Interest Rate Swap Futures

Eris Standards, Flexes & Deliverable Swap Futures

John Coleman

SVP, MD Fixed Income Group

R.J. O'Brien & Associates

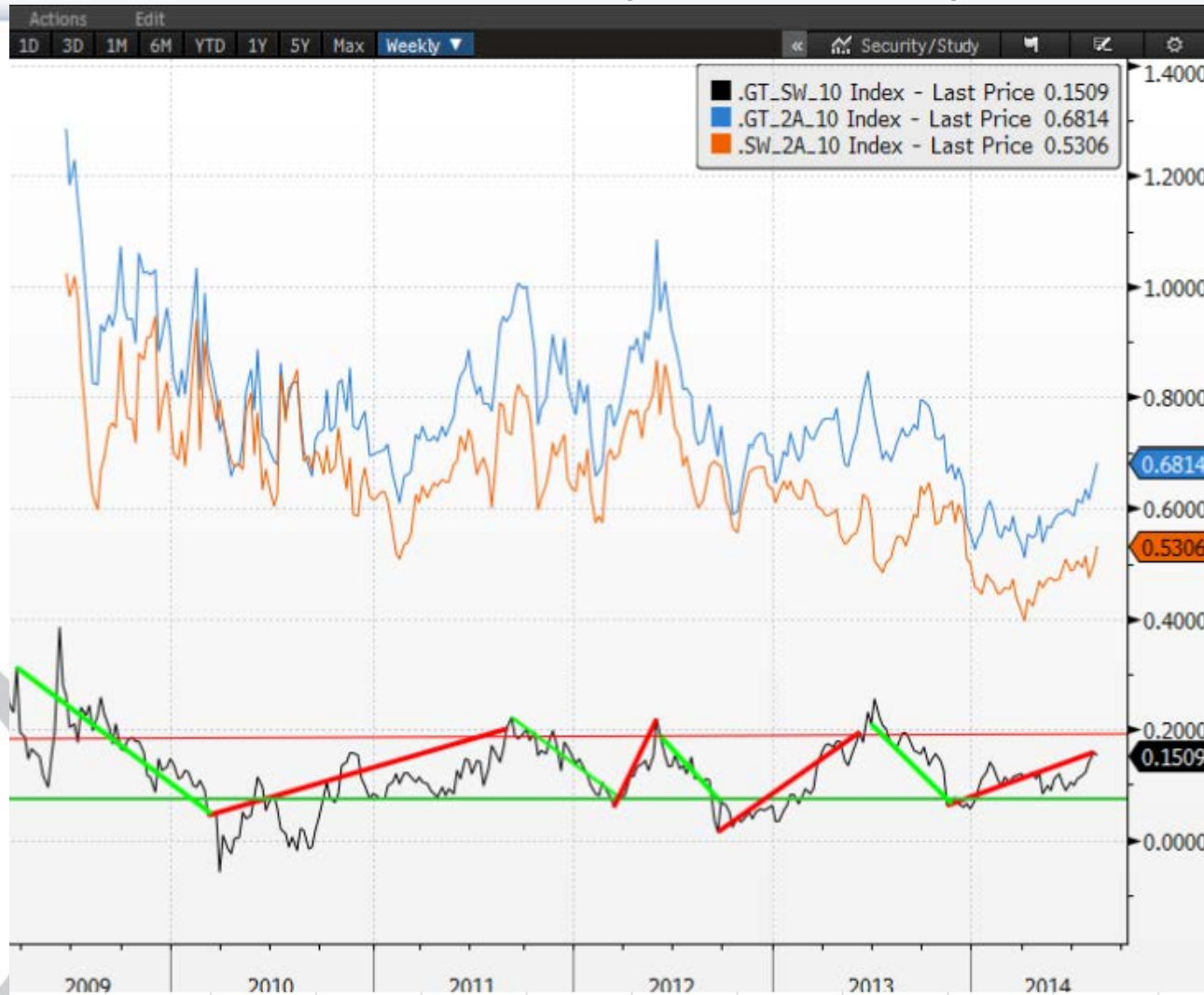# The Fixed Income Group at RJO Sells Futures: Exchange-Cleared Products Only

Institutional Clients Only, Swap-Related Futures:

- **15-20%+ Open Interest in Eris & DSF**

- **+/-250K ED$ Clearing RJO**

  - **Leveraged Entities: REITs, HFs, Street, BDs, US Gov't Entities**

  - **Fixed Income Portfolios: Insurance Co's, Mutual & Pension Funds**

  - **Loan Originators and Servicers: Residential & Commercial Mortgage, Auto, SBA**

Do I *Really Need The Ability To Hedge With* SWAP FUTURES?

- Swap Futures are a new tool to add to your hedge toolbox. Swap Futures aren't a product to replace Government Futures— When used with Govies, Swap Futures will allow Managers/Traders to exploit/defend spread exposure without having to make huge duration or curve bets.

- If it's a **Govie, Cash or Future, the SHORT pays carry** & that can be a return-crusher. **Eris Standards do NOT have a carry effect.**

- CREDIT!- Improve correlations with tighter credit match using Eris Swap Futures.

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AA Corps vs Govies (ex-carry) in Blue
AA Corps vs Swaps in Orange

.GT_SW_10 Index - Last Price 0.1509
.GT_2A_10 Index - Last Price 0.6814
.SW_2A_10 Index - Last Price 0.5306

SINCE "THE CRISIS"-

(see lowest graphic)

There have been both short-term and protracted periods where hedging with:

Govt's outperformed (green trend lines)

Swap Futures outperformed (red trend lines)

SWAP FUTURES ARE AN ALPHA SOURCE & CRITICAL TO SUPERIOR PERFROMANCE!

