CME Group Customer Forum

Fall 2018

CME Group

Agenda

- **CME Globex Technology Roadmap**
  - **Price Precision Extension**
  - **Consolidated iLink Fill Messages**
  - **iLink Enhancements**
  - **iLink Behavior Harmonization - CGW**
  - **iLink FIX Binary Order Entry**
  - **CME Reference Data API**
  - **CME Group Data Insights: Settlements & Valuations**
  - **Decommission of ITC Functions**
  - **Risk Management Tools Updates**
    - **In-Line Credit Controls Enhancement**
    - **CME Account Manager Decommission**
  - **FirmSoft**
  - **CME Direct**
- **Products Updates**

Price Precision Extension & 2 Year Treasury Futures Tick

Supporting a Greater Tick Precision

Project Overview

- Price fields will support **9** decimals to provide greater price granularity – currently limited to **7**

- On January 13, the 2 Year Treasury Futures and spreads will trade at 1/8 of 1/32nd with a decimal precision of **8**

- Customers are encouraged to move to 9 decimal support now; but there are no plans to list a product that uses the 9th decimal at this time.

Impact

- Customer front- and back-end systems must support an 8 digit decimal across CME Group platforms

Price Precision Extension 2-Year Futures Display Format

Example of Current Trading Screen

CC	Product	+	Description	Qty	Bid	Ofr	Qty
− Treasury Futures							
ZT	2-Year U.S. Treasury Note Future	+–	Sep17	41	108'070	108'075	163
				837	108'067	108'077	603
				563	108'065	108'080	503
				104	108'062	108'082	97
				262	108'060	108'085	90

Expectations for Going Forward

Fractional		Decimal	Displayed
	1/8	*0.125*	*108'071*
1/4	**2/8**	**0.250**	**108'072**
	3/8	*0.375*	*108'073*
1/2	**4/8**	**0.500**	**108'075**
	5/8	*0.625*	*108'076*
3/4	**6/8**	**0.750**	**108'077**
	7/8	*0.875*	*108'078*
-	**8/8**	**1.000**	**108'080**

Price Precision Extension & 2 Year Treasury Futures Tick

Upcoming Key Activities and Dates

- **Available** - Technical specifications and full rollout schedules on the Client Systems Wiki
  - MDP 3.0 and streamlined Schemas in New Release
  - Reduced tick 2 Year Note in New Release
  - CME, CBOT and MGEX schema rollouts are complete in Production

- **Starting November 18** – Production launch of MDP 3.0 and Streamlined NYMEX, COMEX, DME, KRX and BMD schema/templates
  - Schema rollout complete on December 2
  - Certification required

- **November 18** – CME Globex Test Production Launch - Reduced Tick Test Instrument
  - 8 decimal precision readiness required OR the ability to ignore market data on this new instrument
  - Tradable reduced tick dummy instrument will be available for testing on Globex
  - Expanded price format support for public FTP STL Settlement File
    - CME DataMine solution will also be available
  - Production mock session will be offered

- **January 13** – Production Launch for Reduced Tick for 2-Year Treasury Note futures, all 2-Year Treasury Future Spreads along with the futures leg of covered options UDS

Consolidated iLink Fill Messages

Consolidate iLink execution reports and clearing trade confirmations to improve performance and increase capacity

- **Consolidation of Fill messages on all customer interfaces:**
  - Completed: MDP 3.0 – Fill consolidation was already delivered in the Trade Summary Message
  - Next: iLink Order Entry
  - Clearing - Trade Match Report messages will reflect iLink fill consolidation

- **iLink Fill Message Consolidation**
  - Per aggressor order, at a single trade price
  - Within the same liquidity source (i.e. customer order and/or implied order)

- **Display Quantity Orders**
  - With Consolidated Fills, resting Display Quantity order fills will be consolidated and sent out at the end o each match event
  - Today, fills for DQ orders are sent for each refresh and are interleaved with regular orders

