

DATA

SPEAKERS

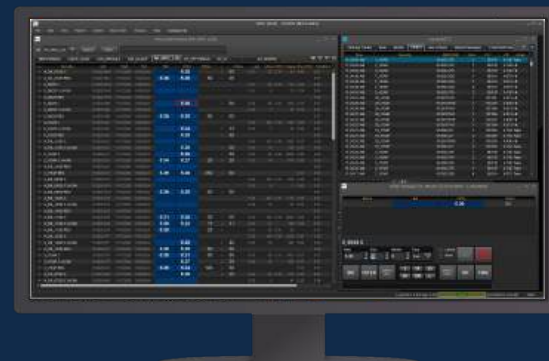
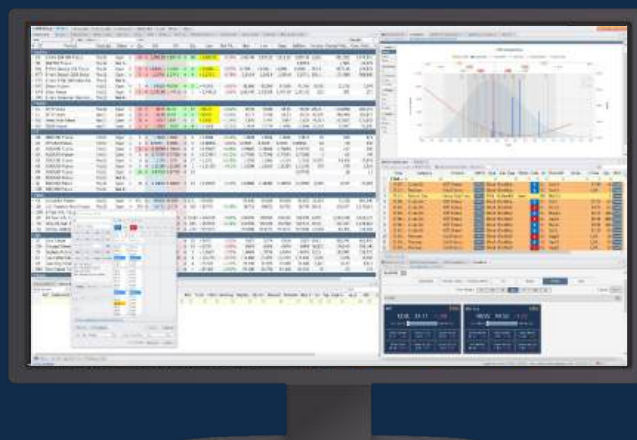
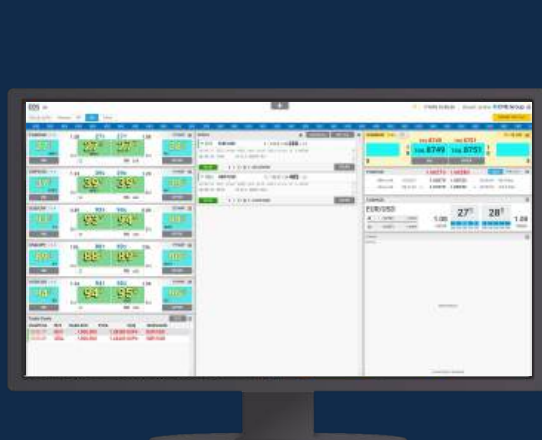
From Screen to Cloud: Simplifying Options, Volatility & Market Access

Jamie Yu, Senior Director, Options &
Platform Solutions APAC lead, CME Group

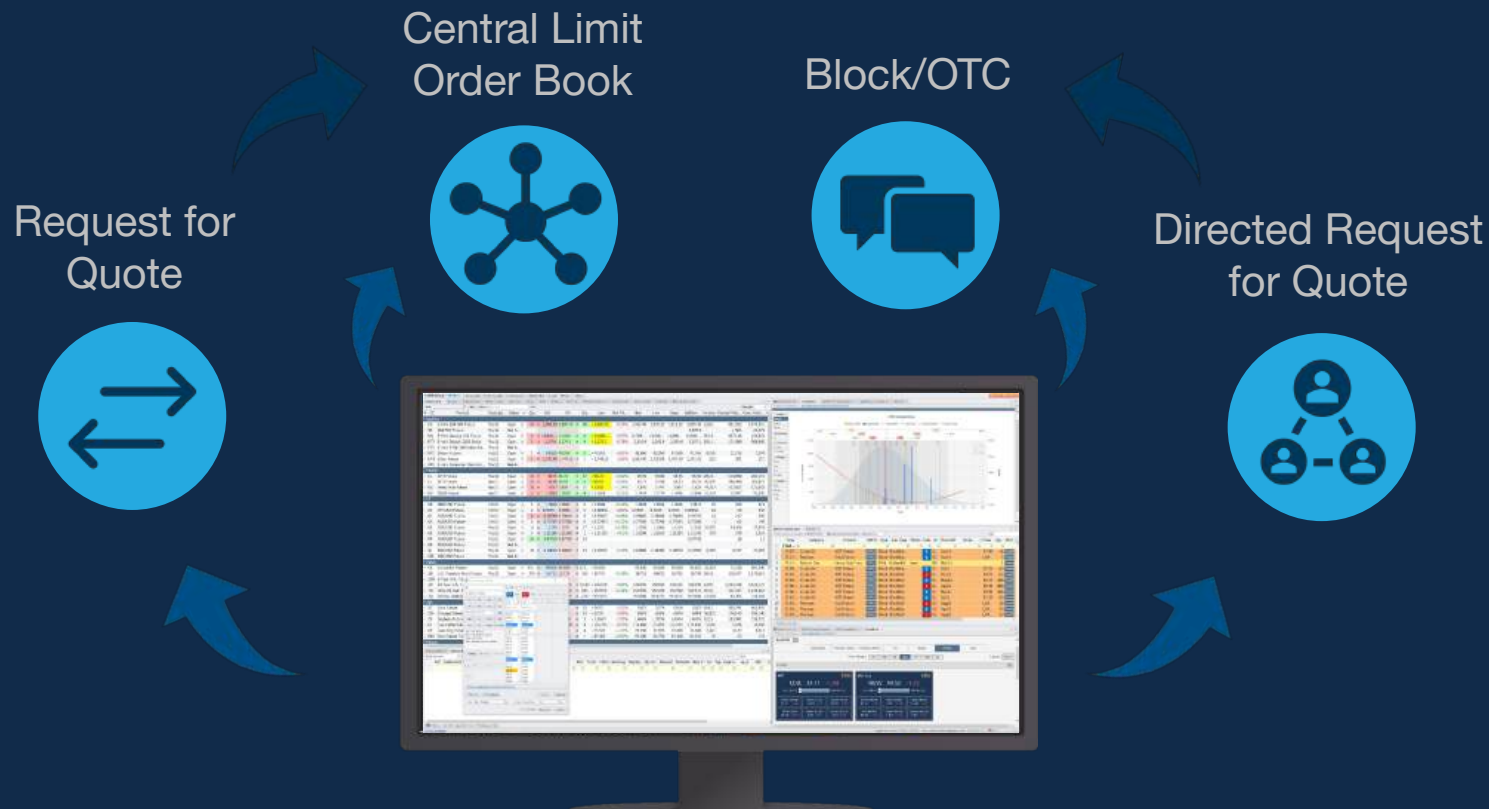
Stewart Jardine, Senior Director,
Head of Trading Applications &
Interfaces, CME Group