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In the Beginning…

- **Original D/F color: SEFs, SDRs, FCMs thru CCPs, Compliance Trails, Auditing, Reporting and more**
  - Street M.O.: "Get that $35-$50bb back– or a bunch of it."
  - The Vision: ATM on steroids. A fee-s(p)itting behemoth.
  - Swap Clearing Engines Built: BIG, SHINY, *EXPEN$IVE*
- **The "Shocker"– One day, this contract showed up**
- **A guy named Don and his "perma-future" upgrade**
- **The unfolding destiny of the cleared OTC swap**
  - The Reality: Saffron in the spice cabinet, not flour in the bakery
  - The Response: "Put some lipstick on that pig and sell it!"
  - **The Outcome: BoNY, State Street, Nomura, RBS– OUT! Too $$$ to compete w futures**

  →The "look" at this point is that cleared swaps are a fabulous product– but ideal for a small percentage of end-users OR necessary as a very thin sliver of highly specific hedges when combined with lower-margined swap futures. Right product all along– gross miscalculation of percent of market.

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The R.J. O'Brien Decision

- **The Challenge:** How to "do" virtually everything that can be done using cleared OTC swaps with greatest cost and capital efficiency for both Customers and RJO.

- **The Solution:** Combine Eris Standards + Eris Flexes + Deliverable Swap Futures (DSFs) and Eurodollars to replicate anything clear-able elsewhere. **Build it- don't buy it.** Lower the margins & costs, increase the liquidity & transparency, and maintain full D/F compliance without more than a trade ticket. It's what futures are- hedge building blocks.

- **The Truth:** RJO is a pure agency FCM– no dealer. We never made a chunk of the $35-$50bb/year that was lost with the elimination of OTC execution ("trading profits"). We got lucky– we didn't chase what we never had. Second mouse gets the cheese.

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Trading Knowledge: Liquidity

- Both DSF and Eris Swap Futures DO NOT yet trade around the clock like Treasury Futures
  - Liquidity/Streaming markets: Just after 7am to 4pm Central; M-F, U.S. business days. Very limited liquidity in DSF during off-hours
    - Morning Fed O/N mark limits opening due to curve valuation
  - Depth, even markets at all, fall off prior to Econ Releases– more like cash; less like Treasury Futures
  - Very low (relative to SEF execution and other interest rate futures) block trade thresholds
    - Via RJO or non-bank FCM: pick your competing brokers
    - Enables "packaging" of irregular curve trades on small (adjustment basis) or massive (whole portfolio immunization or hedge re-allocation)

- Executable via voice or e-platform
  - Trading Technologies, EMSX/Bloomberg (via TT), other 3rd Party fronts
  - Back office systems issues: TOMS still an issue for Eris. Smaller vendors slow to accommodate.

Trading Knowledge: HUGE!

- Eris Standards and Flexes: Fixed-Payer Vantage Point–
  - **BUY ERIS = SHORT DV'01**
  - **SELL ERIS = LONG DV'01**
- Deliverable Swap Futures
  - **BUY DSF = LONG DV'01**
  - **SELL DSF = SHORT DV'01**

  → YES, this difference gets its own slide

Why FIG @ RJO Prefers Eris

- Consistently better bid/ask & tighter execution levels (not limited to 32nds, 64ths, etc)

- Rolls down maturity curve (like assets)

- Doesn't mandate "a roll"– often not needed market friction (bid/ask) & book-keeping work

- Visible, tangible, trade-able off-the-run curve; improves bullet hedge accuracy, creates transparent valuation/discounting spine for assets

- Single line item valuation AND capable of being split to Pay/Receive for accounting

- Stays as 2-day HVAR futures margin

- Doesn't go into cost-machine (i.e. cleared swap)

- PAI correction reduces futures margin convexity effect and gives contract trading closer look/feel to OTC

Why FIG @ RJO
Does NOT Use Eris Solely

- Back office systems– DSF was built to feed into cleared swaps. Many systems "built out" for DSF too early and are slow in upgrading to Eris.

- Clients "like" the look of a bond price versus the "raw" NPV of Eris. This is goofy but, what the client wants… AND TMX WILL DELIVER Eris in the PRICE format

- Previously, DSF traded in PIT along side of Treasury Futures– spread markets were very competitive. (PIT closed but routine established)

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Capital Efficiency: Margining

- IRS transaction that is uncleared:
  - Margin = 10-day HVaR ($\approx$ 5+ TIMES swap futures)

- Cleared OTC IRS transaction
  - Margin = 5-day HVaR ($\approx$ 2 TIMES swap futures)

- Swap Futures (Eris and DSF)
  - Margin = 2-day HVaR

- Equal Tenor Eris and DSFs have same margin
  - 10yr ERIS STANDARD Margin = 10yr DSF Margin

Liquidity & Margin Optimized Curve & Quality Spread Alternatives

Sample Offsets

Eris Standards vs. Eris Flexes

5Y x 5Y	Margin
5Y Eris Standard	$ 2,800,000
5Y Eris Flex	$ 2,805,241
Portfolio	$ 38,244
Margin (% of Tot Notional)	< 0.1%
Margin Savings	**99%**

10Y x 10Y	Margin
10Y Eris Standard	$ 1,950,000
10Y Eris Flex	$ 2,946,479
Portfolio	$ 95,248
Margin (% of Tot Notional)	< 0.1%
Margin Savings	**98%**

Intra-Eris Curve Trading

5Y x 10Y	Margin
5Y Eris Standard	$ 2,800,000
10Y Eris Standard	$ 1,950,000
Portfolio	$ 1,915,000
Margin (% of Tot Notional)	0.6%
Margin Savings	**60%**

Fwd Starting Steepener	Margin
1Y x 5Y Eris Flex	$ 5,045,727
1Y x 6Y Eris Flex	$ 3,224,764
Portfolio	$ 514,413
Margin (% of Tot Notional)	0.1%
Margin Savings	**94%**

Eris vs. ED & Treasury Futures

Eris x Eurodollar Strip	Margin
2Y Eris Standard	$ 1,375,000
2Y ED Strip	$ 1,327,500
Portfolio	$ 1,809,500
Margin (% of Tot Notional)	0.2%
Margin Savings	**33%**