- **Messaging Impacts**
  - New Repeating group for Fill Reason contains:
    - Tag 1362 - NoFills
      - » Tag 1363 – FillExecID
      - » Tag 1364 – FillPx
      - » Tag 1365 – FillQty
      - » Tag 1622 – FillYieldType (Aggressor or Matching Algorithms i.e. FIFO, Pro-Rata, LMM)

Example: Fill Message Consolidation (Pro-Rata)

Bid	Ask
	10 @ 1.0 - Order B (25%)
Order A Bid 30 @ 2.0	10 @ 1.0 – Order C (25%)
	20 @ 1.0 – Order D (50%)
	50 @ 2.0 – Order E
	10 @ 2.0 – Order F

iLink Fills

Current State:

Order A 15 @ 1.0
Order D 15 @ 1.0
Order A 7 @ 1.0
Order B 7 @ 1.0
Order A 7 @ 1.0
Order C 7 @ 1.0
Order A 1 @ 1.0
Order B 1 @ 1.0

**New State:**

Order A 30 @ 1.0 (Aggressor)
Order D 15 @ 1.0 (Pro-Rata)
Order B 8 @ 1.0   (Pro-Rata+FIFO)
Order C 7 @ 1.0   (Pro-Rata)

MDP 3.0 Trade Summary (No Change)

30 @ 1.0

CME Group

Example: Fill Message Consolidation (FIFO - Implied)

GEH8	
Bid	Ask
Order A Bid 100 @ 9806	5(10) @ 9805 - Order B (Display Quantity Order)
	10 @ 9805 – Order C
	20 @ 9805 – Implied Liquidity
	50 @ 9806 – Order D
	10 @ 9806 – Order E

GEM8	
Bid	Ask
	20 @ 9802 – Order X

GEH8-GEM8	
Bid	Ask
	20 @ 3.0 – Order Y

iLink Fills

Current State:
Order A 10 @ 9805
Order B 10 @ 9805
Order A 10 @ 9805
Order C 10 @ 9805
Order Y 20 @ 3
Order A 20 @ 9805
Order X 20 @ 9802
Order A 50 @ 9806
Order D 50 @ 9806
Order A 10 @ 9806
Order E 10 @ 9806

New State:
Order A 20 @ 9805 (Aggressor)
Order C 10 @ 9805 (FIFO)
Order B 10 @ 9805 (FIFO)

Order A 20 @ 9805 (Aggressor) → Implied Source
Order X 20 @ 9802 (FIFO)
Order Y 20 @ 3 (FIFO)

Order A 60 @ 9806 (Aggressor)
Order D 50 @ 9806 (FIFO)
Order E 10 @ 9806 (FIFO)

MDP 3.0 Trade Summary (No Change)

