Understanding Futures on the DTCC GCF Repo Index®

White Paper

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INTRODUCTION

ICE DTCC GCF Repo Index® Futures ("GCF Futures") have achieved remarkable growth since their launch in July 2012. These products have been embraced by various market participants throughout the industry in the short time since their introduction. The contracts are designed to help trading desks better manage interest rate exposure by using a flexible, liquid, transparent, cost effective and centrally cleared instrument.

The DTCC GCF Repo Index® is the first and only benchmark designed to track the average daily interest rates paid for overnight General Collateral Finance repurchase agreements ("GCF Repo®") on U.S. Treasury, Agency and Mortgage- Backed securities. These indices provide a transparent and comprehensive view of the overnight repo trading activity netted each day and settled as part of the clearing process for all U.S. government securities trades.

GCF Repo® transactions are fully executed and cleared exclusively through the Fixed Income Clearing Corporation (FICC), a subsidiary of the Depository Trust & Clearing Corporation (DTCC). DTCC created the DTCC GCF Repo Index® in 2010 to improve transparency and liquidity in the U.S. funding markets.

This paper is intended to provide an understanding of GCF Futures mechanics and some of the methods employed by the industry to achieve hedging and arbitrage results through their use.

PRICING AND QUOTATION

GCF Futures are based on interest on the relevant DTCC GCF Repo® asset class having a face value of $5,000,000 for one month calculated on a 30-day basis at a rate equal to the average relevant DTCC GCF Repo Index® rate for the contract month. Expiring contracts are cash settled against the corresponding average daily DTCC GCF Repo Index® rate for the delivery month, rounded to the nearest one-hundredth of one basis point. Final settlement occurs on the last trading day of the delivery month. The corresponding daily DTCC GCF Repo® overnight rate is calculated and reported by The Depository Trust & Clearing Corporation. The exchange offers "serial" contract months extending out 2 years (24 months total) into the future. See Appendix – Table 1, for contract specifications.

These contracts are quoted using the "IMM index" Convention. The IMM index is equal to 100 minus the implied corresponding average daily DTCC GCF Repo Index® rate for the delivery month.

IMM Index = 100.00 – Monthly Average Rate

E.g., if the monthly average DTCC GCF Repo Index® rate equals 0.250%, the IMM index is quoted as 99.750.

IMM Index = 100.00 – 0.250 = 99.750

If the value of the futures contract should fluctuate by one basis point (0.01%), this equates to a $41.67 movement in the contract value. This may be confirmed by calculating the basis point value (BPV) of a $5 million face value, 30-day money market instrument into the following formula.

Basis Point Value = Face Value x {days/360} x 0.01% = $5,000,000 x {30/360} x 0.01% = $41.67

The minimum allowable price fluctuation, or "tick" size, is one-half of one basis point, or 0.005% for all deferred monthly contracts. Based on a $5 million face-value 30-day instrument, this equates to $20.835. For the front or expiring contract month, the minimum price fluctuation is set at one-quarter basis point, or 0.0025%, equating to $10.4175 per contract.

E.g., See Appendix – Table 2, trade date January 18, 2013, USTH3 (futures on us Treasury DTCC GCF Repo Index® March 2013) expiration advanced by 2.5 basis points to settle the day at a price of 99.83. With each basis point valued at $41.67 based on a $5 million 30-day instrument, this implies an increase in value of $104.175 for the day per contract.

MEASURING RISK

Basis Point Value (BPV) is the reference for measuring risk in the context of short-term, non-coupon bearing instruments, i.e., money market instruments such as Repurchase Agreements, Eurodollars, Treasury Bills, etc.

It measures the expected monetary change in the price of a money market instrument given a 1 basis point (0.01%) change in yield. It returns a dollars and cents valuation based upon the specific face value of the instrument which is referred to as the "dollar value of an 01" or "DV01."

