can take advantage of this apparent tax-exempt yield curve discrepancy by entering into two offsetting swaps (spoiler alert, this IS a basis swap):

**Swap 1:** Receive fixed, pay float. Borrower receives the higher tax-exempt fixed rate for 30 years and pays the SIFMA index.

**Swap 2:** Pay fixed, receive float. Borrower pays the lower 65% of taxable fixed rate for 30 years and receives 65% of 3 Month LIBOR.

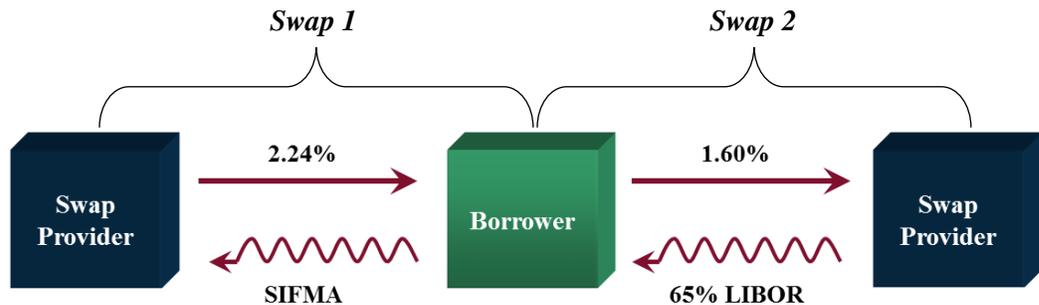


Figure 4: Offsetting Swaps

When the above diagram is simplified similar to a mathematical equation, the result is a basis swap (illustrated by Figure 5 below). The borrower pays SIFMA, receives 65% of 3 Month LIBOR, and also receives a net fixed spread of 0.64%. Assuming SIFMA averages 65% of 3 Month LIBOR over the next 30 years, the borrower will receive a 64 basis point (0.64%) annuity during this time.

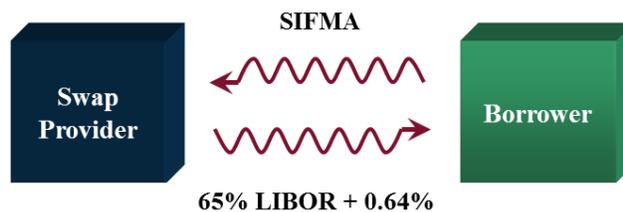


Figure 5: Basis Swap

It is worth noting that the pricing above assumes the borrower enters into a 30 year basis swap. Few borrowers are comfortable with entering into swaps of this tenor. The spread on a 15 year basis swap would be 0.43% and the spread on a 10 year basis swap would be 0.29% as of today.

**Benefits** As mentioned earlier, there are motivations by both tax-exempt and taxable borrowers to enter into SIFMA/LIBOR basis swaps.

**Savings: 30 Year Basis Swap**

The savings associated with basis swaps are predicated upon the assumption that short-term tax-exempt rates will maintain their historical relationship to short-term taxable rates. While this relationship has not been completely static, it has been relatively stable over the past 25 years. Figure 6 shows the historical savings generated from a 30 year basis swap priced at 65% of LIBOR + 0.64%. The best year would have produced 90 basis points (0.90%) of savings while the worst year would have produced 11 basis points (0.11%) of savings. During this time, 65% of 3 month LIBOR has exceeded the SIFMA index 98.6% of the time.