CME Group Trading Applications

- > CME Direct
- > EBS Workstation
- > BrokerTec Global Frontend

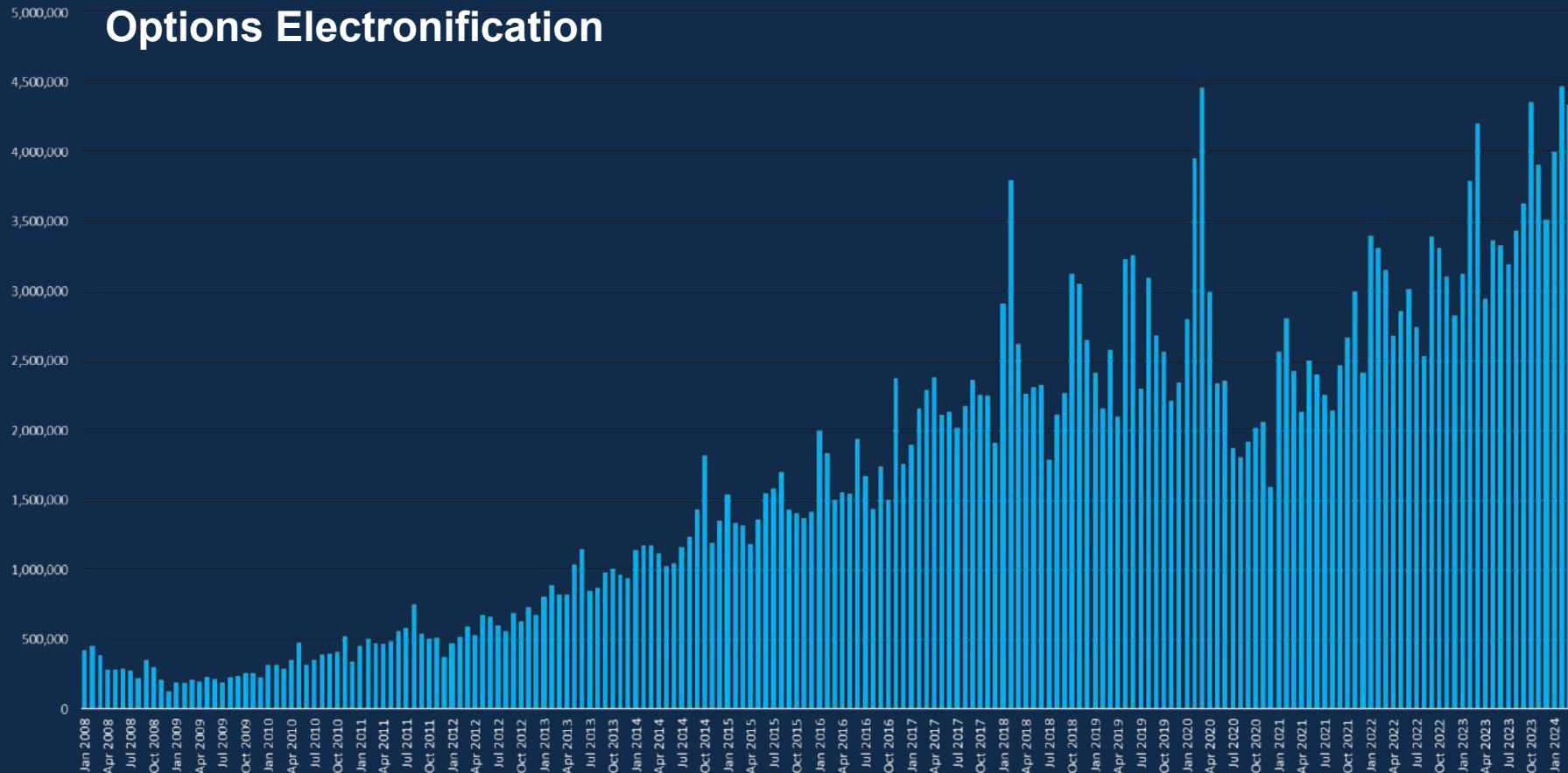


Side-by-Side access to Liquidity & Price Discovery sources



Options Electronification

Globex Options ADV



RFQs: A simple guide

- 1 Let's say you'd like a market on a corn bull call-spread. You would build the spread in your options platform that supports RFQs. And then submit it.
- 2 Once submitted, a unique and tradeable instrument is created on CME Globex and sent to all participants.
- 3 Participants will respond with live bid-ask prices.
- 4 You can then execute based on those prices, counter with your own price, or do nothing at all.

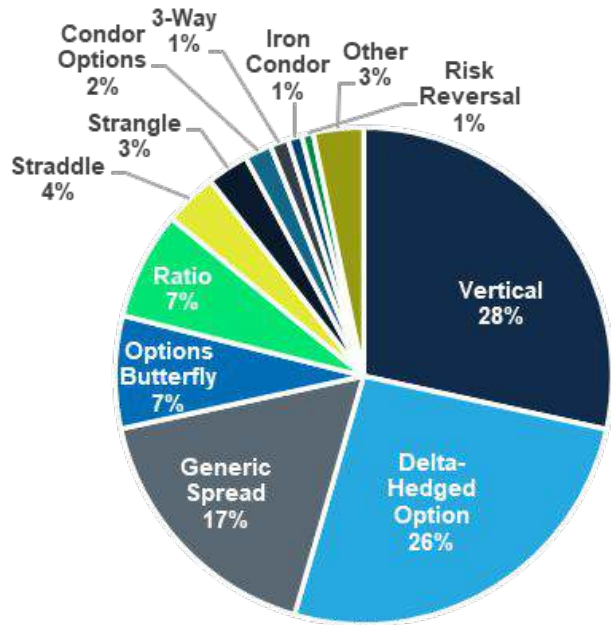


Learn more at
cmegroup.com/rfq

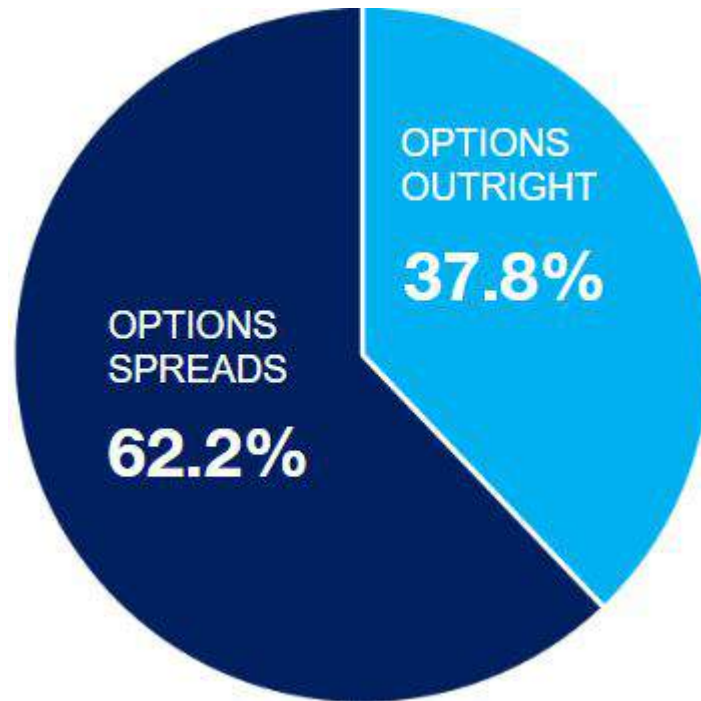


Trading delta-hedged options and options strategies through RFQs

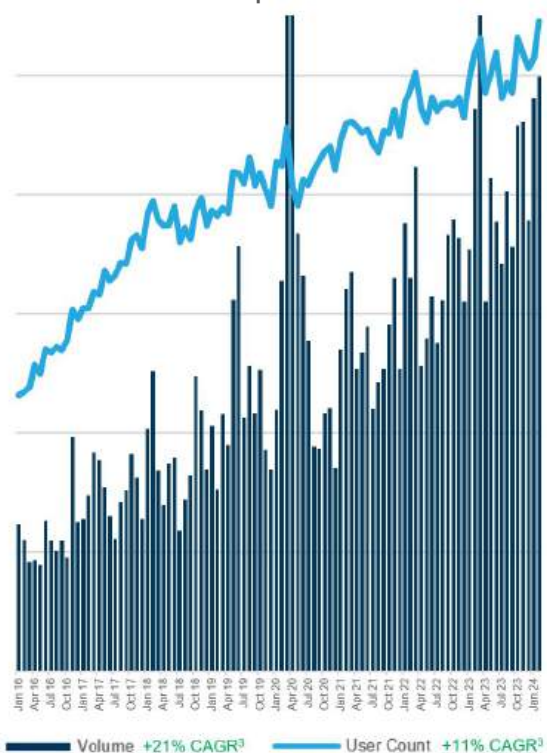
2023 Globex Options Top Strategy



2023 Globex Options Volume



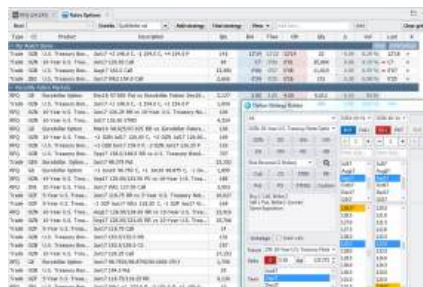
CME Direct Electronic Options User & ADV Growth:



#1 Platform for trading options on Globex¹

#1 Platform for EFRP & Block submission into Clearport²

- Top ranked options front-end by volume across both Globex and Clearport venues
- Strong, consistent growth in user adoption across all customer segments and asset classes
- Low-cost market-leading options functionality, easily deployed via web





Quick-Options Grids

Instantly view all listed options for an underlying Futures contract with a single click.



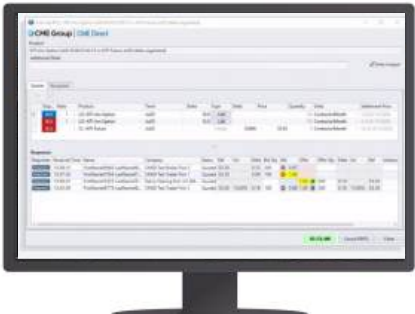
Advanced Options Analytics

Calculate fair-value prices and Greeks on CME Group options, chart volatility and correlations, and test strategies in simulated markets.