BPV is calculated based on the face value and number of days until maturity of the referenced money market instrument as follows:

BPV = Face Value x {Days/360} x 0.01%

HEDGING SHORT-TERM RATE EXPOSURE

Risk management programs at financial institutions use futures to hedge against the possibility of rising or declining rates. These programs are designed to offset the change (delta) in risk exposures to be hedged, with an offsetting change (delta) in the value of a futures contract.

By using the BPV formulae and the fixed one basis point change (BPV) in yield for the Futures on the DTCC GCF Repo Index® we can determine the number of futures contracts necessary to hedge such risk.

BPV risk ÷ BPV futures = Hedge

E.g., a financial institution borrows $100 million to finance a purchase and chooses to lock in the financing for 30 days. The institution is exposed to paying a higher interest rate if rates decline over this time frame.

BPV risk = $100,000,000 x {30/360} x 0.01% = $833.33

BPV future = $5,000,000 x {30/360} x 0.01% = $41.67

$833.33 ÷ $41.67 = 20

Purchasing 20 futures contracts will hedge the risk of declining interest rates. Let us apply an interest rate to the above example and prove the hedge equation –

$100 million borrowed at 1.50% for 30 days. Futures contract price is 98.5 (100 – 1.50). Average financing for the month decreased by 25 BP. Futures contract priced at 98.75 (100 – 1.25).

BVP risk or "DV01" = $833.33

$833.33 x 25 = $20833.25 "loss"

BVP futures or "DV01" = $41.67

$41.67 x 25 x 20 = $20835 "gain" (difference is from penny rounding of futures contract)

Inversely, the institutional lender in the above example is exposed to receiving a lower interest rate if rates increase within this time frame and should sell 20 contracts to mitigate the risk.

Hedge risk of rising interest rates > Sell futures

Hedge risk of declining interest rates > Buy futures

Let us consider the implications of a longer term loan.

E.g., a financial institution borrows $100 million to finance a purchase on July 1st and chooses to lock in the financing for 180 days at a rate of 1.50%.

BPV risk = $100,000,000 x {180/360} x 0.01% = $5000

BPV future = $5,000,000 x {30/360} x 0.01% = $41.67

$5000 ÷ $41.67 = 120

The financial institution would need to purchase 120 futures contracts to hedge the risk of declining interest rates.

But where should the hedge be placed? The front month of the loan - Buy 120 July contracts? The last deferred month of the loan – Buy 120 December contracts? These are examples of "stacking" – let us review the results.

E.g., Rates decline 25Bp on Oct 1.

BVP risk or "DV01" = $5000

$5000 x 25 = $125,000 "loss" BVP futures or "DV01" = $41.67

$41.67 x 25 x 120 = $125,010 "gain" (difference is from penny rounding of futures contract)

If you buy 120 July contracts and interest rates decline any time after the July contracts expire, you are exposed/do not have a hedge.

DV01 EXPOSURE		SPOT STACK	DV01 HEDGE	NET EXPOSURE
5000	Jul	120	5000	0
4167	Aug		0	-4167
3333	Sep		0	-3333
2500	Oct		0	-2500
1667	Nov		0	-1667
833	Dec		0	-833

The most effective way to hedge a term loan is through a “strip” transaction – i.e. to execute consecutive monthly contracts for the duration of the loan period that matches the months’ risk. In this example, one would purchase 120 DV01 contracts divided by the number of months of the underlying loan, 6, or 20 contracts each month.

DV01 EXPOSURE		SPOT STACK	DV01 HEDGE	NET EXPOSURE
5000	Jul	20	5000	0
4167	Aug	20	4167	0
3333	Sep	20	3333	0
2500	Oct	20	2500	0
1667	Nov	20	1667	0
833	Dec	20	833	0

If you buy 120 December contracts and interest rates decline any time before December, you are over hedged as each contract month expires.

