CME Group

INTEREST RATES

Understanding MAC Swap Futures

FEBRUARY 1, 2013

Financial Research & Product Development

Volatile conditions in the capital market have proven quite challenging for asset managers in recent years. We continue to deal with the fallout of the subprime mortgage crisis that has witnessed the failure of several venerable financial services firms and compelled the Fed to push both short- and long-term interest rates to historic lows.

Throughout this period of turbulence, CME Group has continued to offer risk management solutions for investors and asset managers. The Dodd Frank financial reform legislation has been a significant driving force in the OTC swap markets, calling for greater transparency and financial sureties. Deliverable USD Interest Rate Swap Futures (DSF) answers that call and represents an important new addition to CME's product line of risk management tools.

DSF contracts are intended to provide a liquid means of managing rate exposure, offering the opportunity to trade actual interest rate swaps on a forward basis with the financial protections attendant to a standard futures contract. Unlike previously listed cash-settled interest rate swap futures, DSF contracts provide for the delivery of "plain-vanilla" interest rate swaps ("IRS" or "swaps") carried by the CME Clearing House.

As such, DSFs blend the advantages of trading both futures and over-the-counter (OTC) derivative instruments in a consolidated package. These instruments provide new opportunities for asset managers to address the risks attendant to the IRS markets and other fixed income securities.

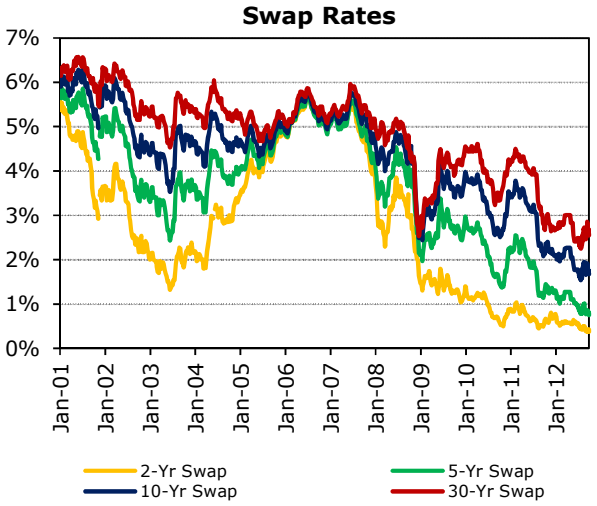
This document is intended to review how DSF contracts are constructed and how they may be applied to a number of risk management issues. In particular, we explore use of DSF contracts to hedge a spot IRS instrument; a cash Treasury security; and, a spread vs. Treasury futures.

Deliverable Swap Futures

DSF contracts call for the delivery of an interest rate swap instrument through the facilities of the CME Clearing House. These delivered swaps are structured using very standardized or plain-vanilla terms and conditions.

Specifically, DSF contracts call for the delivery of an IRS denominated in U.S. dollars (USD). Separate contracts are listed that call for the delivery of a 2-, 5-, 10- and 30-year term swaps with a notional value of $100,000. Contracts are listed in each tenor that are associated with a specific fixed rate or coupon that approximates current market rates, *e.g.,* 0.5%, 1.0%, 1.5%, 2.0%, etc.

DSFs are listed for expiration on a quarterly basis concluding on the Monday preceding the 3rd Wednesday of the contract months of March, June, September and December. This corresponds with the normal expiration cycle of CME Eurodollar futures contracts.



DSF contracts are quoted as 100% of par plus the Non-Par Value (NPV) of the swap to-be-delivered, in percent of par. Note that the NPV of a swap may be positive or negative contingent upon the relationship between prevailing swap rates and the fixed rate or coupon associated with the swap. Thus, DSF contracts may be quoted as either above or below 100% of par, *e.g.,* 101%, 98%, etc. [1]

The minimum allowable price fluctuation or tick size for the 30-year contract equals 1/32nd of 1% of par

[1] This quote convention assures that quotes will be displayed as positive numbers. As an alternative, the Exchange could have adopted the convention of quoting the contract simply by reference to the Non-Par Value (NPV) of the underlying swap. This convention might be consistent with prevailing OTC market practices but could possibly create confusion or difficulties with quotation or bookkeeping systems that are sometimes programmed to reject negative numbers as erroneous.

or $31.25, based on a $100,000 face value contract ($31.25 = 1/32nd of 1% of $100,000). The tick sizefor 10- and 5-year contracts is established at one-half of 1/32nd or $15.625 per contract. The tick size for the 2-year contract is one-quarter of 1/32nd or $7.8125 per contract.

Upon delivery of an actual swap in satisfaction of a maturing contract, an invoice amount is paid from long to short; or, from short to long, as appropriate. This cash adjustment reflects the NPV of the underlying swap as reflected in the futures settlement price on the final trading day of the DSF contract.

DSF contracts utilize the convention of referring to the buyer of Swap futures (or "long") as the receiver of the fixed rate (payer of floating rates) upon delivery of the underlying Swap. Likewise, the seller (or "short") is the payer of the fixed rate (receiver of floating rates) upon delivery.