Strategy Builder & Market Activity

Execute covered, multi-leg strategies on Globex with a side-by-side consolidated view of all trades, RFQs, Crosses and Blocks.



Powerful RFQ Workflows

Efficient price discovery through a global, electronic RFQ network, and private bilateral block market negotiation with seamless Clearport integration.



Quick-Options Grids
Instantly view all listed options for an underlying Futures contract with a single click.

Acct	Future ES: E-Mini S&P 500 Futu										Expiry	1 Year	Category	All	Greeks					QuikStrike Vol		
Vol	Γ	Δ	QS	+	C Qty	C Bid	C Ofr	C Qty	Strike	P Qty	P Bid	P Ofr	P Qty	+	QS	Δ	Γ	Vol				
E3CH4 20 Mar 2024 (0.39 DTE) E-Mini S&P 500 Wednesday Wee...										ATM	5240.00 ▼ ▲		10 strikes - +									
E-Mini S&P 500 Future Jun24										41	H	5,238.50	5,238.75	L	1	+						
18.09%	0.011	0.73	QS	+	8	H	29.50	30.00	L	7	5220.00	168	H	10.75	11.25	L	90	+	QS	-0.27	0.011	18.09%
18.01%	0.012	0.67	QS	+	31	H	26.25	26.75	L	21	5225.00	20	H	12.75	13.00	L	56	+	QS	-0.33	0.012	18.01%
17.94%	0.012	0.61	QS	+	36	H	23.25	23.75	L	24	5230.00	18	H	14.75	15.00	L	53	+	QS	-0.39	0.012	17.94%
17.86%	0.013	0.55	QS	+	58	H	20.50	21.00	L	69	5235.00	84	H	16.75	17.25	L	78	+	QS	-0.45	0.013	17.86%
17.78%	0.013	0.48	QS	+	22	H	18.00	18.25	L	31	5240.00	32	H	19.25	19.50	L	22	+	QS	-0.52	0.013	17.78%
17.70%	0.013	0.42	QS	+	65	H	15.50	15.75	L	8	5245.00	71	H	21.75	22.25	L	63	+	QS	-0.58	0.013	17.70%
17.62%	0.012	0.36	QS	+	108	H	13.25	13.75	L	90	5250.00	36	H	24.50	25.00	L	26	+	QS	-0.64	0.012	17.62%
17.54%	0.011	0.30	QS	+	129	H	11.25	11.75	L	115	5255.00	33	H	27.50	28.25	L	70	+	QS	-0.70	0.011	17.54%
17.46%	0.010	0.24	QS	+	32	H	9.65	9.80	L	9	5260.00	9	H	30.75	31.25	L	7	+	QS	-0.76	0.010	17.46%
17.38%	0.009	0.19	QS	+	38	H	8.05	8.20	L	10	5265.00	10	H	34.00	34.75	L	9	+	QS	-0.81	0.009	17.38%
E3DH4 21 Mar 2024 (1.39 DTE) E-Mini S&P 500 Thursday Weekl...										ATM	5240.00 ▼ ▲		10 strikes - +									
E-Mini S&P 500 Future Jun24										41	H	5,238.50	5,238.75	L	1	+						
16.67%	0.007	0.64	QS	+	6	H	35.50	36.00	L	31	5220.00	106	H	16.75	17.25	L	94	+	QS	-0.36	0.007	16.67%
16.57%	0.007	0.60	QS	+	37	H	32.25	32.75	L	22	5225.00	18	H	18.75	19.00	L	39	+	QS	-0.40	0.007	16.57%
16.47%	0.007	0.57	QS	+	22	H	29.50	29.75	L	16	5230.00	62	H	20.75	21.00	L	18	+	QS	-0.43	0.007	16.47%
16.37%	0.008	0.53	QS	+	84	H	26.50	27.00	L	23	5235.00	16	H	23.00	23.25	L	36	+	QS	-0.47	0.008	16.37%
16.28%	0.008	0.49	QS	+	28	H	24.00	24.50	L	86	5240.00	58	H	25.25	25.75	L	26	+	QS	-0.51	0.008	16.28%
16.18%	0.008	0.45	QS	+	48	H	21.50	22.00	L	74	5245.00	60	H	27.75	28.25	L	29	+	QS	-0.55	0.008	16.18%
16.09%	0.007	0.42	QS	+	30	H	19.25	19.50	L	8	5250.00	27	H	30.50	31.00	L	38	+	QS	-0.58	0.007	16.09%
15.99%	0.007	0.38	QS	+	128	H	17.00	17.50	L	79	5255.00	25	H	33.25	33.75	L	23	+	QS	-0.62	0.007	15.99%
15.90%	0.007	0.34	QS	+	154	H	15.00	15.50	L	78	5260.00	22	H	36.25	37.00	L	43	+	QS	-0.66	0.007	15.90%
15.81%	0.007	0.31	QS	+	92	H	13.25	13.75	L	185	5265.00	6	H	39.50	40.00	L	6	+	QS	-0.69	0.007	15.81%
+ EW4H4 22 Mar 2024 (2.39 DTE) E-Mini S&P 500 Week4 Opt; ES...										ATM	5240.00 ▼ ▲		10 strikes - +									
+ F4AH4 25 Mar 2024 (5.39 DTE) E-Mini S&P 500 Mn week 4 Opt...										ATM	5240.00 ▼ ▲		10 strikes - +									

CME Direct

Market-leading Options Workflows for Traders and Brokers



Strategy Builder & Market Activity

Execute covered, multi-leg strategies on Globex with a side-by-side consolidated view of all trades, RFQs, Crosses and Blocks.

Option Strategy Builder

Filter: All | OZN: 10-Year U.S. Treasury Note Opti | OZN: 10-Year U.S. Treasury Note Opti

ESFRI | OZN | OZT | ES | TYMON | TYWED | LO | ESMON

Vertical Call Spread

Enter strip... | Enter strip...

Apr24 W1 | Apr24 W1 | Apr24 W2 | Apr24 W2

Acct | Time | Type | CC | Product | Description | Status | RFQ | Qty | Bid | Theo | Offr | Qty | Pin | Last | Volume | Δ

My Watch Items

Time	Type	CC	Product	Description	Status	RFQ	Qty	Bid	Theo	Offr	Qty	Pin	Last	Volume	Δ
15:32:37	Trade	ESF	E-Mini S&P 500 Option	Wednesday Expiration	Mar24 Wk3 5300.00/5305.00 CS	Open	RFQ	0/0	1.138	0.40	0.08	0.45	1.00	0.50	0.01
16:03:00	Trade	OZN	10-Year U.S. Treasury Note Option	May24 110.50/111.50 CS 1x2	Open	RFQ	106,560	-0.02	-0.02	-0.01	28,351	0	-0.01	10,500	-0.12
16:34:30	Trade	EW	E-Mini S&P 500 EOM Option	Mar24 4890.00/3775.00 PS	Open	RFQ	1,420	0.55	0.54	0.65	733	0	0.65	1,328	-0.01
16:06:51	Trade	LO	WTI Am Option	Dec24 87.50/92.50/95.00/100.00	Open	RFQ	1,100	0.50	0.50	0.52	1,328	0	0.52	100	0.03

Recently Active Markets

Time	Type	CC	Product	Description	Status	RFQ	Qty	Bid	Theo	Offr	Qty	Pin	Last	Volume	Δ
18:45:23	RFQ	E3C	E-Mini S&P 500 Option	Wednesday Expiration	Mar24 Wk3 5245.00/5275.00 CS	Open	RFQ	0/0	103	10.25	7.93	10.50	97	0.32	
18:45:21	RFQ	S33	JPY/USD	Thursday Expiration	Mar24 Wk3 0.0066750 STRD	Open	RFQ	603	0.00...	0.00...	0.00...	128	0.12		
18:45:20	RFQ	W33	JPY/USD	Premium Quoted Wednesday Expr	Mar24 Wk3 0.0066750 STRD	Open	RFQ	777	0.00...	0.00...	0.00...	17	0.12		
18:45:18	Trade	LO	WTI Am Option	Jul24 90.00/40.00 PS	Open	RFQ	1,547	0.04	0.02	0.05	542	0	0.05	1	0.00
18:45:16	Trade	HKE	Copper Option	May24 3.9000/4.1000 STNG	Open	RFQ	10	0.10...	0.1103	0.11	10	0	0.10...	1	0.15

10-Year U.S. Treasury Note Option May24 110.50/111.50 CS 1x2

Add leg | Add hedge leg | Clear | Hide legs

Side	Ratio	Product	Term	Strike	Type	Delta	Ref	Delete
BUY	1	OZN: 10-Year U.S. Treasury ...	May24	110.5	Call			Delete
SELL	2	OZN: 10-Year U.S. Treasury ...	May24	111.5	Call			Delete