DV01 EXPOSURE		SPOT STACK	DV01 HEDGE	NET EXPOSURE
5000	Jul		5000	0
4167	Aug		5000	833
3333	Sep		5000	1667
2500	Oct		5000	2500
1667	Nov		5000	3333
833	Dec	120	5000	4167

SPREAD STRATEGIES

A future spread trade is the simultaneous purchase and sale of two different futures contracts with the design of profiting from the change in relationship in price between the two contracts. In general, spreads have lower margin requirements than outrights of the same contract which acknowledges the lower risk in trading a spread. There are two types of spreads – Intramarket and Intermarket.

INTRAMARKET SPREADS

Intramarket spreads are created as calendar spreads. You are long and short futures in the same market, but in different months.

E.g.- Buy (long) 10 usTN3 (July 2013) @ 99.90 and sell (short) 10 usTQ3 (August 2013)@ 99.885.

("UST" is the Bloomberg system reference for ICE U.S. Treasury DTCC GCF Repo Index® futures. N and Q are the standard industry codes for the months of July and August. 3 is the standard reference code for the contract year)

USTN3 increases to 99.91, USTQ3 increases to 99.89.

BVP futures or "DV01" = $41.67

USTN3: 99.91 – 99.90 = .01. 10 x $41.67 = $416.70 profit.

USTQ3: 99.89 – 99.885 = .005. 10 x $20.835 = $208.35 loss.

$416.70 – $208.35 = $208.35. Net profit.

USTN3 increases to 99.905, USTQ3 increases to 99.895.

BVP futures or "DV01" = $41.67

USTN3: 99.905 – 99.90 = .005. 10 x $20.835 = $208.35 profit.

USTQ3: 99.895 – 99.885 = .01. 10 x $41.67 = $416.70 loss.

$416.70 – $208.35 = $208.35. Net loss.

INTERMARKET SPREADS

Intermarket spreads can be accomplished by going long or short futures in one market, and short or long futures of the same month in another market.

E.g., Buy (long) 60 USTU3 (US Treasury DTCC GCF Repo Index® future September 2013) @ 99.88 and sell (short) 100 LEDU3 (Eurodollar September 2013) @ 99.69.

USTU3 increases to 99.89, LEDU3 increases to 99.695.

BVP futures or "DV01" = $41.67 GCF Futures

BVP futures or "DV01" = $25.00 (ED)

Inter-commodity ratio: $25 ÷ $41.67 = 0.60

B/S 6 GCF Futures ~ S/B 10 ED

USTU3: 99.89 – 99.88 = .01. 60 x $41.67 = $2500.20 profit.

LEDU3: 99.695 – 99.69 = .005. 100 x $12.50 = $1250 loss.

$2500.20 – $1250 = $1250.20.Net profit.

USTU3 increases to 99.885, LEDU3 increases to 99.70.

BVP futures or "DV01" = $41.67 GCF Futures

BVP futures or "DV01" = $25.00 (ED)

Inter-commodity ratio: $25 ÷ $41.67 = 0.60

B/S 6 GCF Futures ~ S/B 10 ED

USTU3: 99.885 – 99.88 = .005. 60 x $20.835 = $1250.10 profit.

LEDU3: 99.70 – 99.69 = .01. 100 x $25.00 = $2500 loss.

$2500.00 – $1250.10 = $1249.90.Net loss.

OVERNIGHT INDEX SWAPS

An overnight index swap is a financial transaction where one party receives a periodic fixed payment referencing a formula which represents the compounded reference overnight interest rate for the given period. An OIS allows a market participant to exactly hedge their funding exposure into a fixed rate. The fixed rate payer/ floating rate receiver is called the Payer and the fixed rate receiver/floating rate payer is called the Receiver. There is usually one settlement of net cash flows at the maturity of the deal. The settlement amount is the net of the amount that is accrued on the fixed leg (simple interest calculation) and the amount that is accrued on the floating leg (a daily compounded rate of the variable rate).