Reference Conventions

Swap Futures	Delivered or Actual Swap
Buyer (Long)	Fixed Rate Receiver (Floating Rate Payer)
Seller (Short)	Fixed Rate Payer (Floating Rate Receiver)

Thus, if NPV>0 upon delivery, the long will pay cash to the account of the short. If NPV<0 upon delivery, the short will pay cash to the account of the long.

A summary of DSF contract terms and conditions may be referenced in the appendix to this document.

Delivered Swap

The Exchange lists separate DSF contracts that call for the delivery of 2-, 5-, 10- and 30-year term swap instruments. These swaps delivered in satisfaction of an expiring futures contract are configured as a swap between quarterly floating rate payments vs. semi-annual fixed rate payments.

The fixed rate payment dates correspond to semi-annual anniversaries of the IRS Effective Rate on 30/360 day count convention. The floating rate payment dates correspond to quarterly anniversaries of the IRS Effective rate on a Actual/360 day count convention. [2] They are denominated in U.S. dollars (USD) and administered by the CME Clearing House.

The floating rate associated with the delivered swap is tied to the ICE Benchmark Administration Limited (ICE) LIBOR fixings. This fixing is a popular benchmark against which myriad interest rate products, including CME Eurodollar futures, routinely are pegged. Because of the significance of the ICE LIBOR fixing rate, so-called "ICE LIBOR Swaps" are frequently traded in the over-the-counter (OTC) markets.

The Exchange lists DSF contracts that call for the delivery of swaps with a fixed rate or coupon. These coupon levels will be established at integral multiples of 25 basis points to approximate prevailing swap rates. As market conditions fluctuate over time, the Exchange may list additional coupons at its discretion.

E.g., if OTC swaps are trading at 1.42%, the Exchange may list a DSF contract with a coupon of 1.5%.

Futures Quote Convention

To understand the DSF quote convention, it may be useful to review the NPV concept. In short, the NPV of an OTC swap represents the present value (PV) of the series of fixed rate payments associated with the hypothetical IRS minus the PV of the floating rate payments.

Floating rate payments are sometimes estimated by reference to the shape of the yield curve. CME Eurodollar futures contracts sometimes serve as a reasonable estimate for future yield levels insofar as they are listed some 10 years into the future. The marketplace frequently references the Overnight Interest Swap (OIS) curve to discount floating and fixed rate payments.

One may apply some simple algebra to calculate the value of the future stream of fixed rate payments by

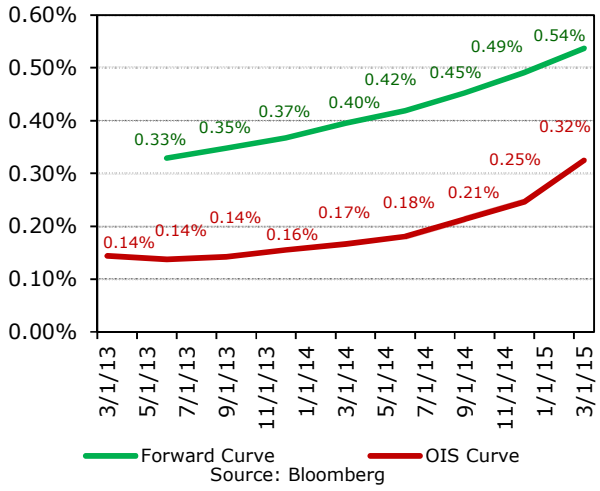
[2] Swaps that reset on dates corresponding to the dates on which quarterly Eurodollar futures contracts expire are often referred to as a "IMM-dated" swaps. Note that IRS instruments delivered vs. DSF are *not* IMM-dated swaps. However, the IRS Effective Date or futures Delivery Date does fall on an IMM date.

reference to the fixed coupon associated with the Swap futures contract, discounted to their PV. Similarly, one may calculate the value of the estimated future stream of floating rate payments discounted to their PV as well. A comparison of the PV of the two payment streams represents the NPV of the swap.

$$Non\ Par\ Value\ = PV(Fixed\ Rate\ Payments) - PV(Floating\ Rate\ Payments)$$

E.g., let's calculate the NPV of a 2-year IRS with a coupon of 0.5% as of November 27, 2012. For these purposes, we might assume that the floating rate payments may be estimated by reference to the Bloomberg Eurodollar forward curve. This curve is calculated based upon term Eurodollar rates supplemented by references to rates gleaned from Eurodollar futures markets and long-term IRS markets. We discount the net floating vs. fixed rate payments by reference to the OIS curve.