☐ Build another | New order | Submit

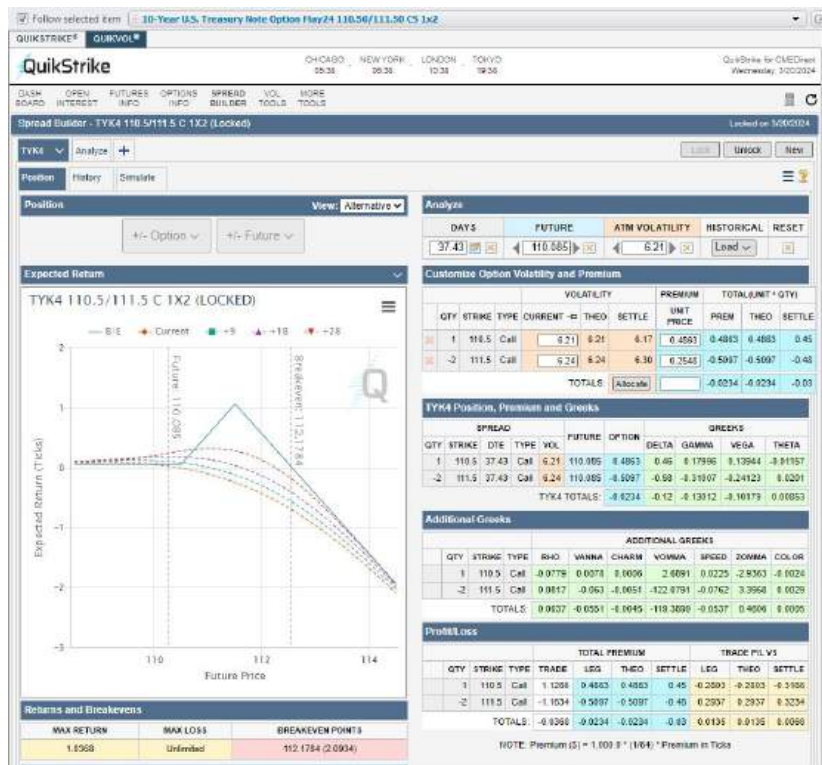
CME Direct

Market-leading Options Workflows for Traders and Brokers



Advanced Options Analytics

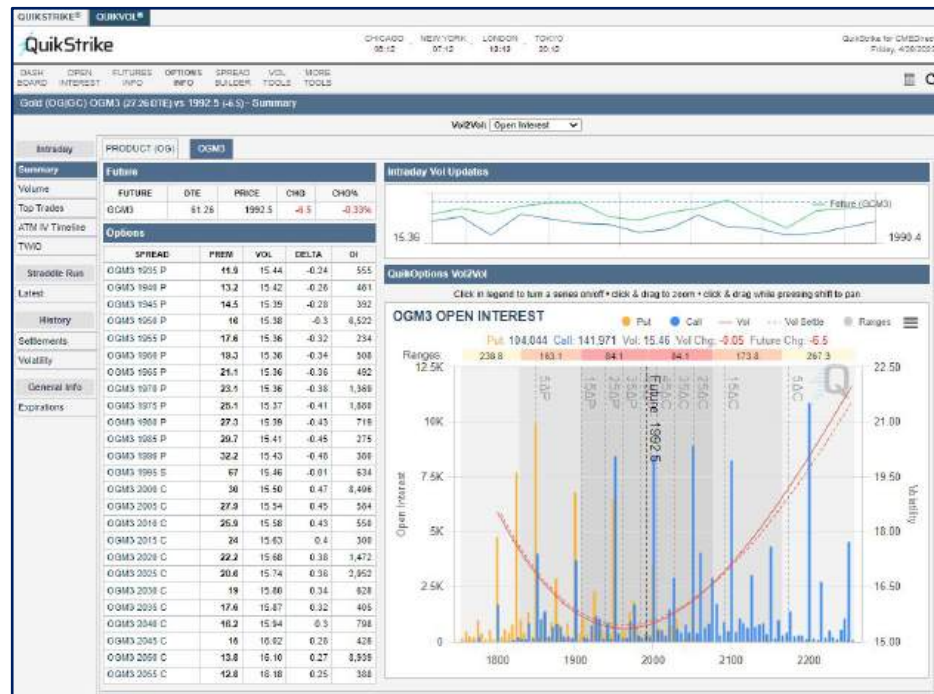
Calculate fair-value prices and Greeks on CME Group options, chart volatility and correlations, and test strategies in simulated markets.



QuikStrike

Trade smarter and more decisively with our suite of options analytics, provided by QuikStrike®:

- Chart and Analyze historical volatility, skew, constant maturity and implied volatility
- Analyze Open Interest by product, by strike and by expiration using charts and heatmaps
- See most active intraday strategies and strikes by calls and puts
- Generate fair-value prices and Greeks for any CME Options product using an embedded Options Calculator
- Simulate strategy and P&L performance across different underlying price scenarios
- and more...



CVOL™

www.cvol.com

CVOL Commodities Aggregate Index (CMVL)



WTI

CLVL 37.97 0.67

(Lo) 37.30 (Hi) 39.35

DnVar (CLDN)	Skew (CLSK)	UpVar (CLUP)
38.41 1.05	-0.87 -0.75	37.53 0.30
ATM (CLAT)	Skew ^R (CLSK)	Convex (CLCO)
36.25 0.48	0.98 -0.02	1.05 0.00

Nat Gas

NGVL 94.86 7.15

(Lo) 87.71 (Hi) 94.86

DnVar (NGDN)	Skew (NGSK)	UpVar (NGUP)
93.12 8.21	3.44 -2.06	96.56 6.15
ATM (NGAT)	Skew ^R (NGSK)	Convex (NGCO)
87.62 6.41	1.04 -0.03	1.08 0.00

Treasury

TPVL 7.13 0.05

(Lo) 6.95 (Hi) 7.28

DnVar (TPDN)	Skew (TPSK)	UpVar (TPUP)
7.41 0.03	-0.56 0.05	6.85 0.07
ATM (TPAT)	Skew ^R (TPSK)	Convex (TPCO)
6.91 0.05	0.92 0.01	1.03 0.00

G5 FX

FXVL 8.61 0.07

(Lo) 8.54 (Hi) 9.06

DnVar (FXDN)	Skew (FXSK)	UpVar (FXUP)
8.85 0.09	-0.51 -0.04	8.34 0.04
ATM (FXAT)	Skew ^R (FXSK)	Convex (FXCO)
8.24 0.08	0.94 0.00	1.04 0.00

Corn

CVL 17.72 0.69

(Lo) 17.03 (Hi) 17.87

DnVar (CDN)	Skew (CSK)	UpVar (CUUP)
16.72 0.58	1.95 0.21	18.67 0.79
ATM (CAT)	Skew ^R (CSK)	Convex (CCO)
15.36 0.59	1.12 0.01	1.15 0.00

SRW Wheat

WVL 31.10 0.20

(Lo) 30.90 (Hi) 32.58

DnVar (WDN)	Skew (WSK)	UpVar (WUP)
26.47 0.23	8.66 -0.06	35.13 0.17
ATM (WAT)	Skew ^R (WSK)	Convex (WCO)
27.95 -0.03	1.33 -0.01	1.11 0.01

Gold

GCVL 14.30 0.05

(Lo) 14.25 (Hi) 14.56

DnVar (GCDN)	Skew (GCSK)	UpVar (GCUUP)
14.16 -0.01	0.29 0.12	14.45 0.11
ATM (GCAT)	Skew ^R (GCSK)	Convex (GCCO)
13.56 0.08	1.02 0.01	1.05 0.00