The floating rate calculus can be expressed as follows:

FR = ER x nd/basis

FR = Floating Rate

ER=Effective Rate or = return on overnight rate rollovers or = (1+R1*1/basis)(1+R2*1/basis)(1+R3*1/basis)…..-1

R1 = day 1 overnight reference rate, R2 = day 2 overnight reference rate, etc.

nd = number of days of the swap

basis = day count convention

E.g., a bank enters into the following swap agreement:

Tenor: 1 Week (7 days), Notional: $100,000,000, Bank pays: Fixed rate of 0.15%, Bank receives: daily compounded DTCC GCF Repo Index® average, settlement: at maturity. Day convention:360

DTCC GCF Repo Index® rates recorded that week – Monday 0.161, Tuesday 0.143, Wednesday 0.147, Thursday 0.152, Friday 0.138.

FR = (1+0.00161x1/360)x(1+0.00143x1/360)x(1+0.00147x1/360)x(1+0.00152x1/360) x(1+0.00138x3/360-1)x360/7

FR = (1.00002825 – 1)x360/7

FR = 0.0014529 or 0.145% Rounded

Final payment = $100,000,000 x (0.15% - 0.145%)x 7/365

Bank pays = $91.63

HEDGING OIS

When an Overnight Index swap is priced by referencing the DTCC GCF Repo Index® they may also be hedged with futures contracts referencing the same index.

Fixed rate payers (floating rate receivers) are exposed to the risk of falling rates and rising prices and would buy Futures on the DTCC GCF Repo Index® as a hedging strategy. Similarly, fixed rate receivers (floating rate payers) are exposed to the risk of rising rates and falling prices and would sell Futures on the DTCC GCF Repo Index® as a hedging strategy.

Fixed rate payers hedge risk of falling rates > Buy futures

Fixed rate receivers hedge risk of rising rates > Sell futures

U.S. FEDERAL RESERVE MONETARY POLICY

Traditionally, the Federal Reserve targeted the federal funds rate as a transmission mechanism for its monetary policy stance across the interest rate curve. Post 2008 financial crisis, the Federal Reserve has highlighted that the federal funds rate may not be the best indicator of short term interest rates. The recent FOMC meeting minutes released in May 2013[1] "raised the possibility that the federal funds rate might not, in the future, be the best indicator of the general level of short-term interest rates, and supported further staff study of potential alternative approaches to implementing monetary policy", and a Federal Reserve staff white paper[2] concludes that, with the federal funds market hypothetically becoming less relevant with the inception of Basel 3 (LCR), a target "general collateral repo rate" can prove to be a more effective policy tool because of the broader set of repo market participants than federal funds limited depository institutions and GSE participants. In a follow up to these statements and indicative of the roll that a Repo index may have in the implementation of monetary policy, the minutes of the July 2013 FOMC meeting[3] offered the following - "In support of the Committee's longer-run planning for improvements in the implementation of monetary policy, the Desk report also included a briefing on the potential for establishing a fixed- rate, full-allotment overnight reverse repurchase agreement facility as an additional tool for managing money market interest rates. The presentation suggested that such a facility would allow the Committee to offer an overnight, risk- free instrument directly to a relatively wide range of market participants, perhaps complementing the payment of interest on excess reserves held by banks and thereby improving the Committee's ability to keep short-term market rates at levels that it deems appropriate to achieve its macroeconomic objectives."

Though the future method for transmission of monetary policy stance remains unknown at this time given the current questionable relevance of the Fed Funds rate, the GCF Futures reference curve has become a leading indicator for shifts in short term interest rates. As the Federal Reserve begins to remove its extraordinary monetary intervention, traders can use the futures to express opinions about shifts in Federal Reserve interest rate policy. The perceived change in interest rates will reflect in the deferred months of the futures on the DTCC GCF Repo Index® contract strip.