Forward Curve and OIS Curve



Source: Bloomberg

Our analysis suggests that the PV of the fixed rate payments exceeds that of the floating rate payments by $154.38 per $100,000 in face value. This result is intuitive to the extent that the coupon on 2-year LIBOR-based swaps was trading at 0.42%, and below the DSF coupon of 0.50%, when this analysis was conducted. [3]

Mar-13 Two-Year DSF w/ 0.50% Coupon
(As of November 27, 2012)

Payment Date	Fixed Payment	Floating Payment	Net Payment	Discount Factor	Present Value
3/20/13	$0.00	$0.00	$0.00	0.999548	$0.00
6/20/13	$0.00	$84.10	-$84.10	0.999196	-$84.03
9/20/13	$250.00	$89.01	$160.99	0.998833	$160.80
12/20/13	$0.00	$92.92	-$92.92	0.998441	-$92.78
3/20/14	$250.00	$98.85	$151.15	0.998025	$150.85
6/20/14	$0.00	$106.97	-$106.97	0.997565	-$106.71
9/22/14	$252.78	$118.16	$134.62	0.997009	$134.22
12/22/14	$0.00	$123.98	-$123.98	0.996389	-$123.53
3/20/15	$247.22	$131.15	$116.07	0.995600	$115.56
					$154.38

Source: Bloomberg

DSFs are quoted as 100% of par + the Non-Par Value (NPV) of the swap to-be-delivered. NPV is transformed into % of par to facilitate display of the quote.

$$Swap\ Futures\ Quote = 100\% + Non\ Par\ Value\ in\ \%\ of\ Par$$

E.g., assume that a 2-year DSF contract has a NPV of $154.38 as shown in our previous example. This equates to approximately 5/32nds of 1% of $100,000 (=$154.38/$31.25). Thus, the DSF contract might be quoted as 100-5/32nds (=100% + 5/32nds).

$$Swap\ Futures\ Quote = 100\% + \left(\frac{\$154.38}{\$100{,}000}\right) = 100 - 5/32nds$$

[3] This analysis relied upon Bloomberg's "Swap Manager" or "SWPM" functionality. To use this functionality, identify the specific DSF by reference to its ticker. Bloomberg designates 2-, 5-, 10- and 30-year DSF as CTP, CFP, CNP and CBP, respectively. Attach a reference to the month and year to the ticker per standard conventions, e.g., H3 currently is a reference to March 2013, M3 a reference to June 2013, U3 to September 2013 and Z3 to December 2013. By typing in "CTPH3 <Comdty> DES <GO>" one arrives at a descriptive landing page for the 2-year DSF. From the descriptive landing page DES, select "Swap Manager (SWPM)" to view real-time implied DSF pricing based on forward staring interest rate swaps. Further details regarding the calculations are accessible from the SWPM page as well including the interest rate curves references, cash flows, scenario analysis, etc. Bloomberg provides a series of recommended settings but users may override these recommendations in order to deploy their own preferred settings as well. This tool represents a powerful and efficient functionality. Note that this analysis does not take into account cost of carry considerations. However, carry may generally be rather negligible to the extent that an OTC IRS instrument may generally be transacted on a par basis with no explicit up-front payment or cost. In any event, the results of this analysis do not necessarily indicate where DSF will trade but might be considered a general guidance or reference.

E.g., assume that a 2-year DSF contract has a NPV of -$1,344. This equates to approximately negative 1-11/32nds of the $100,000 notional value of the swap (=-$1,344/$100,000). Thus, the contract may be quoted as 98-21/32nds (=100% - 1-11/32nds).

$$Swap\ Futures\ Quote = 100\% + \left(\frac{-\$1{,}344}{\$100{,}000}\right)$$
$$= 98 - 21/32nds$$

Non-Par Payment on Delivery

Upon delivery, an invoice amount is paid in cash between buyer (fixed rate receiver or floating rate payer) and seller (fixed rate payer or floating rate receiver) of the futures contract. This invoice amount or cash adjustment reflects the NPV of the underlying swap instrument. This value is identified by reference to the Final Settlement Price of the DSF contract on the Final Trading Day.

E.g., if 2-year DSFs settle at 101-0/32nds on the Final Trading Day, delivery of the underlying swap is consummated by a payment of $1,000 from long (fixed rate receiver) to short (fixed rate payer).

E.g., if 2-year DSFs settle at 97-0/32nds on the Final Trading Day, delivery of the underlying swap is consummated by a payment of $3,000 from short (fixed rate payer in swap) to long (fixed rate receiver in swap).

Limitation on Participation

Anyone with a properly established futures account may trade DSF contracts. However, regulations restrict holding of actual interest rate swaps (IRS) to Eligible Contract Participants (ECPs) as defined in Section 1a(18) of the Commodity Exchange Act. ECPs may generally be thought of as institutional market participants and some high-net worth individuals.

Thus, only ECPs are permitted to participate in the delivery process of actual swaps. Note further that only CME designated OTC IRS clearing members may carry delivered swaps with the CME Group Clearing House.

Measuring Risk

DSF contracts may be used to create or manage exposure to swap or swap-correlated risks. But there is an old saying – "you can't manage what you can't measure." Thus, let us consider how one might measure the risk associated with fixed income securities. One generally measures such risk by reference to duration or its close cousin "basis point value" (BPV).