Silver

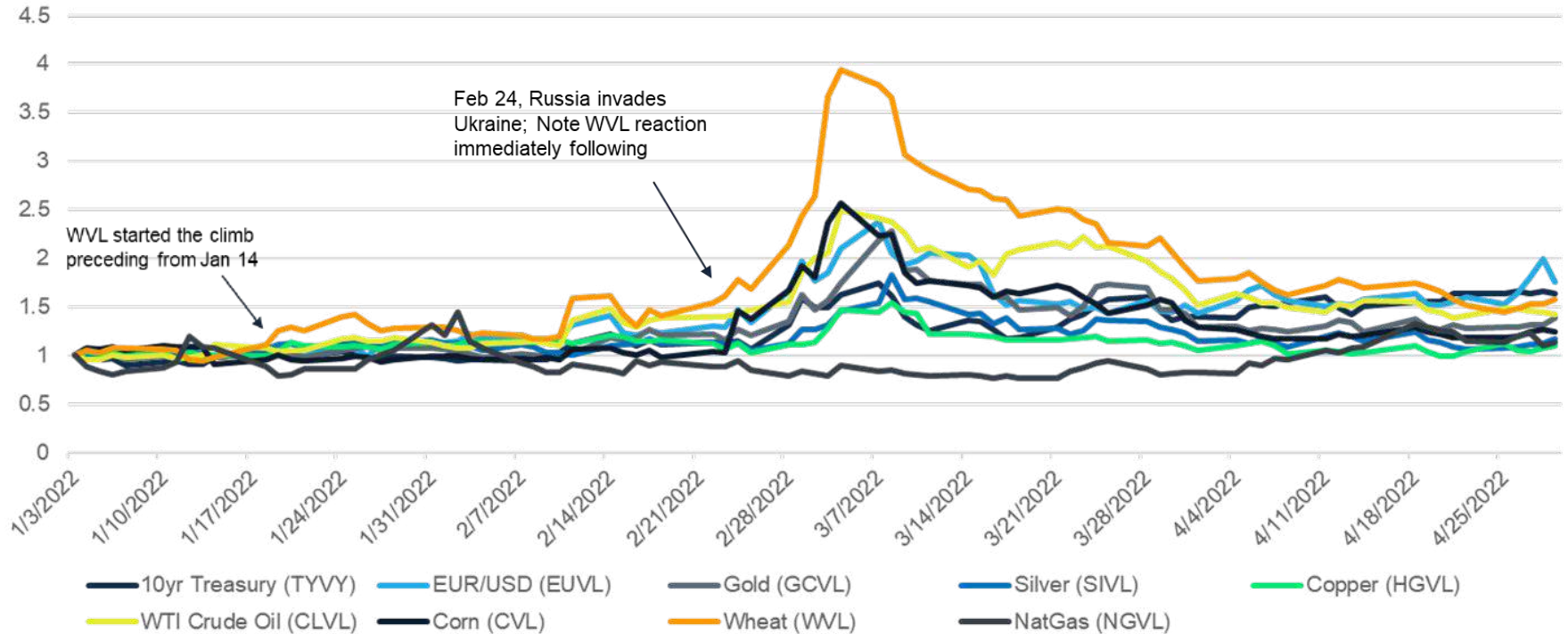
SIVL 28.28 -0.26

(Lo) 28.28 (Hi) 29.29

DnVar (SIDN)	Skew (SISK)	UpVar (SIUP)
26.85 -0.08	2.80 -0.35	29.64 -0.42
ATM (SIAT)	Skew ^R (SISK)	Convex (SICO)
26.18 -0.03	1.10 -0.01	1.08 -0.01

CVOL™ Use Cases

Measuring Implied Volatility Reaction Across Asset Classes



The CVOL™ Index Family

Providing comprehensive, cross-asset coverage across Financial and Commodity markets

Spanning 30 benchmark products and 6 market-wide aggregates, CVOL offers a single, standardized measure of volatility which can be easily compared in real-time and using end-of-day benchmarks.

Interest Rates	FX	Agriculture	Energy	Metals	Aggregates
2-Year Treasury Note (price and yield volatility)	AUD/USD	Corn	WTI Crude Oil	Gold	Commodities Volatility Index
	CAD/USD	Soybeans	Henry Hub Natural Gas	Silver	Energy Volatility Index
5-Year Treasury Note (price and yield volatility)	EUR/USD	Wheat	RBOB Gasoline	Copper	Agriculture Volatility Index
10-Year Treasury Note (price and yield volatility)	GBP/USD	Soybean Oil	NY Harbor ULSD	Aluminum	Metals Volatility Index
	JPY/USD	Soybean Meal		Platinum	G5 FX Volatility Index
30-Year Treasury Bond (price and yield volatility)		Lean Hogs (60-day)			Treasury Volatility Index (price and yield volatility)
SOFR-SR3 90-day		Live Cattle (60-day)			
SR3 1-Year Midcurve 90-day		Feeder Cattle (60-day)			
SR3 2-Year Midcurve 90-day		Class III Milk (60-day)			

CVOL™ Auxiliary Indicators

6 Auxiliary indicators to enable in-depth sentiment analysis

In addition to the CVOL implied volatility index, five auxiliary indicators are also published in real-time and as daily measures which allow for powerful market insight and sentiment analysis. These additional measures provide a simplified view of **Up & Down Variance**, **Skew**, **Convexity** and **ATM implied volatility** that can be overlayed across multiple underlying products for easy comparison.

UpVar is the variance estimate from out-of-the-money (OTM) Call options.

DnVar is the variance estimate from out-of-the-money (OTM) Put options.

Skew measures the asymmetry between **UpVar** and **DnVar**

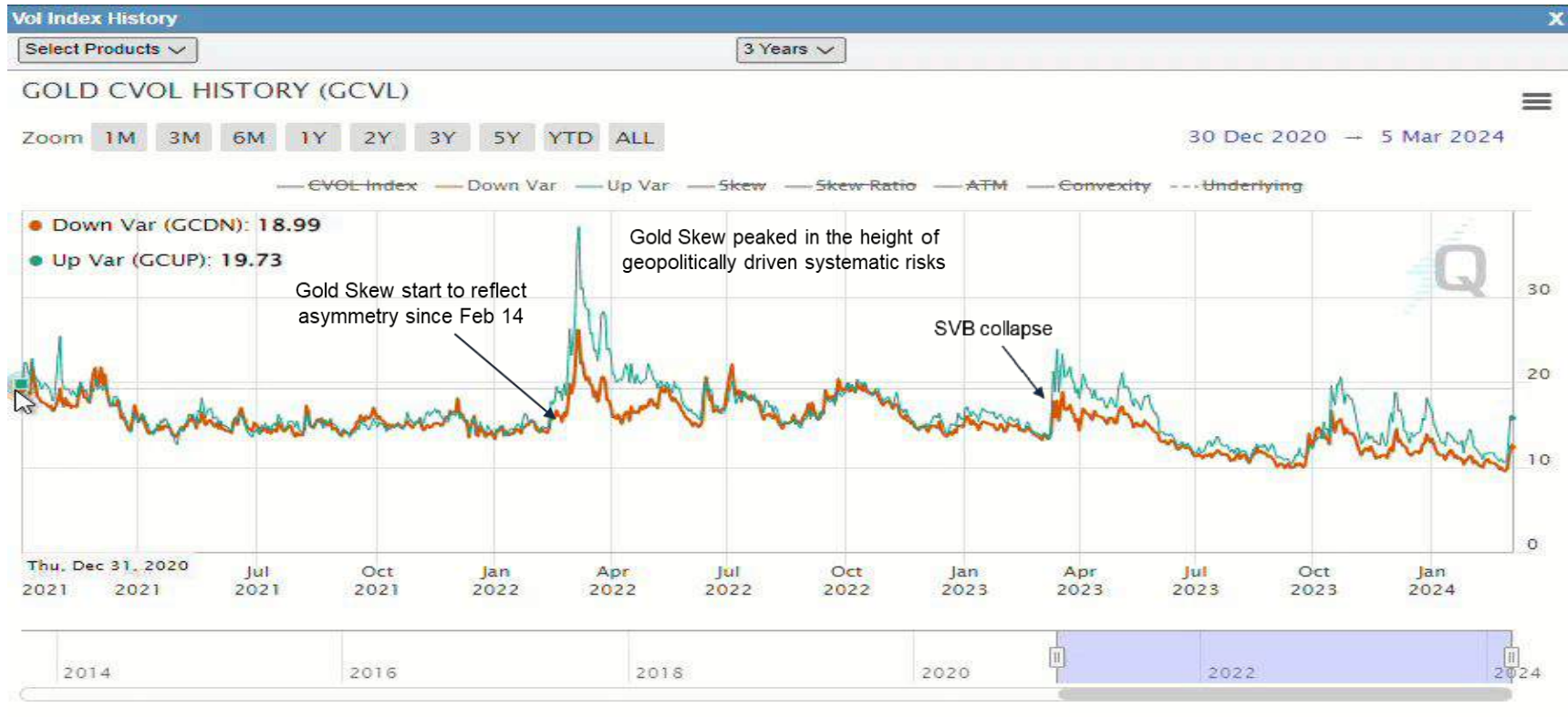
CVOL measures implied volatility across entire implied volatility curve

ATM Vol measures implied volatility of the at-the-money (ATM) call and puts.