Eris x Treasury Future	Margin
7Y Eris Standard	$ 2,400,000
10Y Tsy Futures	$ 1,880,625
Portfolio	$ 1,888,125
Margin (% of Tot Notional)	0.7%
Margin Savings	**56%**

Eris Standards vs. CME DSF

5Y x 5Y	Margin
5Y Eris Standard	$ 2,800,000
5Y CME DSF	$ 2,800,000
Portfolio	$ 560,000
Margin (% of Tot Notional)	0.1%
Margin Savings	**90%**

10Y x 10Y	Margin
10Y Eris Standard	$ 1,950,000
10Y CME DSF	$ 1,950,000
Portfolio	$ 390,000
Margin (% of Tot Notional)	0.2%
Margin Savings	**90%**

- Based upon approximately $100k of DV01
- Margin offsets available for all customer and house accounts

Total margin is 80% less than a portfolio of IRS and 5Y Treasury futures that are held at different clearinghouses

as of 03/03/14

Eris Exchange
The Future of Swaps

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Swap Futures Basics: ATM Coupon => NPV is ZERO

Start with an IMM-Dated Fixed-Pay Swap

**Fixed Leg: Semi-An
Float Leg: Quarterly**

Since Coupon is At-The-Money: 1.927%

NPV is C$ 0.00

Screenshots from Bloomberg™ SWPM swap calculator screens

Swap Futures Basics: Fixed Standard Coupon

Screenshots from Bloomberg™ SWPM swap calculator screens

TMX will choose a Near-The-Money Coupon

2% as an example

A single trading futures coupon concentrates liquidity

If the Coupon is always Fixed, the NPV will be ATM variable.

NPV determines PRICE

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Swap Futures Basics: NPV From Hypothetical Forward Cash Flows

Enter all values and hit <Go>.

Pay Date	Payments(Rcv	Payments(Pay	Net Payments	Discount	Zero Rate	PV
12/16/2015	-100,000.00	100,000.00	0.00	0.999247	0.483482	0.00
03/16/2016	192.97	0.00	192.97	0.998103	0.469501	192.60
06/16/2016	187.59	-1,002.74	-815.15	0.996977	0.461519	-812.69
09/16/2016	186.22	0.00	186.22	0.995885	0.454410	185.45
12/16/2016	188.77	-1,002.74	-813.97	0.994641	0.464197	-809.60
03/16/2017	196.63	0.00	196.63	0.993236	0.483505	195.30
06/16/2017	215.76	-997.26	-781.50	0.991704	0.503238	-775.02
09/18/2017	244.71	0.00	244.71	0.990040	0.524869	242.27
12/18/2017	257.41	-1,013.70	-756.29	0.988237	0.548812	-747.39
03/16/2018	266.09	0.00	266.09	0.986330	0.573041	262.45
06/16/2018	298.51	-997.26	-698.75	0.984164	0.601544	-687.68
09/17/2018	302.88	0.00	302.88	0.981944	0.627800	297.41
12/17/2018	325.97	-997.26	-671.29	0.979425	0.659769	-657.48
03/18/2019	346.39	0.00	346.39	0.976642	0.695227	338.30
06/17/2019	361.87	-997.26	-635.39	0.973700	0.730531	-618.68
09/16/2019	377.18	0.00	377.18	0.970604	0.765672	366.09
12/16/2019	408.64	-997.26	-588.62	0.967262	0.802979	-569.35
03/16/2020	436.17	0.00	436.17	0.963698	0.841615	420.34
06/16/2020	458.94	-1,002.74	-543.80	0.959930	0.879436	-522.01

NPV -693.49

Screenshots from Bloomberg™ SWPM swap calculator screens

So, the NPV is the SUM of the Present Values of the Fixed and Floating Pay/Receive Amounts– Using 2% for the Fixed Coupon (herein) and Forward CDOR for the Floating Rates

AS CDOR CHANGES, SO DOES THE NPV OF THE FUTURE

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Swap Futures Basics:
ERIS Future's PRICE

Future's Price is:
[100,000+NPV]/1,000

So, 100,000+(-693.49) = 99,306.51
99,306.51 / 1,000 = 99.30651

Current DEC'15 10year Swap Future's PRICE = 99.30651

Screenshots from Bloomberg™ SWPM swap calculator screens

PV'01

- **PV'01 Critical Value: The PV'01 is the CHANGE IN NPV when the FIXED LEG COUPON is changed by 1 basis point. (i.e. Move fixed coupon from 2.00% to 1.99%. How much does NPV change? Answer is PV'01**

- **PV'01 allows for simple calculation of ATM yield on Swap Futures:**

  CURRENT YIELD SWAP FUTURE = COUPON +/- [(NPV ÷ PV'01)/100]

Swap Futures Basics: What's the Yield?

To Calculate ERIS FUTURES EQUIVALENT YIELD, THREE Values Needed:

1) Future's PRICE   **2) Future's COUPON**   **3) PV'01**

99.30651   **2.00%**   **$95.53/bp**

-Calculate NPV=> **99.30651** – 100.000 = -0.69349   NPV = 1,000 x -0.69249 = -$693.49

-Calculate NPV effect on Fixed Coupon=> NPV / PV'01 = Coupon Effect:

     -$693.49 / **$95.53** per bp = -7.244 bps

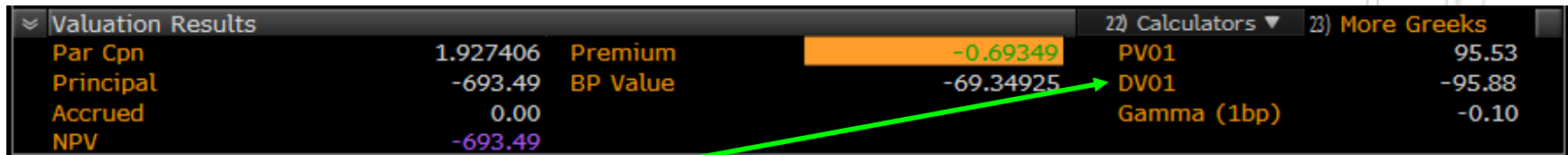-Calculate ATM Coupon from Fixed Coupon=> **2%= 200bps** & NPV Effect = -7.244 bps