Duration is a concept that was originated by the British actuary Frederick Macauley. Mathematically, it is a reference to the weighted average present value of all the cash flows associated with a fixed income security, including coupon income as well as the receipt of the principal or face value upon maturity.

E.g., the most recently issued or "on-the-run" 10-year Treasury note as of November 27, 2012 was the 1-5/8% security maturing November 15, 2022. Its duration was 9.158 years. This suggests that if yields were to advance by 100 basis points (or "bps"), the price of the security should decline by approximately 9.158%.

On-the-Run Treasury Notes & Bonds
(November 27, 2012)

Tenor	Coupon	Maturity	Duration	BPV (per million)
2-Year	1/4%	10/31/14	1.916	$192
3-Year	3/8%	11/15/15	2.945	$295
5-Year	3/4%	10/31/17	4.824	$485
7-Year	1-1/4%	10/31/19	6.614	$670
10-Year	1-5/8%	11/15/22	9.158	$915
30-Year	2-3/4%	11/15/42	20.258	$2,012

Source: Bloomberg

Basis point value (BPV) is a concept that is closely related to duration. The BPV measures the expected change in the price of a security given a 1 basis point (0.01%) change in yield. It may be measured in dollars and cents based upon a particular face value security, commonly $1 million face value. It is sometimes also referred to as the "dollar value of a 01" or simply "DV of a 01."

E.g., the on-the-run 10-year T-note had a basis point value of $915 per $1 million face value unit, as of November 27, 2012. This implies that if yields were to advance by 1 basis point, the price of a $1

million face value unit of the security might decline by $915.

Hedge Ratio

The fundamental objective of a hedge is to balance any loss (profit) in the hedged market with an equal and opposite profit (loss) in futures. Consider the hedge ratio (HR) that allows one to balance the change in the value of the instrument to be hedged (Δ_{hedge}) with any change in the value of the DSF contract (Δ_{DSF}). We use the Greek letter delta or Δ to denote the concept of a change in value.

$$\Delta_{hedge} = HR \; x \; \Delta_{DSF}$$

We solve for the hedge ratio (HR) as follows.

$$HR = \Delta_{hedge} \div \Delta_{DSF}$$

Because the concept of a "change in value" is rather abstract, this equation cannot readily be deployed in practice. But we could readily use notions such as duration or BPV to measure changes in value. Thus, substituting the term BPV for Δ, we arrive at the following general formula.

$$HR = BPV_{hedge} \div BPV_{DSF}$$

The BPV or DV01 of a DSF may be calculated simply by "shocking" the calculations as illustrated in our pricing example above by 1 basis point. *I.e.,* compare the current NPV with the NPV calculated assuming that yields fluctuate uniformly by 1 basis point.

E.g., we had previously calculated the NPV of a 2-year DSF with a 0.50% coupon as of November 27, 2012 at $154.38. But assume that rates along both the forward curve and the OIS curve were to rise uniformly by 1 basis point.

Under these circumstances, we calculate an NPV of $134.13. Compare the two, we calculate a BPV or DV01 equal to $20.25 (=$154.38-$134.13) or the difference between the two NPVs. [4]

Mar-13 Two-Year DSF w/ 0.50% Coupon Assuming Yields Rise 1 Basis Point
(As of November 27, 2012)

Payment Date	Fixed Payment	Floating Payment	Net Payment	Discount Factor	Present Value
3/20/13	$0.00	$0.00	$0.00	0.999517	$0.00
6/20/13	$0.00	$86.66	-$86.66	0.999139	-$86.58
9/20/13	$250.00	$91.57	$158.43	0.998751	$158.24
12/20/13	$0.00	$95.45	-$95.45	0.998334	-$95.29
3/20/14	$250.00	$101.35	$148.65	0.997893	$148.34
6/20/14	$0.00	$109.53	-$109.53	0.997407	-$109.24
9/22/14	$252.78	$120.77	$132.01	0.996825	$131.59
12/22/14	$0.00	$126.51	-$126.51	0.996180	-$126.02
3/20/15	$247.22	$133.59	$113.63	0.995367	$113.10
					$134.13

Hedging a Spot OTC Swap

DSFs are exchange-traded futures contracts designed to track the interest rate risk exposures associated with OTC interest rate swap instruments. As such, they may readily be deployed to hedge or manage the risks associated with a similarly constructed swap; or, a portfolio of swaps, that one may hold or anticipate holding in the future.

Consider the prospect of hedging an OTC IRS instrument with DSF futures. If you are the buyer or fixed rate receiver of an IRS instrument, you are exposed to the risk of rising rates. Thus, you might generally sell DSF futures as a hedging tactic. If you are the seller or fixed rate payer of an IRS instrument, you are exposed to the risk of falling rates. Thus, you might generally buy DSF futures as a hedge.

Hedging Tactics

IRS Instrument	DSF Contracts
Buyer or Fixed Rate Receiver	Sell DSF contracts
Seller or Fixed Rate Payer	Buy DSF Contracts

Unfortunately, the critical terms of the IRS to be hedged may not match precisely with the terms of the DSF in a number of respects. *E.g.,* DSF contracts are based upon an Exchange established coupon while the IRS to be hedged may have been established at a different coupon.