CONCLUSION

GCF Futures have become an essential tool for institutional market participants to hedge their short term interest rate risk. Equally, as discussed above, they offer tremendous utility for arbitrage activity and expressing interest rate opinions. To learn more about this product, visit:

https://www.theice.com/productguide/ProductSpec.shtml?specId=31500931

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1. "Minutes of the Federal Open Market Committee April 30-May 1, 2013"
http://www.federalreserve.gov/monetarypolicy/files/fomcminutes20130501.pdf

2. "Is a target repo rate a viable alternative to the target federal funds rate?" Klee and stebunovs, September 2011

3. "Minutes of the Federal Open Market Committee July 30-31, 2013"
http://www.federalreserve.gov/monetarypolicy/files/fomcminutes20130731.pdf

APPENDIX

Table 1 – U.S. Treasury DTCC GCF Repo Index® Contract Specifications

ICE FUTURES EUROPE

ICE Futures Europe
Jun 27, 2014

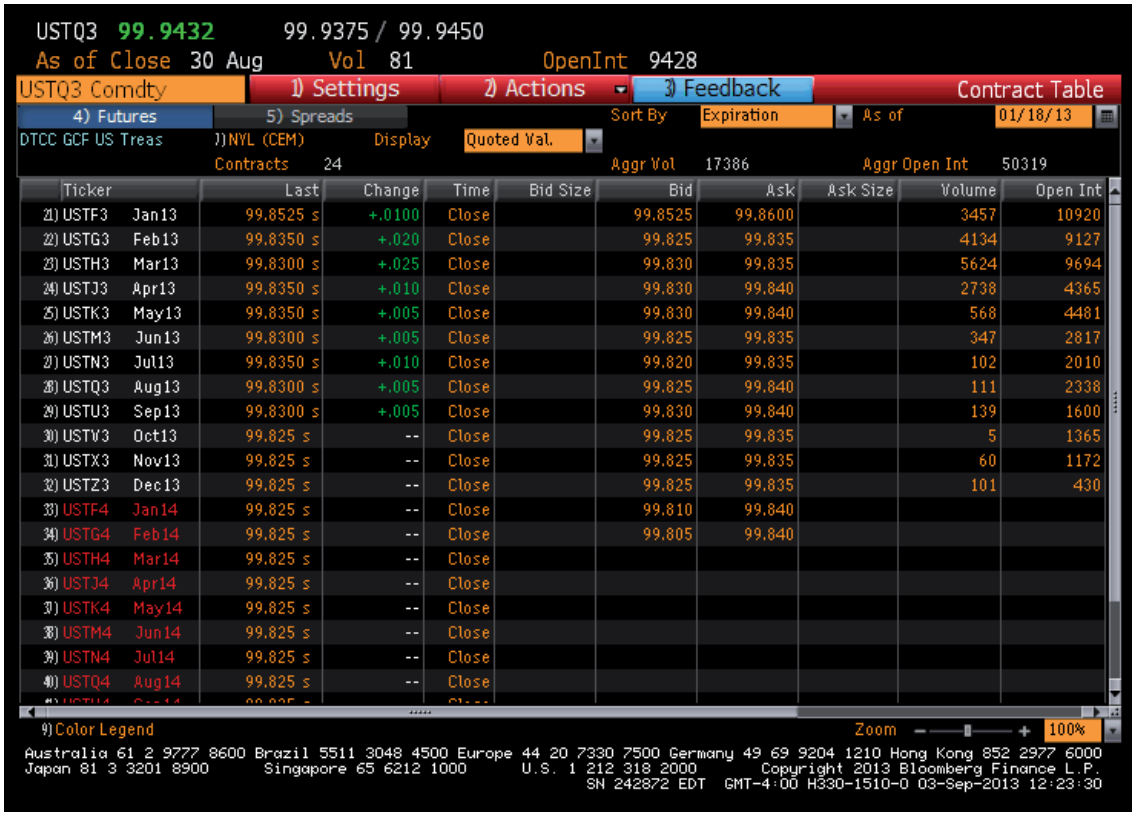
ICE FUTURES EUROPE

U.S. Treasury DTCC GCF Repo Index®

Contract Specifications

Description	A cash settled future based on the U.S. Treasury DTCC GCF Repo Index®
Contract Symbol	RPT
Contract Months	24 Consecutive Monthly Contracts
Trading Hours	7:45pm – 5:00pm Eastern (New York) Time, Sunday – Friday. Market pre-open at 7:30pm ET, Sunday – Friday.
Last Trading Day	Last business day of the contract month at 3:00pm New York Time.
Contract Size	Interest on the U.S. Treasury DTCC GCF Repo Index having a face value of $5,000,000 for one month calculated on a 30-day basis at a rate equal to the average U.S. Treasury DTCC Repo Index® rate for the contract month.
Currency	US Dollars and cents
Trading Price Quotation	100 minus the corresponding average daily U.S. Treasury DTCC GCF Repo Index® rate for the contract month.
Tick Size	One-half of one basis point (0.005) or $20.835 per contract.
Daily Settlement Price Quotation	One-half of one basis point (0.005) or $20.835 per contract.