     SO FUTURE'S YIELD IS: 200bps – 7.25939bps = 192.7406 basis points

OR 1.927406%

Valuation Results				22) Calculators ▼	23) More Greeks	
Par Cpn	1.927406	Premium	-0.69349	PV01		95.53
Principal	-693.49	BP Value	-69.34925	DV01		-95.88
Accrued	0.00			Gamma (1bp)		-0.10
NPV	-693.49					

Screenshots from Bloomberg™ SWPM swap calculator screens

DV'01

Valuation Results				22) Calculators ▼	23) More Greeks	
Par Cpn	1.927406	Premium	-0.69349	PV01		95.53
Principal	-693.49	BP Value	-69.34925	DV01		-95.88
Accrued	0.00			Gamma (1bp)		-0.10
NPV	-693.49					

Screenshots from Bloomberg™ SWPM swap calculator screens

The DV'01, or Interest Rate Sensitivity, is no more than:

   The Change in the Future's Price given a 1-basis point change in yield
   DV'01 is positive for the Receiver/Eris Short & negative for the Payer/Eris Long

The DV'01 is the primary ratio for hedging interest rate risk:

   Post-Hedge Risk = DV'01 (asset) +/- DV'01 Futures

Generically, "Duration" for Swap Futures is:

   DV'01 Future / 10 = Duration (from DV'01=Price X Duration w/Price ATM~par)

Easy Example: Rate Risk Hedge

- **Manager BUYS $20mm XYZ 5yr at 2.97%. Wants to immunize half of the risk.**

- **XYZ DV'01 = $500/$1mm →**
  - **$20mm = $10,000/basis point risk**

- Eris 5yr with 2% Coupon
  - DV'01 = $50.52
  - PV'01 = $50.00

- So, (½) XYZrisk = ($5,000 dv'01)/(Eris $50.52 dv'01) →
  - Hedge=$5000/$50.52=~99 **So, BUY 99 ERIS 5yr**

- **Manager Buys (buy = short dv'01) 99 ERIS 5yr Futures to approximately hedge 50% of the XYZ rate risk**

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Easy Example: Calc Hedge Yield

- Eris 5yr 2% Coupon
- Eris 5y PV'01 = $50.00
- Eris 5y Executed (Price bought): 99.000
- NPV = 1000*(99.000-100.000)= -$1,000
- [(Coupon in bps)+(NPV÷PV'01)]/100= Eris Rate
- So: [(200bps)+(-$1000/($50/bp)]/100= 180bps
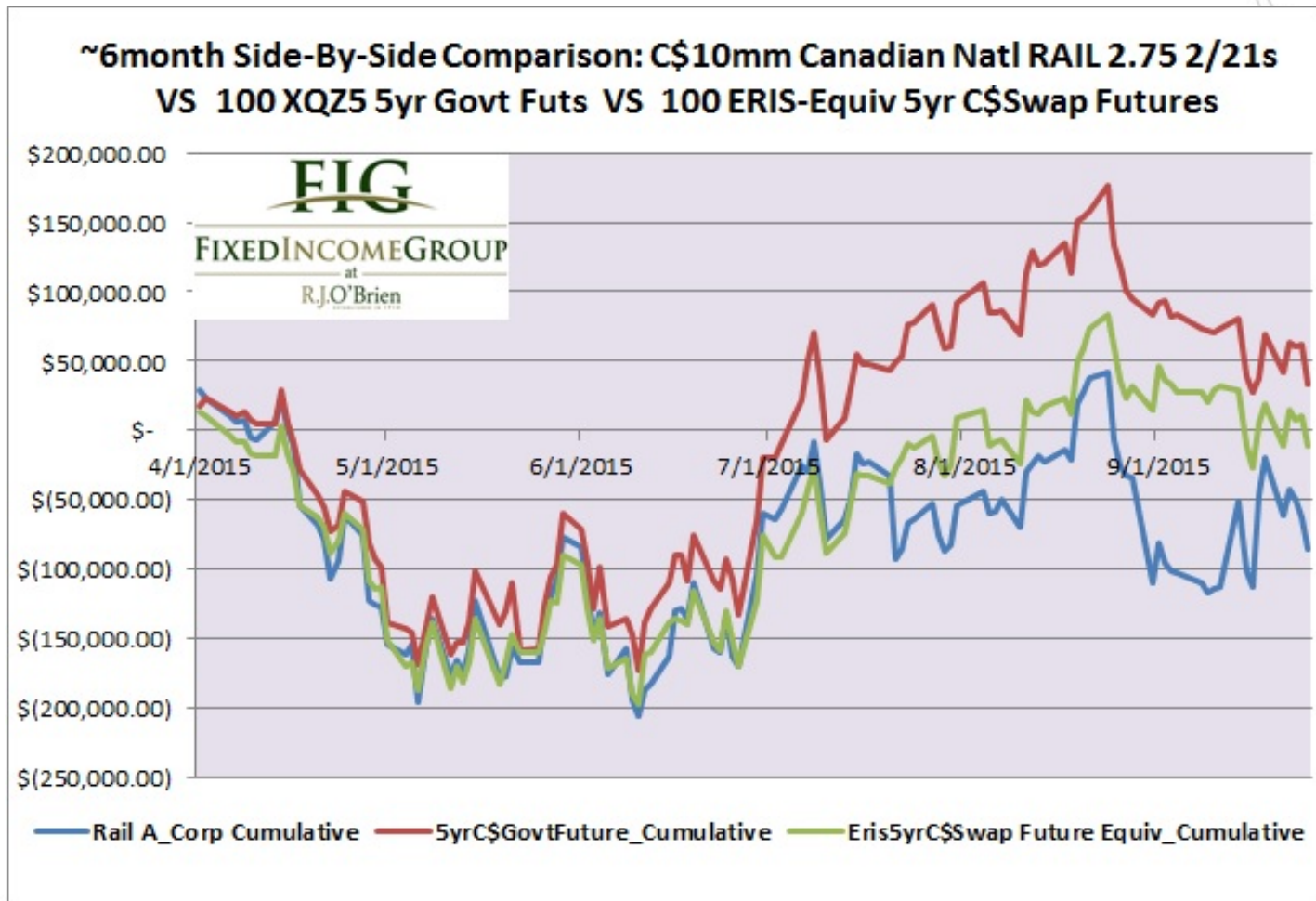 - Or, The Rate Fixed by Buying Eris 5y at 99.000 NPV is 1.80%