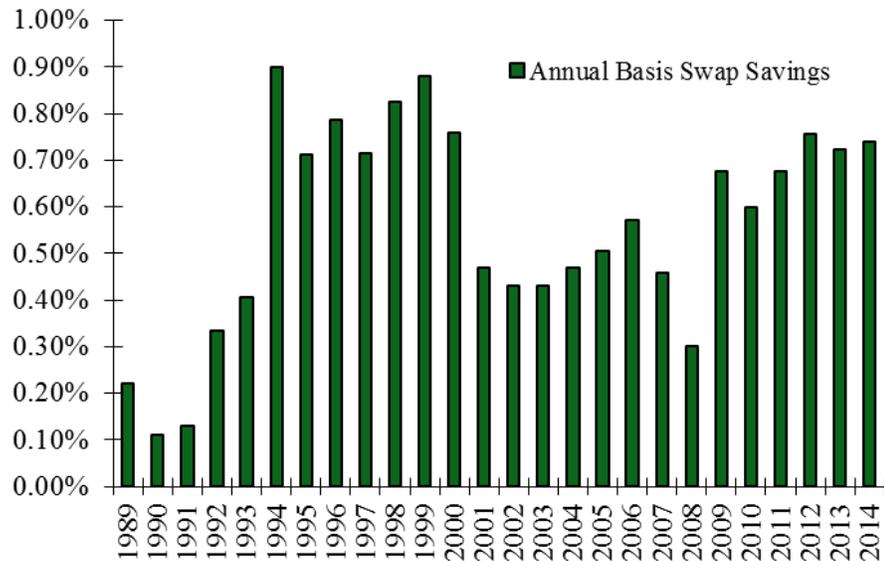


Figure 6: Historical Savings 30 Year Basis Swap

**Savings: 10 Year Basis Swap**

Figure 7 shows the historical savings generated from a 10 year basis swap priced at 65% of LIBOR + 0.29%. The best year would have produced 55 basis points (0.55%) of savings while the worst year would have produced -24 basis points (-0.24%) of savings. During this time, 65% of 3 month LIBOR has exceeded the SIFMA index 81.3% of the time. During the past 10 years, the basis swap would have produced 1 year of negative savings (2008).

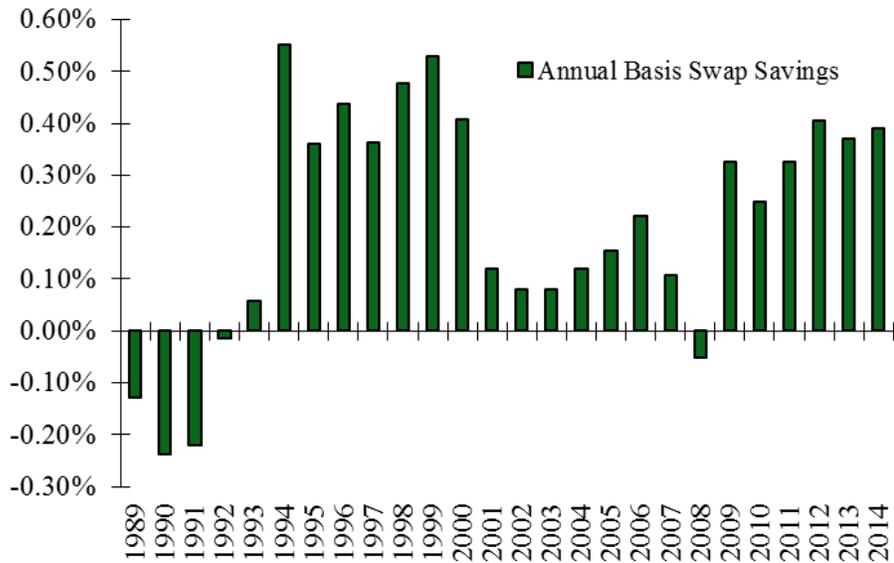


Figure 7: Historical Savings 10 Year Basis Swap

**Diversification**

Basis swaps can be used to diversify an existing debt/swap portfolio. Figure 8 below shows a risk horizon for a tax-exempt borrower. The left side of the horizon represents a tax-exempt, fixed rate bond while the right size represents a tax-exempt, variable rate bond. As a borrower moves from left to right on the horizon the number of risks inherent in the debt increases while the yield decreases<sup>2</sup>. The basis swap, as will be seen in the next section, adds tax and basis risk in return for immediate – and potentially long-term – savings.



Figure 8: Risk Horizon

<sup>2</sup> This does not hold true when the yield curve is flat or inverted.

Viewed in this light, the basis swap is a way for a borrower to add component risks of a variable rate debt strategy without directly taking on the risk of rising interest rates.

There is another clever way to prove that a basis swap is part of a variable rate debt strategy. By reducing the ratio on the 30 year basis swap (pay SIFMA, receive 65% of LIBOR + 0.64%) from 65% down to 0%, an interesting thing happens:

Borrower Pays Index 1	Borrower Receives Index 2	Borrower Receives Spread
SIFMA	65% LIBOR	0.64%
SIFMA	60% LIBOR	0.76%
SIFMA	55% LIBOR	0.89%
SIFMA	50% LIBOR	1.01%
SIFMA	45% LIBOR	1.13%
SIFMA	40% LIBOR	1.26%
SIFMA	35% LIBOR	1.38%
SIFMA	30% LIBOR	1.50%
SIFMA	25% LIBOR	1.63%
SIFMA	20% LIBOR	1.75%
SIFMA	15% LIBOR	1.87%
SIFMA	10% LIBOR	1.99%
SIFMA	5% LIBOR	2.12%
SIFMA	0% LIBOR	2.24%

Figure 9: Decreasing Ratios

As the ratio on the taxable index approaches 0, the spread the borrower receives approaches the 30 year fixed SIFMA swap rate. Because 0% of LIBOR is always 0.00%, this structure is illustrated by Swap 1 in Figure 4: Receive fixed (2.24%), pay float (SIFMA).