Other specific characteristics of the IRS instrument may likewise depart from those associated with the

[4] Note that the Bloomberg SWPM page may be accessed as a ready reference to current BPVs or DV01s. Note that Bloomberg generally uses the nomenclature of DV01 rather than BPV. We tend to prefer a reference to BPV to the extent that this concept is generalizable to non-dollar denominated fixed income instruments as well.

standardized DSF including the term, reset dates, day count conventions, etc. Perhaps the most important of these characteristics is the reference floating rate.

But presuming that the terms are reasonably similar, in particular, if we assume that the IRS to be hedged is based upon the ICE 3-month USD LIBOR rate, it is likely that there is sufficient correlation to create an effective hedge. Towards that end, one readily may deploy the hedge ratio calculation as shown above. [5]

E.g., consider a hedge of a long $10 million notional value unit of a 1.65% coupon 10-year IRS instrument with an effective date of November 1, 2012. By November 28th, it had a NPV of $46.25 per $100,000 notional; or, $4,625 per $10 million notional. [6] It had a BPV of $95.67 per $100,000 notional or $9,567 per $10 million notional.

A hypothetical Mar-13 10-year DSF with a 2% coupon had a NPV of $2,459.55 and a BPV of $99.21 per $100,000 notional. This suggests that one might sell 96 Ten-year DSF futures to hedge this risk.

$$HR = \$9{,}567 \div \$99.21 = 96.43 \; or \; SELL \; 96 \; contracts$$

Note that the aggregate Basis Point Value (BPV) of 96 short DSFs equals $9,524 (=96 x $99.21) which is comparable to the BPV of the hedged IRS instrument of $9,567. The aggregate Non Par Value (NPV) of 96 short DSFs equals $236,117 (=96 x $2,459.55).

What might happen if interest rates along the forward and OIS curves were uniformly to rise or fall 25 basis points within the course of the day? We may simulate the results per our table. [7]

Scenario Analysis
NPV and (Profit/Loss) on Position

Rates	Long $10 mil IRS	Short 96 DSF	Net P/L
+0.25%	NPV = -231,467 P/L = -$236,092	Aggregate NPV = $1,199 P/L = +$234,918	**-$1,174**
0.00%	NPV =$4,625 P/L = $0	Aggregate NPV = $236,117 P/L = $0	**$0**
-0.25%	NPV = $246,915 P/L = +$242,290	Aggregate NPV = $477,473 P/L = -$241,356	**+$934**

Despite the fact that the IRS instrument to be hedged departs in some ways from that of the IRS to be delivered against the DSF contract, we nonetheless simulate a generally successful hedging result. [8]

DSFs as Proxy for IRS Portfolio

To the extent that DSFs may be deployed to hedge the risks inherent in an interest rate swap, it logically follows that they may be deployed as an economically equivalent proxy for a portfolio of interest rate swaps. Significant benefits may be associated with the use of DSFs in this manner as cataloged below.

- *Effective Auto-Netting* – A firm may carry a portfolio of multiple IRS positions with many counterparties on its books. Often, netting agreements are utilized to consolidate the cash flows between one counterparty and the other.

[5] Fixed income instruments, including IRS instruments, may represent varying points along the yield curve in terms of maturity or reset dates. Use of the BPV hedge ratio implies a presumption that yields might move in parallel or equally along the curve. This presumption may serve a hedger well although we note that fixed income traders may very well harbor beliefs about the prospective future shape of the yield curve. If one believed that the curve would steepen or flatten, this could impact one's hedging strategy.

[6] For these purposes and as a matter of simplification, we do not consider any accrued interest associated with the OTC IRS instrument.

[7] These results are simulated with the aid of Bloomberg's Swap Manager (SWPM) functionality. Navigate into "Scenario" analysis from the SWPM page.

[8] Note that the change in the NPVs of the IRS instrument and the DSF contracts illustrated in the hedge are not precisely aligned with the changes as predicted by the BPVs. This is due to the effects of "convexity." As a rule in the context of non-callable IRS instruments, prices decline (advance) as yields advance (decline). But the price/yield relationship is not linear. Rather, as yields advance, prices decline at a decelerating rate. As yields decline, prices advance at an accelerating rate. Thus, BPVs will increase (decrease) as yields decline (advance) as a result of this convexity effect. This further implies that one might be best served to monitor the hedge ratio and adjust risk exposures in response to fluctuating market conditions and relationships.

But one would normally require distinct netting arrangements with each individual counterparty to effect such netting.

DSF futures introduce operational convenience to the extent that they are centrally cleared through the CME Clearing House. This provides for effective netting on a fully automated basis through normal futures back-office accounting processes.

- *Minimize Line Items* – Again, firms frequently may be carrying a large portfolio of IRS positions with diverse terms and with multiple counterparties. Thus, the firm may be carrying a book with a long list of individual line items, burdening the back-office account process and associated risk management procedures.