Curve & Valuation

- **Prior to FUTURES last settlement date, Eris & DSF trade to NPV: Open Market, Actionable Bid/Ask, Anonymous, Face CME CCP**

- Begin/End of Day Yield Curve Valuation

   ftp://ftp.erisfutures.com → Dates, Rates, Discount Factors
   - CME Valuation Curve for ALL Cleared Swaps and Swap Futures-Settlement; Daily Eris Settles

- AFTER futures period:
   - DSF converts to OTC Cleared, Initial Margin roughly doubles to 5-day HVaR, Payments Made/Taken on Float and Fixed Pay/Receive dates.
   - Eris standards become Eris 'Aged Standards' and persist as a future. Margin remains 2-dHVaR but same as for tenor of original future for each year. Pay/Rec payments are averaged over the period and directly adjusted in daily price settlement. PAI (Synthetic O/N Interest on Variation) added. "Dirty Price"= NPV+Daily %Pay/Rec+PAI– Identical to total cash flows of OTC Swap (see AWESOME white paper ErisFutures.com).
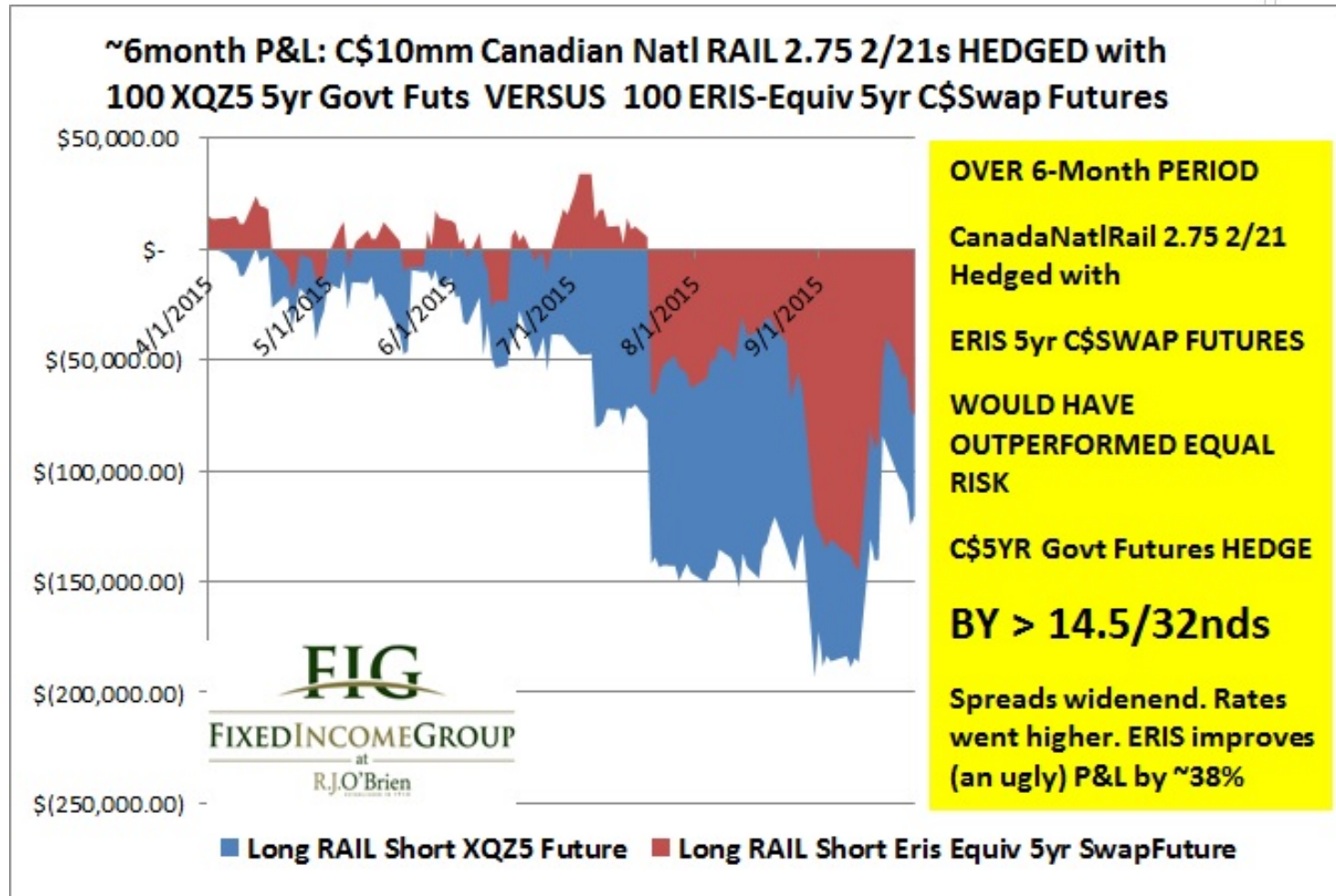
Bullet Asset Hedging

- Standards & DSFs as LIBOR-Based Duration Immunization Choice

- "In-Lieu-Of" Non-Treasury Credit Exposure
  - Investment & Liquidation A/L Control

- Off-the-run Aged Standards- All-Rate duration amortizers: Curve Buildout

- Flex + Swap Futures for ⬆
  - Capital Efficiency & Max Liquidity **on bulk of duration**
  - Precision if and where required