Final Settlement Price Quotation	1/100 of one basis point (0.0001) or $0.4167 per contract
Floating Price	In respect of daily settlement, the Floating Price will be determined by ICE using price data from a number of sources including spot, forward and derivative markets for both physical and financial products

Table 2 – Bloomberg, usTA Commodity, Futures Contract Table



USTQ3 99.9432 99.9375 / 99.9450
As of Close 30 Aug Vol 81 OpenInt 9428

USTQ3 Comdty | 1) Settings | 2) Actions | 3) Feedback | Contract Table

4) Futures | 5) Spreads | Sort By: Expiration | As of: 01/18/13

DTCC GCF US Treas | 1)NYL (CEM) | Display: Quoted Val.

Contracts 24 | Aggr Vol 17386 | Aggr Open Int 50319

	Ticker		Last	Change	Time	Bid Size	Bid	Ask	Ask Size	Volume	Open Int
21)	USTF3	Jan13	99.8525 s	+.0100	Close		99.8525	99.8600		3457	10920
22)	USTG3	Feb13	99.8350 s	+.020	Close		99.825	99.835		4134	9127
23)	USTH3	Mar13	99.8300 s	+.025	Close		99.830	99.835		5624	9694
24)	USTJ3	Apr13	99.8350 s	+.010	Close		99.830	99.840		2738	4365
25)	USTK3	May13	99.8350 s	+.005	Close		99.830	99.840		568	4481
26)	USTM3	Jun13	99.8300 s	+.005	Close		99.825	99.835		347	2817
27)	USTN3	Jul13	99.8350 s	+.010	Close		99.820	99.835		102	2010
28)	USTQ3	Aug13	99.8300 s	+.005	Close		99.825	99.840		111	2338
29)	USTU3	Sep13	99.8300 s	+.005	Close		99.830	99.840		139	1600
30)	USTV3	Oct13	99.825 s	--	Close		99.825	99.835		5	1365
31)	USTX3	Nov13	99.825 s	--	Close		99.825	99.835		60	1172
32)	USTZ3	Dec13	99.825 s	--	Close		99.825	99.835		101	430
33)	USTF4	Jan14	99.825 s	--	Close		99.810	99.840			
34)	USTG4	Feb14	99.825 s	--	Close		99.805	99.840			
35)	USTH4	Mar14	99.825 s	--	Close						
36)	USTJ4	Apr14	99.825 s	--	Close						
37)	USTK4	May14	99.825 s	--	Close						
38)	USTM4	Jun14	99.825 s	--	Close						
39)	USTN4	Jul14	99.825 s	--	Close						
40)	USTQ4	Aug14	99.825 s	--	Close						

9) Color Legend | Zoom 100%

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