  DSF futures effectively consolidate those myriad and diverse line items into a concise position that may readily be maintained.

- *Reduced Transaction Costs* – DSF may effectively reduce one's transaction costs relative to maintaining a portfolio of IRS positions. The over-the-counter IRS market may be quite competitive upon entry of a position. But once a position is established with a specific counterparty, one must return to that counterparty if one hopes to liquidate the position. Sometimes competition may become less intense when one seeks to execute closing transactions.

  But like all futures contracts, DSFs may be executed through the CME Globex® central limit order book (CLOB). Globex transactions are conducted anonymously and no distinction is made between opening and closing orders, preserving the intensity of competition.

- *Capital Efficiencies* – DSFs may offer certain capital efficiencies vis-à-vis a portfolio of IRS positions with an equivalent economic impact. Note that the Dodd-Frank financial reform bill of 2010 required standardized swap positions to be margined through a centralized counterparty (CCP) clearing organization and further establishes standard for such margining.
  Per these new regulations, we may estimate the capital required to support a cleared interest rate swap position vs. an equivalent DSF position of different tenors. Note that the capital savings associated with DSFs run from 57% to 64% relative to the equivalent IRS position.

Margin Savings (% of Notional)
(Estimated as of Dec-12)

Tenor	Cleared IRS	DSF	Savings
2	0.42%	0.15%	64%
5	1.58%	0.60%	62%
10	3.25%	1.30%	60%
30	8.07%	3.50%	57%

Note that one may utilize an Exchange for Related Position transaction (EFRP), as provided per CME Rule 538, effectively to exchange a newly established or seasoned OTC IRS position for an equivalent DSF position. [9]

Spreading vs. Cash U.S. Treasuries

DSF contracts may likewise be utilized to address the risk exposures associated with U.S. Treasury securities of similar maturities. An appreciation of the relationship between the value of swaps and U.S. Treasuries may quickly be surmised by an inspection of the yield spreads between IRS instruments and U.S. Treasuries of comparable maturities.

While the correlations are not perfect, they are nonetheless sufficiently related to warrant possible use of DSF contracts to approximate the risks associated with Treasuries. A BPV HR may be deployed in this context just as it was in our prior example.

E.g., assume you wish to hedge the risks associated with a $10 million face value unit of the 10-year on-the-run 1-5/8% Treasury of 2022. This security had a BPV of $918 per million or $9,180 per $10 million face value. Per our previous example, a hypothetical 10-year DSF had a BPV of $99.21 per contract as of November 28, 2012.

[9] Additional information regarding ex-pit transactions may be referenced at www.cmegroup.com/education/files/Ex-Pit-Transactions.pdf

$$HR = \$9{,}810 \div \$99.21 = 92.53 \; or \; SELL \; 93 \; contracts$$

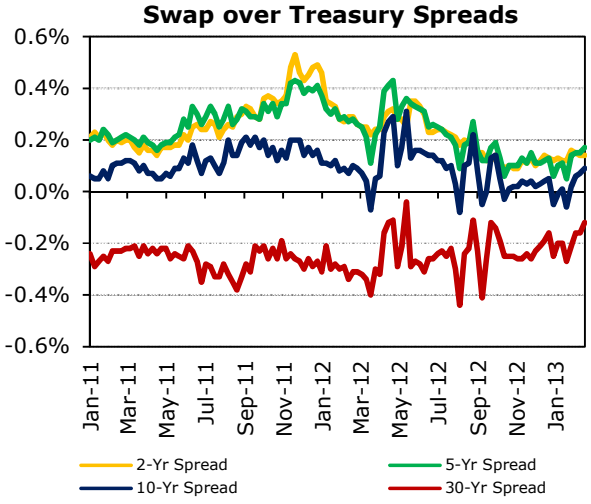
Our analysis suggests that one might sell 93 Ten-year DSF contracts to address the risks associated with that $10 million face value unit of the 10-year U.S. Treasury note.

One might further trade DSF contracts vs. cash U.S. Treasuries in anticipation of movement in these yield spreads. To the extent that private credit risks are represented in the LIBOR rate while public credit risks are represented in U.S. Treasuries, one would expect that U.S. Treasury yields would consistently be less than the implicit yield on an IRS instrument.

Classically one might buy U.S. Treasuries and sell private credit instruments in anticipation of credit episodes and widening spreads. Or, sell Treasuries and buy private credit instruments in anticipation of improving credit quality and narrowing spreads.

Credit Conditions Improving	→	**BUY Swaps & SELL U.S. Treasuries**
Credit Conditions Deteriorating	→	**SELL Swaps & BUY U.S. Treasuries**

However, the presumption that private borrowing costs should always exceed public borrowing costs with similar maturities has not held in recent years. In particular, we have witnessed the spread between 30-year swaps and U.S. Treasury yields fall to negative levels. A number of factors have contributed to this circumstance.