Real Life, Real Time Example:
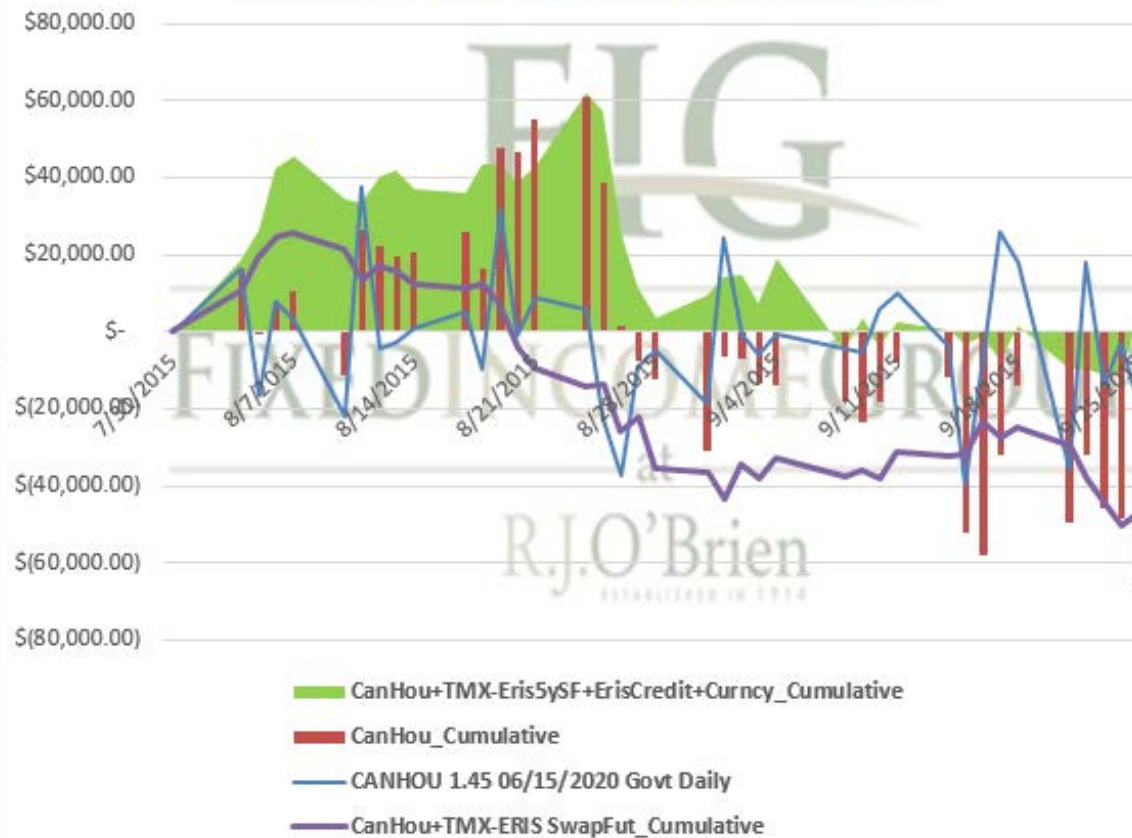# Hedging a Canadian National Rail Bond

~6month Side-By-Side Comparison: C$10mm Canadian Natl RAIL 2.75 2/21s VS 100 XQZ5 5yr Govt Futs VS 100 ERIS-Equiv 5yr C$Swap Futures

Well, How Did an Eris Hedge Perform Relative to a XQZ5 5yr C$Govt Hedge?

~6month P&L: C$10mm Canadian Natl RAIL 2.75 2/21s HEDGED with 100 XQZ5 5yr Govt Futs VERSUS 100 ERIS-Equiv 5yr C$Swap Futures

OVER 6-Month PERIOD

CanadaNatlRail 2.75 2/21 Hedged with

ERIS 5yr C$SWAP FUTURES

WOULD HAVE OUTPERFORMED EQUAL RISK

C$5YR Govt Futures HEDGE

BY > 14.5/32nds

Spreads widenend. Rates went higher. ERIS improves (an ugly) P&L by ~38%

■ Long RAIL Short XQZ5 Future ■ Long RAIL Short Eris Equiv 5yr SwapFuture

FIG
FIXED INCOME GROUP
at
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Hedge Canada Housing 5yr With TMX-Eris 5yr SwapFut & Eris IG Credit Swap Future

5yrCanHou 1.45 6/20 Hedged for:
Rates Only w/TMX-ERIS 5yr Swap Future &
Rates+Credit w/TMX-Eris5ySF & Eris IG

With Rate & Credit Hedge- No problem

With Rate Hedge- Less Nasty

Outright LONG was OUCH!

- CanHou+TMX-Eris5ySF+ErisCredit+Curncy_Cumulative
- CanHou_Cumulative
- CANHOU 1.45 06/15/2020 Govt Daily
- CanHou+TMX-ERIS SwapFut_Cumulative

NOT a Gratuitous Marketing Pitch

- Our group has a variety of models AND you can make these too with Eris Swap Futures:
  - Relative Hedge Value/Best Execution
  - Portfolio Risk/Curve/Credit Management
  - MTM Asset Discounting & Valuation from traded and settled swap curves
  - Amortizing Asset & Portfolio Hedging
    - Ex-Ante accounting documentation
    - Yield Spread Optimization
    - Gap Funding Analysis

SwapMon

The Fixed Income Group at RJO Utilizes Bloomberg™ API Calls For Real-Time Monitoring of

**ERIS Standard vs DSF**

Relative Yield Value & Liquidity-at-Price.

Pinpoint Best-Ex Alternative, Actionable Size, $/contract advantage, Real-Time DV'01 & Convexity Updating.

ERIS provides comprehensive live spreadsheets for virtually all intermarket relationships.