Convexity measures the curvature of the implied volatility curve

CVOL™ Use Cases

Measuring Sentiment thru Gold Volatility Skew (UpVar-DownVar)



Treasury Yield expectations reflected thru the Treasury Volatility Skew

1 Year ▾

What's New?

- **CVOL** – real-time and end of day volatility indices and visualization across 5 asset classes
- **Improved Risk Controls** – ‘Start of Day’ positions upload & credit limit auto-adjust
- **Automated Audit Trails** - Firm/Account level automated export of audit trails
- **TrendSpider**– real-time charting and technical analysis tool
- **Directed Request for Quote (DRFQ)** – streamlined block negotiation with automated deal reporting via Clearport
- **Improved Options Features** – Straddles Grid, Active Options Grid, DTE columns, QuikStrike enhancements



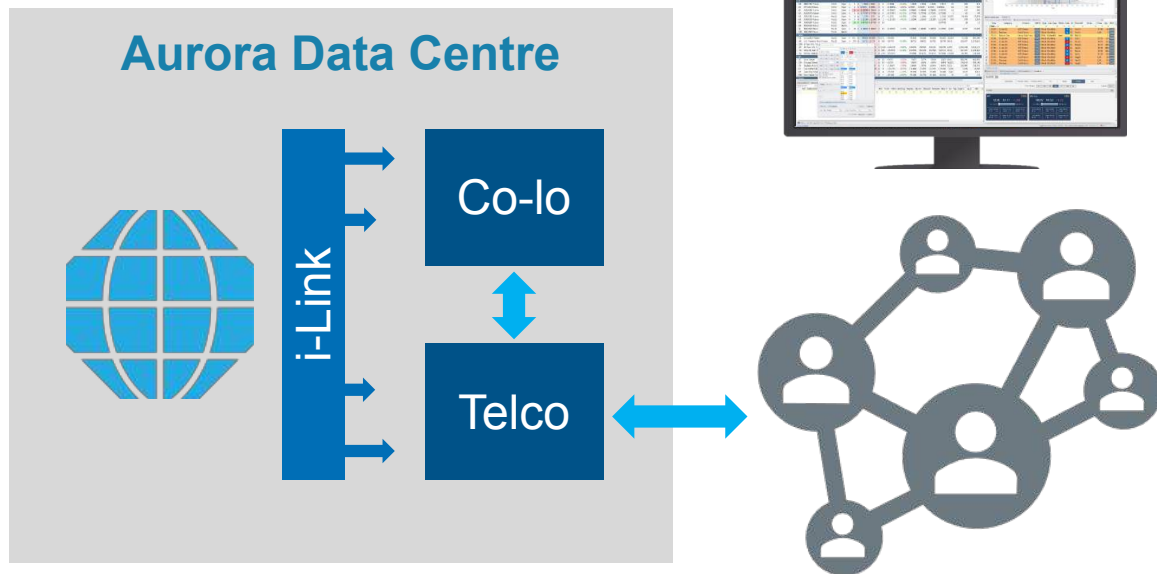
Unlocking Distribution

A more flexible market
distribution capability



Unlocking Distribution

Traditional Market Access:



Connectivity:

- Leased Lines
- Extranets
- Globex Hubs
- ISVs

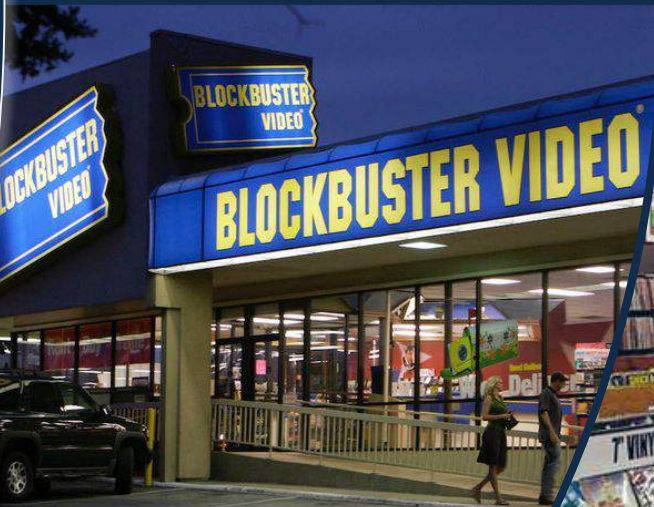
Protocol:

- iLink (FIX Binary)
- ISVs

Software:

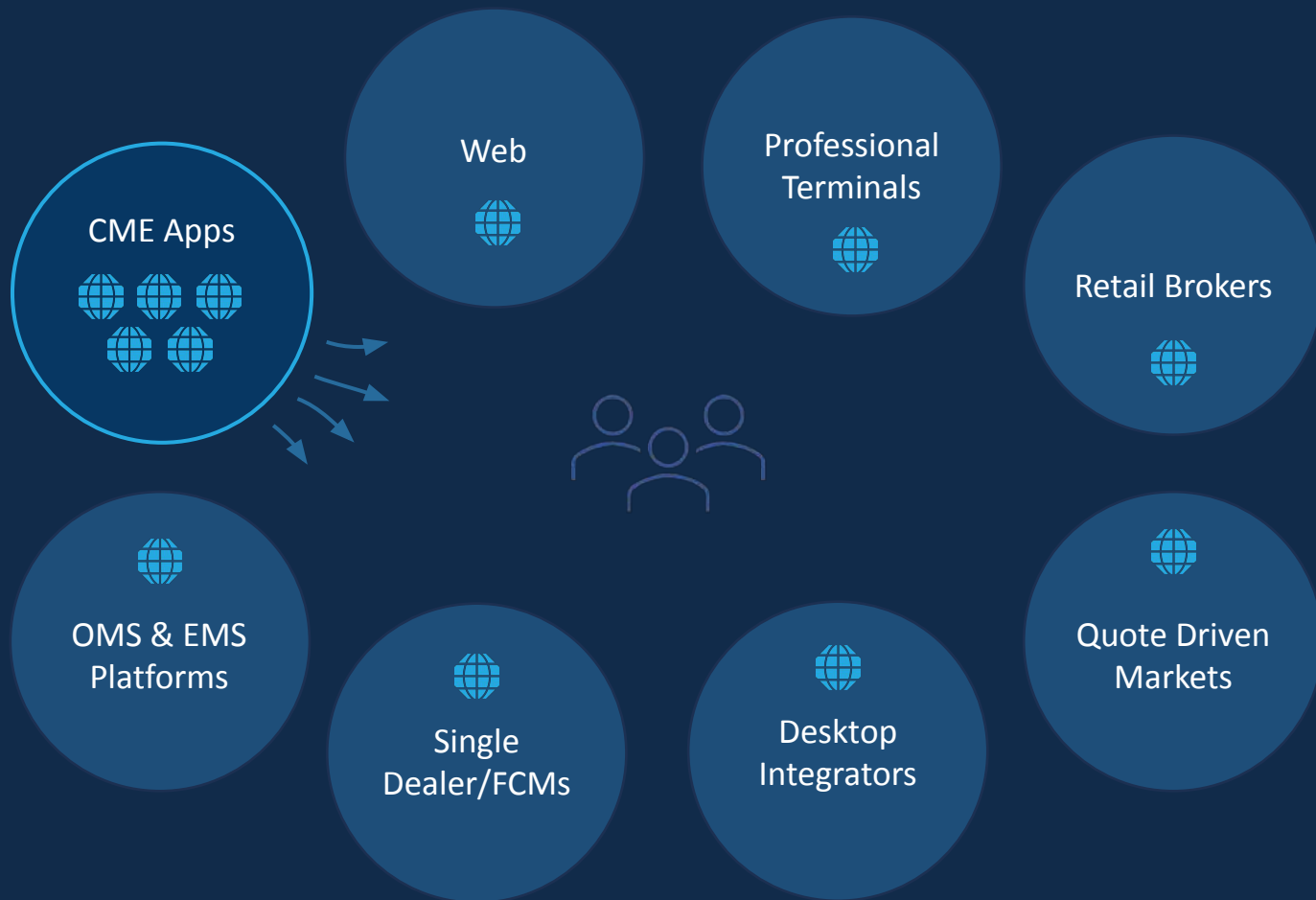
- CME Direct

~~“Content is King”~~



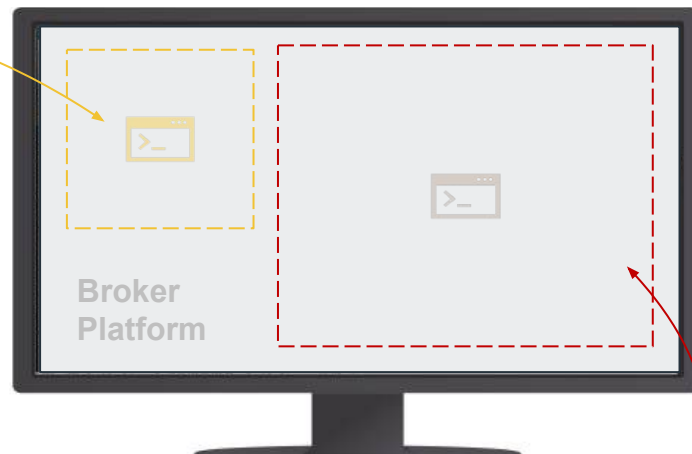
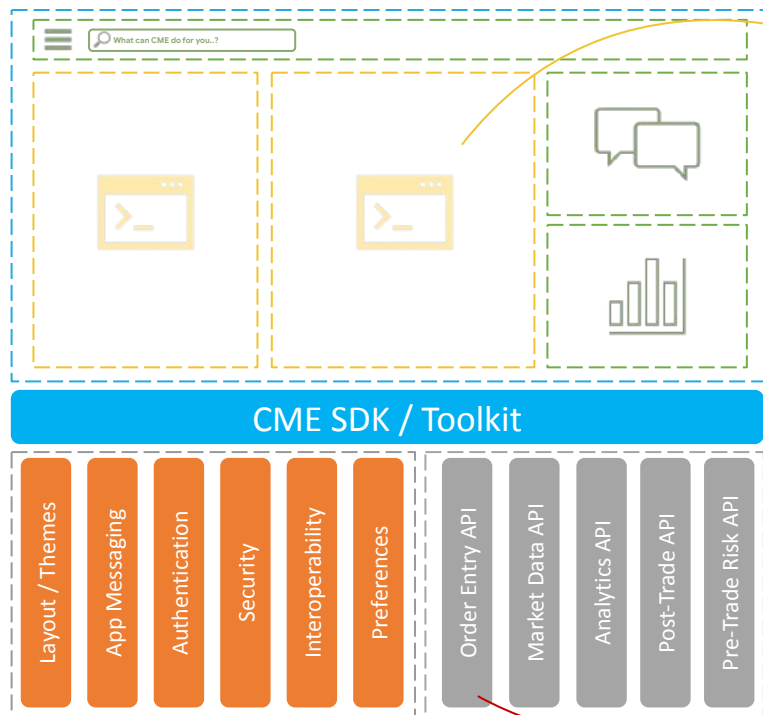
Omnichannel Distribution

*What if CME's apps
and content could be
accessed anywhere,
from any platform, on
any device?*



CME 'Plug & Play'

Interoperability through Microservices & Micro-frontends



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10  "payload": {  
11    "customerOrderHandlingInstr": "CLIENT_ELECTRONIC",  
12    "customerOrderId": "ds-12345",  
13    "displayQtyInt": 4,  
14    "durationType": "DAY",  
15    "entities": {  
16      "operatorId": "sender_sub_1",  
17      "senderCountry": "US",  
18      "senderState": "NY",  
19      "executingFirmId": "203",  
20      "customerAccountId": "555"
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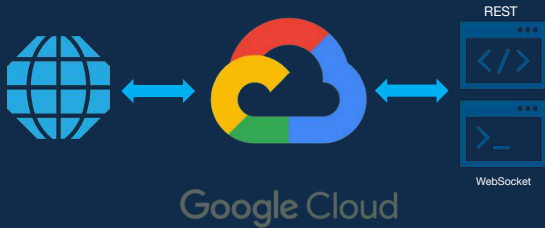

CME 'Plug & Play' Examples

Coming Soon...

Clearport Web App (micro-frontend):



CME GCP Order Entry API:



Real-Time TrendSpider Charting:



Block Trading in the Cloud

A modern, cloud-based Clearport deal-entry application, offering:

- Clearport Reporting
- Market Activity
- Strategy Recognition
- Trade Blotter
- Product Search
- OI & Volume Metrics
- Instrument Details
- 3rd Party Interoperability

Customer Center | PORTFOLIO & RISK | POST TRADE | REGULATORY | APPS & ANALYTICS | ADMINISTRATION | REPORTS | DEFAULT | CME Group

Clearport Clearing IT

CME Group CME ClearPort®

Logged in: E15342 (Raymond Keeling) 03/13/2023 14:48 (v. 41.1.105.12)

Trade Entry | Trade Blotter | Trade Confirmation | About CME ClearPort® | Dashboard

Trade Entry

Submitting Firm: [Dropdown] Trade Type: BLOCK

Set Preference: [Dropdown] show details

Side: Buy [Dropdown] Search for Product: [Text] Market: [Dropdown]

Product Information

Product Groups: [Dropdown]

Products: [Dropdown]

Contract Terms

Term: [Dropdown] Strip/Pack/Bundle: [Dropdown] End Term: [Dropdown] Pricing Marker: [Dropdown]

Quantity: 2,000 [Text] Price - USD per Barrel: [Text] Price Validation: [Check]

Allocation

Voice Brokered? [Check] Approver: [Dropdown]

Buyer Information

Designated: [Dropdown] Order No.: [Text] Give-Up: [Check]

Company Name: [Text] Trading Account: [Text] Name: [Text]

Seller Information

Designated: [Dropdown] Order No.: [Text] Give-Up: [Check]

Company Name: [Text] Trading Account: [Text] Name: [Text]

Block Date: 03/13/2023 Execution Time (HH:MM, HH:00-24, Local): 08:24 (How)

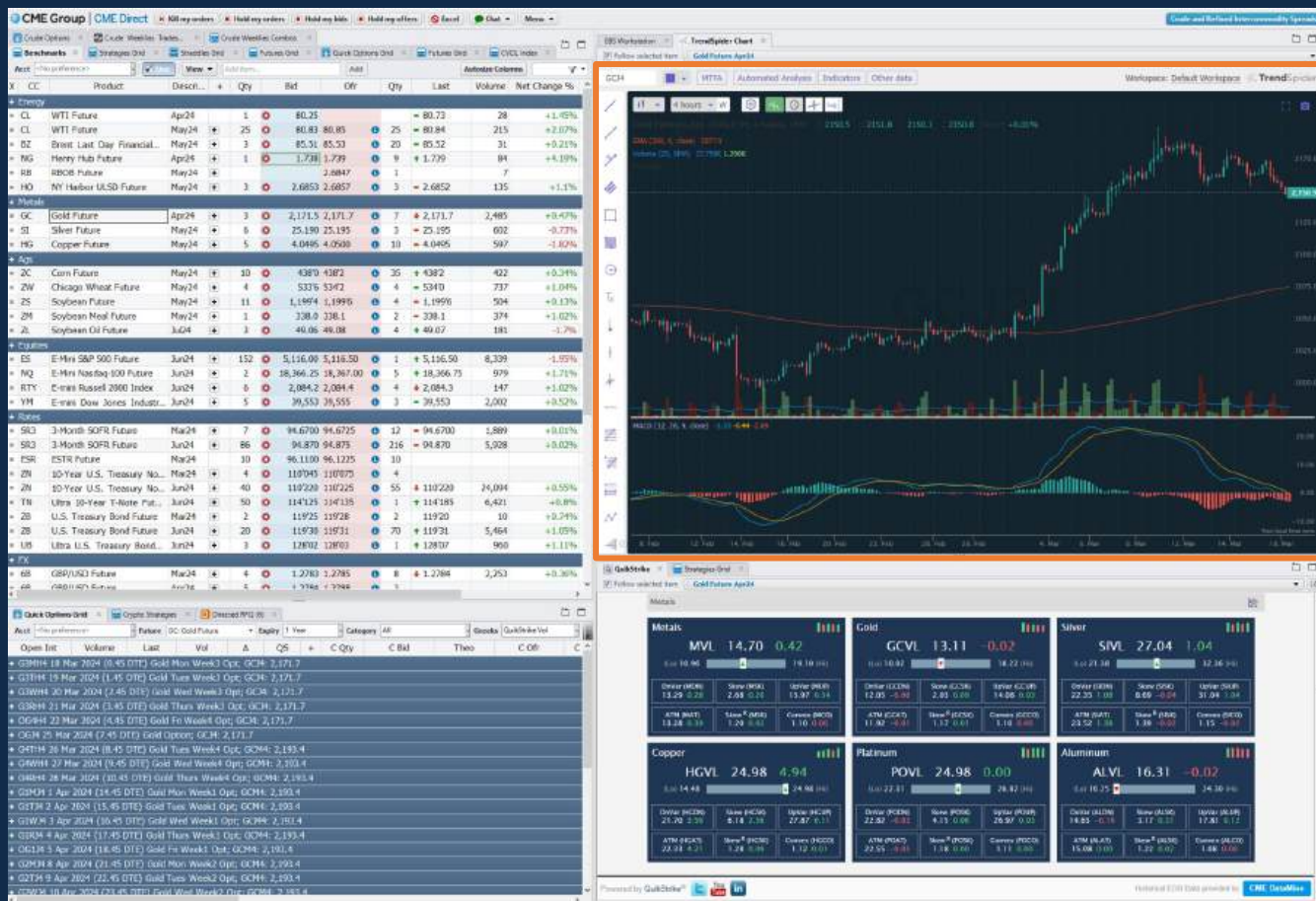
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Real-Time Charting, by TrendSpider