- *Too Big to Fail" Policies* - The Fed backstopped the banking industry during the subprime mortgage crisis while Standard & Poor's downgraded the credit rating of U.S. long-term sovereign debt in August 2011. Thus, private and public credit risks implicitly converged to some extent.

- *IRS Structure* – When you purchase a U.S. Treasury, you generally pay in cash. But IRS instruments may be initially be traded at par with no up-front consideration between the counterparties. This may serve to reduce credit risk of swaps relative to U.S. Treasuries.

- *Supply & Demand* – Pension funds, insurance companies and other investors with long-term liabilities have increasing embraced the concept of "liability-driven investment" or LDI. This strategy calls for investment managers to match the term of their investments with the term of their liabilities. Many of these managers have come to rely upon the leverage associated with very long-term IRS instruments as an alternative to long-term Treasuries, pushing the 30-year IRS vs. U.S. Treasury spread to negative levels.

Spreading DSF and U.S. Treasury Futures

This analysis may be further extended to a spread of DSF contracts vs. CME Group U.S. Treasury futures. Once again, we might structure a hedge or a spread by reference to the relative BPVs of DSF and Treasury futures contracts. [10]

The BPV of a U.S. Treasury futures contract may be identified as the ratio of the BPV of the cheapest-to-deliver (CTD) Treasury security divided by the conversion factor (CF) of the CTD security per the following equation. [11]

[10] A "forward" BPV of the CTD is sometimes referenced for purposes of calculating the BPV of a Treasury futures contract. This means that one might calculate the BPV as of the anticipated futures delivery date, holding other terms static. Use of a forward or a current BPV will tend to produce nearly equivalent results, particularly as the tenor of the futures contract becomes extended. Our examples reference a current BPV as a matter of convenience.

[11] U.S. Treasury note and bond futures permit the delivery of a variety of U.S. Treasury securities within a certain maturity window, at the discretion of the short. *E.g.,* the 10-year T-note futures contract permits the delivery of T-notes with a remaining maturity between 6-1/2 to

$$BPV_{Treasury\ futures} = \frac{BPV_{ctd}}{CF_{ctd}}$$

Thus, the appropriate HR may be restated as follows, substituting the foregoing quantity for the BPV of the item to be hedged.

$$HR = \left(\frac{BPV_{ctd}}{CF_{ctd}}\right) \div BPV_{DSF}$$

E.g., on November 28, 2012, the CTD 10-year Treasury security vs. Mar-12 Ten-year T-note futures was identified as the 3-3/8% U.S. Treasury of 2019. It had a BPV of $72.90 per $100,000 face value with a CF for delivery vs. the Mar-12 Treasury futures of 0.8604.

$$HR = \left(\frac{\$72.90}{0.8604}\right) \div \$99.21 = 0.85$$

This suggests that one might hedge or spread 10-year DSFs vs. 10-year Treasury futures in a ratio of 0.85 or 17 DSF contracts for every 20 Treasury futures. This result is intuitive to the extent that the CTD U.S. Treasury security had a maturity of 2019 or just 7 years from November, 2012.

Thus, 10-year Treasury futures were tracking or correlated most closely with a relatively short maturity security compared with the 10-year term of the IRS instrument to be delivered in satisfaction of a 10-year DSF. As a result, one may hedge with fewer DSF contracts.

Yield Curve Steepening → **SELL 10-yr DSFs & BUY 10-yr Treasury futures**

Yield Curve Flattening → **BUY 10-yr DSFs & SELL 10-yr Treasury futures**

Further, this 10-year DSF vs. 10-year Treasury futures spread implies that this spread will be sensitive to movements in the shape of the yield curve spread to the extent that one is effectively playing the 10-year vs. the 7-year portion of the yield curve. If one believed that the yield curve might steepen, this implies that one may sell DSFs and buy U.S. Treasury futures. If one believed that the curve might flatten, buy DSFs and sell U.S. Treasury futures.

If one wished to mitigate these yield curve considerations and put on a spread that was more closely driven by credit risk considerations, one might place a spread using a combination of 5- and 10-year DSF contracts vs. 10-year U.S. Treasury futures. *E.g.,* if the CTD 10-year T-note had a maturity of 7 years, one might match 60% of the T-note futures position with 5-year DSFs and 40% of the T-note futures position with 10-year DSFs.

Conclusion

DSF contracts represent a powerful and versatile new trading and risk-management vehicle. The product may be deployed in a variety of practical applications including use as a substitute for actual IRS market exposures; a hedge vs. current or anticipate IRS holdings; a hedge or spread vs. cash Treasury securities or Treasury futures.

These products are offered on the CME Group Globex® electronic trading platform and via open outcry. Further, they may be transacted as an EFRP or block trade as well. Once transacted and booked into the CME Clearing House, DSF contracts offer significant capital efficiencies. For example, DSF contracts are eligible for cross-margining offsets vs. other CME Group interest rate products.