SHORT DV'01 — Pay FIX

								DV'01	CVXTY
2yr DSF Mar 14	0.750%		0.48835%	100'16.75	1000	Adv/cont		-20.38	-0.0051
2Y Eris Stnd Mar 14	0.750%	BUY	0.48400%	-32	2,500	$	9	-20.31	-0.0051
5yr DSF Mar 14	2.000%		1.63871%	101'24.5	771	Adv/cont		-51.98	-0.0284
5Y Eris Stnd Mar 14	1.750%	BUY	1.63643%	-555	1,500	$	11	-51.63	-0.0282
7Y Eris Stnd Mar 14	2.250%	BUY	2.23204%	-120	750			-69.49	-0.0517
10yr DSF Mar 14	3.250%		2.78613%	104'7.5	645	Adv/cont		-96.18	-0.0981
10Y Eris Stnd Mar 14	3.000%	BUY	2.78528%	-1,960	750	$	8	-94.97	-0.0972
30yr DSF Mar 14	3.750%		3.58974%	103'16	200	Adv/cont		-227.21	-0.5159
30Y Eris Stnd Mar 14	3.750%		3.58974%	-3,500	250	$	-	-227.21	-0.5159

LONG DV'01 — Receive Fixed

								DV'01	CVXTY
2yr DSF Mar 14	0.750%		0.48054%	100'17.25	500	Adv/cont		20.38	0.0051
2Y Eris Stnd Mar 14	0.750%	SELL	0.48101%	-38	5000	$	1	20.31	0.0051
5yr DSF Mar 14	2.000%		1.63232%	101'25.5	540	Adv/cont		51.98	0.0284
5Y Eris Stnd Mar 14	1.750%	SELL	1.63337%	-570	1500	$	5	51.63	0.0282
7Y Eris Stnd Mar 14	2.250%		2.22755%	-150	1250			69.49	0.0517
10yr DSF Mar 14	3.250%	BUY	2.78270%	104'8.5	27	Adv/cont		96.18	0.0981
10Y Eris Stnd Mar 14	3.000%		2.78090%	-2,000	750	$	16	94.97	0.0972
30yr DSF Mar 14	3.750%	BUY	3.58688%	103'18	61	Adv/cont		227.2	0.5159
30Y Eris Stnd Mar 14	3.750%		3.58608%	-2,000	750	$	18	227.2	0.5159

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RiskBuilder– Visualizing Hedge Impact
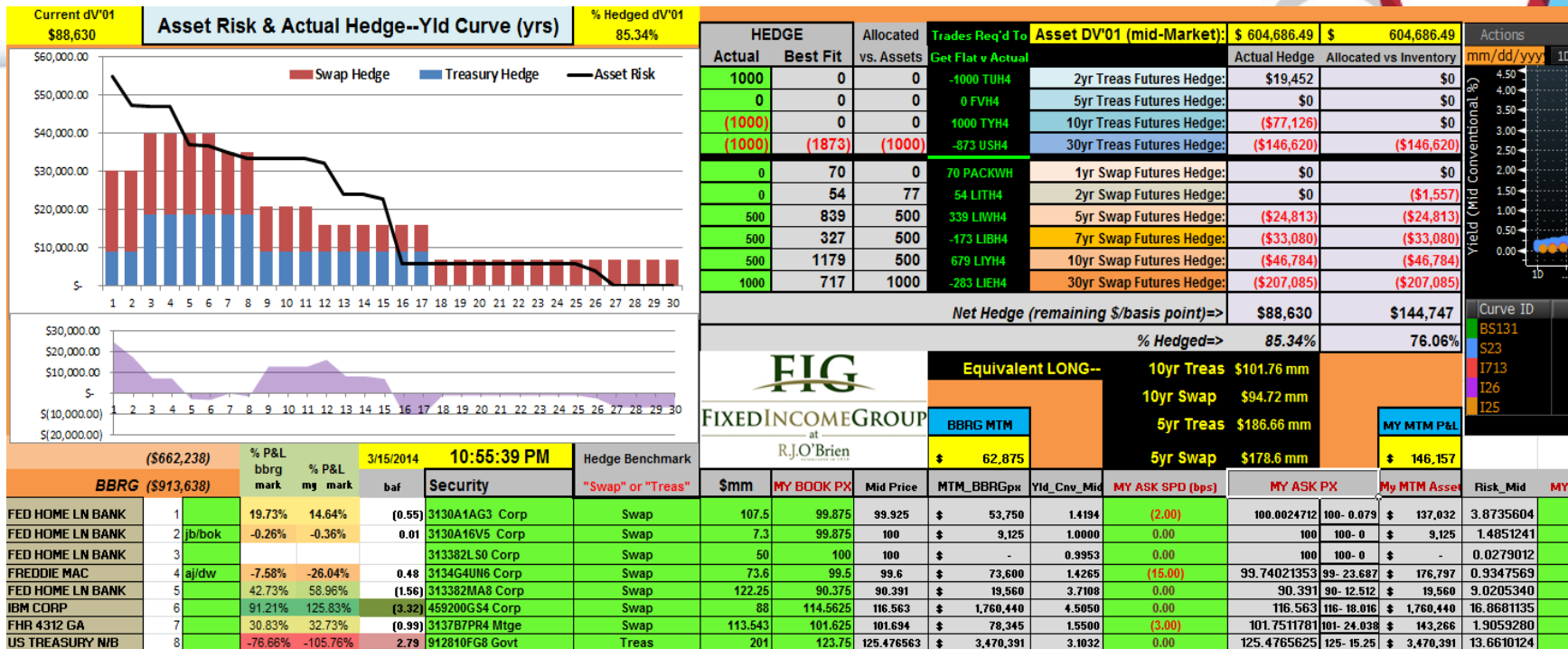
Simple DV'01, Single-Point (benchmark) Hedging For Fixed Income Portfolios

-Allows traders to gain familiarity with Swap (combined with Treasury) Futures Risk Metrics

-Cusip & Credit Basis (Swap or Treas) ONLY Required Inputs

- Hedge Product, Curve Location and DV'01 Neutral Quantity Suggested

- Trader Override Allowed To Isolate Curve and Credit Spread Biases

- Graphic Display: Each Year's Cumulative Portfolio DV'01 Exposure, Differentiated Treasury & Swap Hedge Contribution, Vertical (vs Key Rate) DV'01 Risk Netting for Easy Visualization of Residual Curve Exposure

HedgeBuilder

The Fixed Income Group's Amortizing Hedge Generator

==========================

RMBS/CMBS/AUTO/Whole Loan

==========================

Hedger Inputs-

- **WAC**
- **WAM**
- **WALA**
- **CURRENT FACE**
- **CPR Ramp or Static Speed**
- **ERIS or DSF Swap Future**

For Up to 24 Individual Classes

Cumulative Portfolio Hedge (or Adjustment) is Output Based Upon Pooled Unpaid Balances. Transaction E-mail and Tear-Sheet (for auditing) Created.