**Tax Hedge**

As top marginal tax rates increase, it stands to reason that the yield on short-term tax-exempt debt decreases relative to taxable debt thus removing any arbitrage. In such an event, SIFMA would trade at a correspondingly lower percentage of LIBOR and the cashflow under the basis swap would move in the borrower’s favor. How does the math work? If SIFMA trades at 60% of LIBOR because of a higher marginal tax rate, then the borrower would pay 60% of LIBOR and receive 65% of LIBOR + 0.64%. The higher the marginal tax rate, the lower the ratio of SIFMA to LIBOR, and the better cashflow the basis swap produces.

**Risks** As with any financial contract, there are certain risks associated with basis swaps. The list below represents the most common risks.

### Termination Risk

If the basis swap is structured properly, borrowers should have the right to voluntarily terminate the swap at their discretion. However, there are certain provisions – Termination Events, Events of Default – within the governing swap documents that may force a borrower to terminate earlier than they may desire. If these events are triggered and the mark-to-market of the basis swap becomes a potential liability to the borrower, the borrower will be required to make a termination payment that they otherwise did not expect to make.

### Counterparty Risk

If a swap provider defaults on its obligation under a basis swap or no longer participates in the swap market (i.e. – Lehman Brothers), the borrower may be required to terminate the swap or assign it to another swap provider at a less advantageous basis.

### Collateral Posting and Margin Calls

If a borrower elects to post collateral pursuant to a Credit Support Annex (“CSA”) in order to credit enhance a basis swap, large swings in the valuation of the basis swap against the borrower will require more and more collateral to be posted. Borrowers that are not well capitalized may experience unforeseen financial strain in these situations.

### Tax/Basis Risk

A decrease in marginal tax rates will theoretically put upward pressure on tax-exempt rates relative to taxable rates (i.e. – SIFMA/LIBOR ratios). As taxes approach 0%, tax-exempt rates approach 100% of taxable rates. In such a scenario, the cashflow under a basis swap will decrease<sup>3</sup>.

Similarly, other factors may exist such that the index the borrower receives does not fully offset the index it pays. This “basis risk” can be caused by factors such as yield compression<sup>4</sup> as well as a supply/demand mismatch in the market for tax-exempt VRDOs. This was witnessed in a brief period in 2008 as well as 2009 when liquidity in all capital markets dried up and the demand for tax-exempt VRDOs dropped dramatically. Basis swaps that take advantage of a rolling six month average index are less exposed to such temporary dislocations in the market.

<sup>3</sup> In a scenario where SIFMA = 100% of LIBOR, a 30 year basis swap priced at 65% of LIBOR + 0.64% would produce positive cashflows as long as LIBOR remains below 1.82%.

<sup>4</sup> As interest rates approach 0%, SIFMA/LIBOR ratios have historically increased. At such depressed interest rate levels, there is very little benefit to the tax-exemption. It is worth noting however, that as of February 19, 2015 SIFMA is 0.02% while 3 Month LIBOR is 0.26%. This is a ratio of 7%. Source: Bloomberg.

While basis risk has been present in the past, over long periods of time this risk diminishes based on averages as financial markets recover. The charts below are designed to explore the historical and potential sensitivity of cashflows for a basis swap based on the pricing outlined earlier: Borrower pays SIFMA and receives 65% of LIBOR + 0.64%.

Figure 10 to the right illustrates the historical relationship between SIFMA and 3 Month LIBOR over the past six months, one year, five years, ten years, and twenty years. Each row is color coded and can be matched with its corresponding place on the cumulative cashflow chart (Figure 11). As outlined in Figure 1 previously, 65% of 3 Month LIBOR has been a relatively good proxy for SIFMA over the past 20 years.

	Ratio	SIFMA	3M LIBOR
6 Mo.	15.7%	0.04%	0.24%
1 Yr	21.0%	0.05%	0.24%
5 Yr	45.6%	0.15%	0.32%
10 Yr	67.0%	1.27%	1.90%
20 Yr	65.7%	2.03%	3.09%

Figure 10: Historic Interest Rates and Ratios

Figure 11 shows what the present value savings would have been on the 30 year basis when back-tested in various interest rate environments. There are two values within each cell. The top number represents the present value of all cashflows from the basis swap assuming a \$10 million notional. The bottom number represents this present value number as a percentage of the notional. A handful of the cells are color coded to indicate averages outlined above in Figure 10. Focusing on the 20 year average of SIFMA and 3 Month LIBOR, Figure 11 can be interpreted as follows:

If 3 Month LIBOR (x-axis) averages 3.09% and SIFMA averages 65% of 3 Month LIBOR (y-axis) for the term of the 30 year basis swap, then \$1,392,256 (or 13.92% of notional) in present value savings would be achieved for every \$10 million in notional.