Further, the Dodd-Frank financial reform legislation of 2010 mandates centralized clearing for standardized swap contracts including plain-vanilla interest rate swaps. Per the legislation, the initial

10 years. This includes a rather wide variety of securities with varying coupons and terms until maturity. Because these securities may be valued at various levels, the contract utilized a Conversion Factor (CF) invoicing system to determine the price paid by long to compensate the short for the delivery of the specific security. Specifically, the principal invoice amount paid from long to short upon delivery of securities is calculated as a function of the futures price multiplied by the CF. Technically, CFs are calculated as the price of the particular security as if they were yielding the "futures contract standard" of 6%. The system is intended to render equally economic the delivery of any eligible for delivery security. However, the mathematics of the CF system is such that a single security tends to stand out as most economic or cheapest-to-deliver (CTD) in light of the relationship between the invoice price of the security vs. the current market price of the security. Typically, long duration securities are CTD when prevailing yields are in excess of the 6% futures market standard; while short duration securities are CTD when prevailing yields are less than 6%. It is important to identify the CTD security because futures will tend to price or track or correlate most closely with the CTD.

performance bond or margin associated with futures must be designed to cover a minimum one-day liquidation timetable; a minimum five-day liquidation timetable is mandated for cleared IRS; and, a minimum ten-day liquidation timetable for non-cleared IRS. Thus, DSF contracts may be traded with an advantageous capital requirement relative to their close cousins in the form of OTC IRS instruments.

DSF contracts are already being embraced by broker/dealers, hedge funds, traditional asset managers as a facile means by which either to create or manage exposure to interest rate swap risks. To learn more about this contract, please visit our website at www.cmegroup.com/dsf.

Deliverable Swap Futures (DSF) Specifications

Trading Unit	A $100,000 notional face value Interest Rate Swap (IRS), cleared by CME Clearing House, with tenors of 2-, 5-, 10- or 30-years, exchanging semiannual fixed interest payments at a rate per annum equal to Contract Fixed Rate for quarterly floating interest rate payments based on 3-month London interbank offered rate.	
Delivery Months	March, June, September or December	
Contract Fixed Rate	Established by Exchange at integer multiples of 25 basis points with 30/360 day count fraction	
Quote Convention	Prices quoted in % of par: 100 points + non-par value (NPV) of IRS where NPV is present value of IRS fixed-rate payments minus present value of IRS floating-rate payments as of Delivery Day	
Minimum Price Increment	*2-Year*	1/4th of 1/32nd of 1% of $100,000 ($7.8125)
	5- and 10-Year	½ of 1/32nd of 1% of $100,000 ($15.625)
	30-Year	1/32nd of 1% of $100,000 ($31.25)
Last Trading Day	Trading in expiring futures terminates at 2 pm (CT) on 2nd London business day before 3rd Wednesday of futures Delivery Month	
Delivery Day	3rd Wednesday of Delivery Month	
Delivery Standard	*Reference Conventions*	Fixed Rate Payer is "short" and "makes" delivery Floating Rate Payer is "long" and "takes" delivery
	Reference Tenors	2-, 5-, 10- and 30-Year IRS Instruments
	Notional Amount	$100,000 (USD) per futures contract
	IRS Effective Date	3rd Wednesday of Delivery Month
	Termination Date	Anniversary of IRS Effective Date at futures Reference Tenor
	Fixed Pay Dates	Semiannually from IRS Effective Date on 30/360 day count
	Fixed Rate	Established by Exchange at integer multiples of 25 basis points
	Floating Pay Dates	Quarterly from IRS Effective Date on Actual/360 day count
	Floating Rate Reference	ICE 3-Month USD LIBOR with no spread or compounding
Delivery Method	Physical delivery of IRS per Delivery Standard with Clearing Acceptance Date and Clearing Effective Date = 1st Business Day preceding 3rd Wednesday of Delivery Month Invoice Price = IRS Initial Payment Amount, per Final Settlement Price (P) If 100 < P, then IRS Floating Rate Payer pays, and IRS Fixed Rate Payer receives, $1,000 x (P – 100) per contract, rounded to nearest penny If P ≤ 100, then IRS Fixed Rate Payer pays, and IRS Floating Rate Payer receives, $1,000 x (100 – P) per contract, rounded to nearest penny	
Delivery Eligibility	Limited to Eligible Contract Participants (ECPs) per Section 1a(18) of the Commodity Exchange Act and registered with CME by CME IRS Clearing Member as IRS Participant.	
Trading Hours and Venue	*CME Globex*	5:00 pm to 4:00 pm, Sun-Fri
	Open Outcry	7:20 am to 2:00 pm, Mon-Fri

Futures and options trading is not suitable for all investors, and involves the risk of loss. Futures are leveraged investments, and because only a percentage of a contract's value is required to trade, it is possible to lose more than the amount of money initially deposited for a futures position. Therefore, traders should only use funds that they can afford to lose without affecting their lifestyles. And only a portion of those funds should be devoted to any one trade because they cannot expect to profit on every trade. All matters pertaining to rules and specifications herein are made subject to and are superseded by official CME rules. Current rules should be consulted in all cases concerning contract specifications.

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