Bringing a new
dynamic, charting
experience to the CME
Direct platform

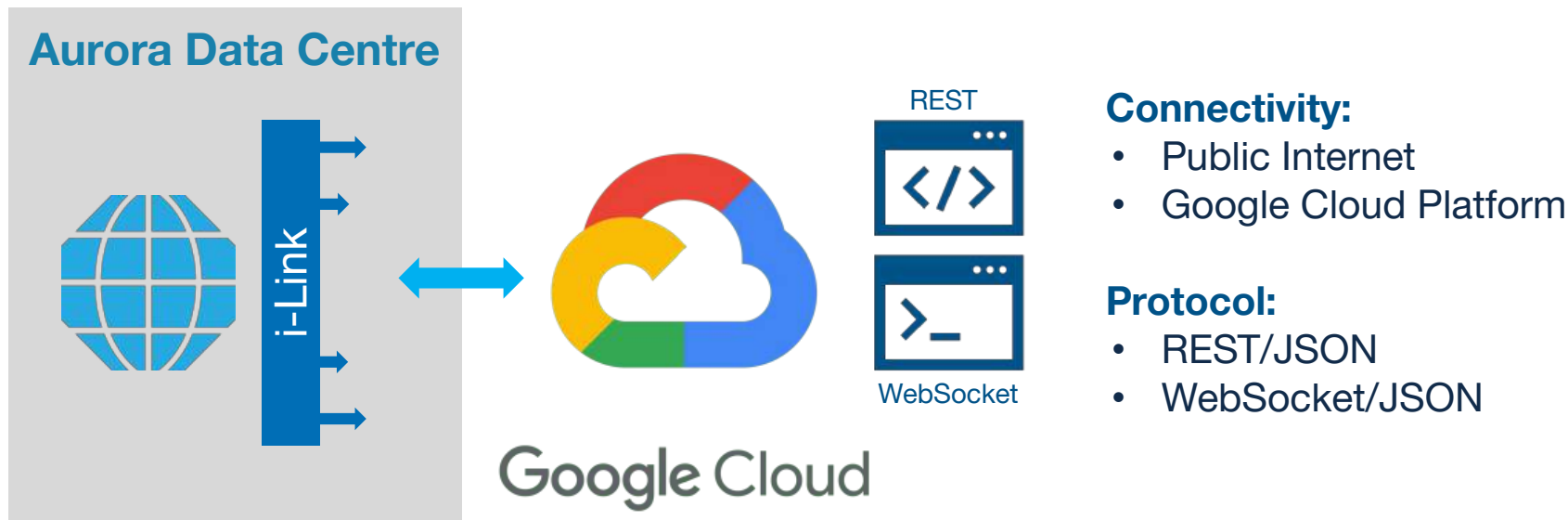
- Real-Time ticks
- 200+ Indicators
- Pattern Recognition
- Raindrop™ charts
- Multi-Time Frame Analysis
- Technical Analysis



Trading from the Cloud

Coming Soon: Order Entry API via the Google Cloud Platform

Coming Soon: Cloud-based Order Entry



Trading from the Cloud

Coming Soon: Order Entry API via the Google Cloud Platform

Simple, Human-Readable coding via JSON.

```
10  "payload": {  
11    "customerOrderHandlingInstr": "CLIENT_ELECTRONIC",  
12    "customerOrderId": "ds-12345",  
13    "displayQtyInt": 4,  
14    "durationType": "DAY",  
15    "entities": {  
16      "operatorId": "sender_sub_1",  
17      "senderCountry": "US",  
18      "senderState": "NY",  
19      "executingFirmId": "203",  
20      "customerAccountId": "555",  
21      "customerType": "MEMBER_OWN",  
22      "customerOriginType": "CUSTOMER"  
23    },  
24    "instrument": {  
25      "glbxSecurityId": 391998  
26    },  
27    "manualInd": "YES",  
28    "memo": "comments",  
29    "minimumQtyInt": 0,  
30    "price": 700,  
31    "qtyInt": 4,  
32    "selfMatchPreventionId": "-1",  
33    "selfMatchPreventionInstr": "CANCEL_NEWEST",  
34    "sideInd": "SELL",  
35    "stopPrice": 2.50,  
36    "type": "LIMIT"  
37  }
```

vs. FIX Binary...

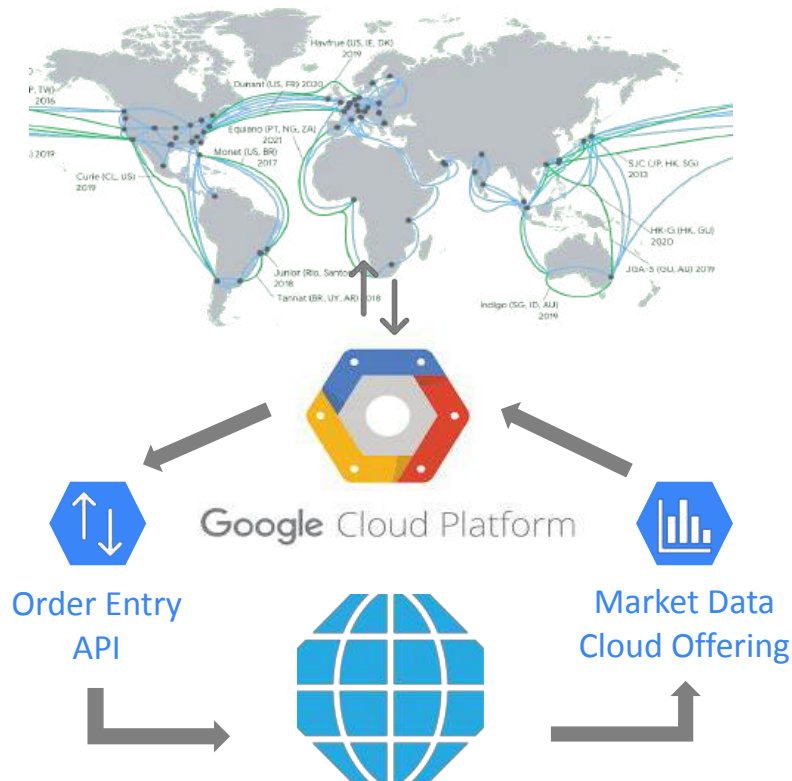
```
8000FECA7400020208000000000E  
8764817000000001000000CBA70D  
0001010000000437563756D62657  
20000000000000000000000000595  
A373334000000000000000000000  
00000000007B00000000000000DE  
020000000000000D7096EAB9B27  
BB15FFFFFFFFFFFFFFFF7F4D696  
E736B00000000000000000FFFF32  
00000000FFFFFFFF
```


Trading from the Cloud

Coming Soon: Order Entry API via the Google Cloud Platform

Cloud-based Order Entry:

- Low cost, scalable, globally available programmatic access for non-latency sensitive use cases.
- Order Submission, Order Management, User Defined Spread creation (UDS), supporting all Future & Options markets on Globex
- Available at 100+ “GCP Edge” Locations, and via Public Internet
- Adjacent to other CME/GCP services:
 - Immediate access to unlimited compute & storage
 - Real-Time market data available via CME’s Market Data Cloud offering (GCP Pub/Sub, TCP and WebSocket).
 - Historical and referential data available via Google Analytics Hub & Big Query



Thank you

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