This chart shows that applying any historical average rate environment to the basis swap will produce significant cashflow.

		Average Three Month LIBOR Rate Over Life of Basis Swap						
		0.24%	0.32%	1.00%	1.90%	3.09%	4.00%	5.00%
Average SIFMA/LIBOR Ratio Over Life of Basis Swap	16%	1,644,956 16.45%	1,738,101 17.38%	2,464,634 24.65%	3,430,805 34.31%	4,707,170 47.07%	5,681,766 56.82%	6,754,144 67.54%
	21%	1,617,701 16.18%	1,700,799 17.01%	2,348,970 23.49%	3,210,933 32.11%	4,349,633 43.50%	5,219,112 52.19%	6,175,826 61.76%
	46%	1,491,766 14.92%	1,528,446 15.28%	1,814,546 18.15%	2,195,013 21.95%	2,697,630 26.98%	3,081,415 30.81%	3,503,705 35.04%
	65%	1,392,256 13.92%	1,392,256 13.92%	1,392,256 13.92%	1,392,256 13.92%	1,392,256 13.92%	1,392,256 13.92%	1,392,256 13.92%
	67%	1,382,092 13.82%	1,378,346 13.78%	1,349,125 13.49%	1,310,266 13.10%	1,258,931 12.59%	1,219,733 12.20%	1,176,603 11.77%
	80%	1,315,363 13.15%	1,287,020 12.87%	1,065,946 10.66%	771,953 7.72%	383,572 3.84%	87,016 0.87%	-239,294 -2.39%

Figure 11: Historic Returns 30 Year Basis Swap

For comparison purposes, Figure 12 shows what the present value savings would have been on the 10 year basis when back-tested in various interest rate environments.

Focusing on the 20 year average of SIFMA and 3 Month LIBOR, Figure 12 can be interpreted as follows:

If 3 Month LIBOR (x-axis) averages 3.09% and SIFMA averages 65% of 3 Month LIBOR (y-axis) for the term of the 10 year basis swap, then \$271,005 (or 2.71% of notional) in present value savings would be achieved for every \$10 million in notional.

		Average Three Month LIBOR Rate Over Life of Basis Swap						
		0.24%	0.32%	1.00%	1.90%	3.09%	4.00%	5.00%
Average SIFMA/LIBOR Ratio Over Life of Basis Swap	16%	379,559 3.80%	419,572 4.20%	731,673 7.32%	1,146,717 11.47%	1,695,013 16.95%	2,113,676 21.14%	2,574,344 25.74%
	21%	367,851 3.68%	403,548 4.04%	681,987 6.82%	1,052,265 10.52%	1,541,424 15.41%	1,914,931 19.15%	2,325,913 23.26%
	46%	313,752 3.14%	329,509 3.30%	452,411 4.52%	615,850 6.16%	831,763 8.32%	996,627 9.97%	1,178,033 11.78%
	65%	271,005 2.71%	271,005 2.71%	271,005 2.71%	271,005 2.71%	271,005 2.71%	271,005 2.71%	271,005 2.71%
	67%	266,639 2.67%	265,030 2.65%	252,477 2.52%	235,784 2.36%	213,732 2.14%	196,893 1.97%	178,365 1.78%
	80%	237,973 2.38%	225,798 2.26%	130,830 1.31%	4,538 0.05%	-162,301 -1.62%	-289,695 -2.90%	-429,870 -4.30%

Figure 12: Historic Returns 10 Year Basis Swap

**Summary** Basis swaps can be used by a variety of borrowers and investors to change the makeup of their interest rate risk profiles. An end user can enter into a basis swap for one of several reasons:

- Immediate cashflow savings
- Potential long-term cashflow savings
- Debt (or asset) portfolio diversity
- A partial hedge against increasing tax rates

The relative steepness in the tax-exempt yield curve versus the taxable yield curve has created opportunities for many end users. Historically, basis swaps have provided a method with which end users can take advantage of this discrepancy to create value. However, they are not entirely without risk. When not structured or documented appropriately, basis swaps can backfire.

End users that anticipate using basis swaps and other derivatives as a risk management tool should fully understand the mechanics, benefits, and risk of these products and consider hiring a swap consultant that is well versed in structuring, pricing, documenting, and executing these opaque products.

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