POOL HEDGE AT STATIC 13.1 CPR
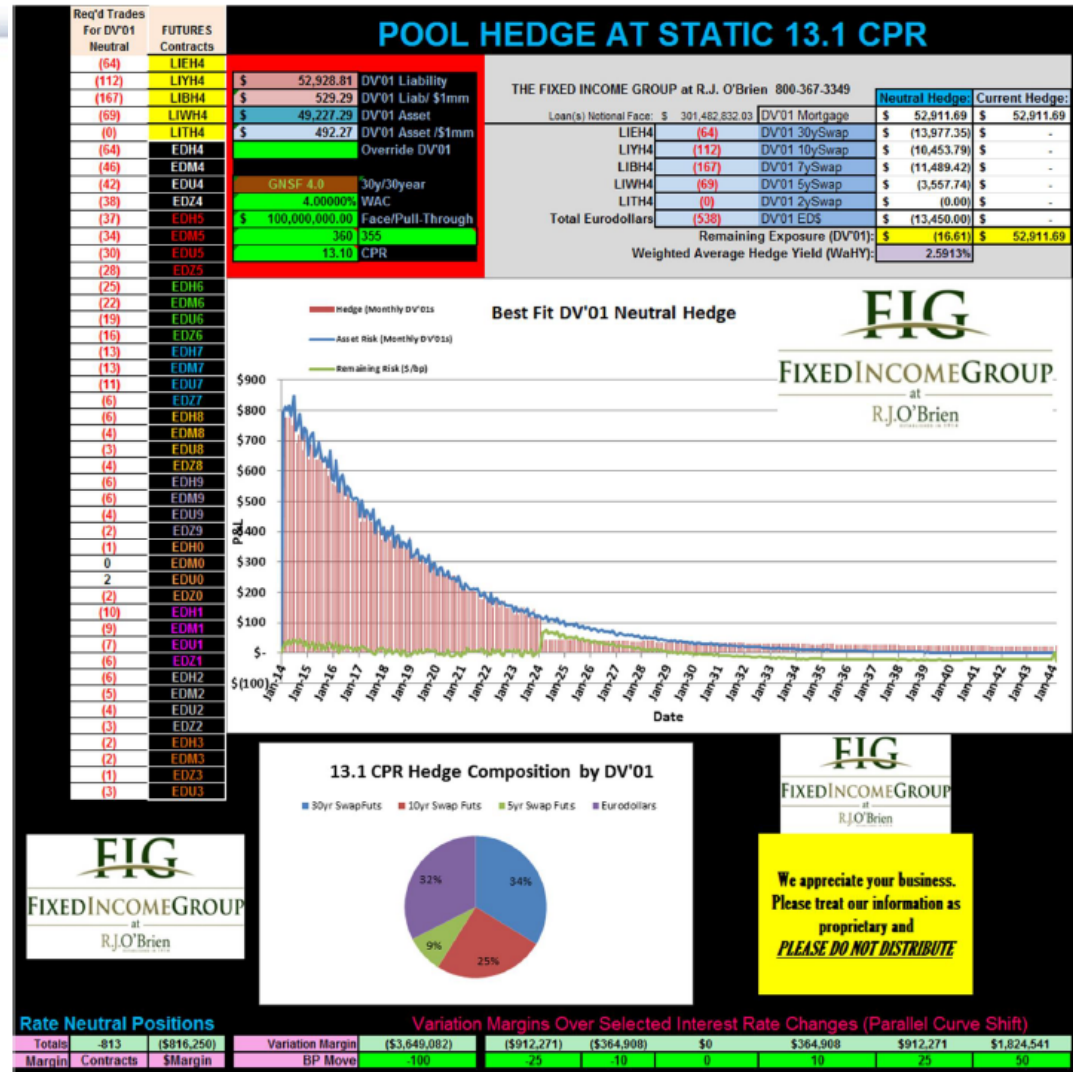
Comin' In HOT from the Swap Futures Design Lab (and Regulator's Desk)

- Non-USD Eris everything

- Swaptions

- Reduced Block Size

- Increased off-hours EFP activity

- Synthetic Generic Securities: Index Credit Futures + Swap Futures (+ Currency)

- Asset + Repo and Swap Futures Coupling?

- A Mortgage Swap Future?
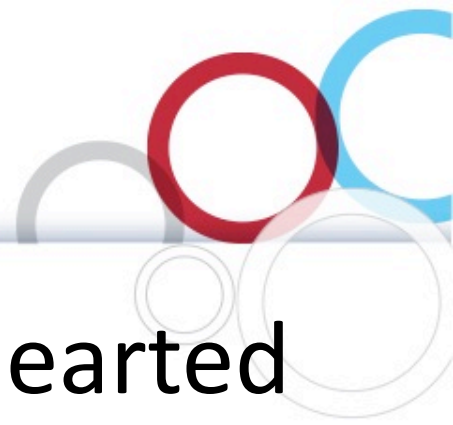
Final Remarks… And a Wholehearted Thank you for your time.

"You have an ENORMOUS improvement in hedge alternatives coming soon– via Eris Swap Futures."

An extra "Thank You" to Henry Erickson at Aurora University for his assistance…

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