GEH8:
40 @ 9805
GEM8:
20 @ 9802
GEH8-GEM8:
20@3.0

GEH8:
60 @ 9806

Consolidated iLink Fill Messages – Launch Timeline

Oct	Nov	Dec	Jan	Feb	Mar

Oct 22	**Oct 29**	**Nov 19**	**Jan 14**	**Feb 3**	**Feb 24**	**Mar 3**	**Mar 10**
New Release Week 1	New Release Week 2	New Release Week 3	New Release Week 4	**Production Week 1**	**Production Week2**	**Production Week 3**	**Production Week 4**
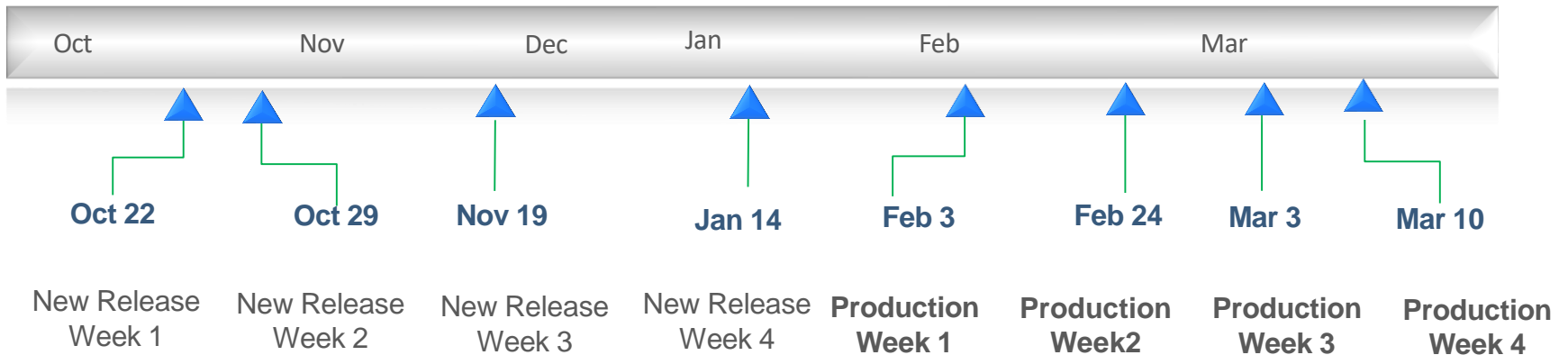
- Consolidated iLink Fill Messages will be a multiphase rollout
- Consult the Client Systems Wiki for full launch schedules
- Please confer with your internal teams and vendors to check readiness
- No certification is required; testing is encouraged

More information & video are now available in the
CME Group Client Systems Wiki

CME Group

iLink Enhancements

End-to-End Note Field

- New FIX tag 5149-Memo carries customer text from iLink to Drop Copy and CME STP
- Launch Timeline: NR – October 22, 2018 / Production – March 31, 2019

Clearing Instructions (e.g., Average Pricing and SLEDS)

- New FIX tags for post-trade clearing instructions on customer orders
  - Tags 819 - AvgPxIndicator
  - Tag 1731 - AvgPxGroupID
  - Tag 1598 – ClearingTradePriceType
- Currently, special characters in tag 1-Account are used to signal post-trade instructions
- Special instructions in Tag 1-Account support will eventually be phased out post-launch
- Launch Timeline: NR – November 19, 2018 / Production – March 31, 2019

iLink Enhancements

Tag 50 Validation

- Market Regulation Rule 576 requires that all iLink messages sent to CME Globex are properly submitted with the correct Tag 50 ID

- With this launch, CME Globex will enforce the following tag 50 validation rules on all iLink message type:
  - Minimum length = 2
  - Maximum length = 18
  - Alphanumeric and permitted special characters

- iLink messages with invalid tag 50 value will be rejected

- Launch Timeline: NR – January 13, 2019 / Production – March 31, 2019

Executing Party Identifiers – 2H 2019

  - New optional tags allow customers to identify the responsible party of any order
    - Tag 116 – OnBehalfOfSubID (inbound message)
    - Tag 129 – DeliverToSubID (outbound message)

CME Group

iLink Enhancements

Mandatory Tag 1031 – Q4 2019

- Provides trading and clearing firms a more effective means to reconcile executing broker fees

- Requires current Tag 1031 - CustOrderHandling on all iLink order messages (currently optional)

- Tag 1031 valid values have been defined by the FIA

Tag 1031	Values	High/Low Touch
W	Desk	High
Y	Electronic (Default)	Low
C	Vendor-provided platform	Low
G	Sponsored access	Low
H	Premium algorithmic trading provider	Low
D	Other, including other-provided screen	Low

- FIA will publish a white paper soon with best practices and scenarios

CME Group

iLink Behavior Harmonization - CGW

To simplify session level behaviors across MSGW and CGW, the following changes to CGW will be launched on January 6, 2019.

These changes are forward-compatible and can be made at any time prior to launch

Real-Time Message Interleaving

- In resend request scenarios, customers will receive both the resend messages and the real-time messages

- Customers must be able to receive out-of-sequence messages during a resend response without triggering another resend request.

Duplicate Session TCP Connection Attempts

- CGW will no longer support duplicative TCP connection attempts

Launch Timeline

- **Available now in New Release**

- Certification via AutoCert+ is **mandatory** for all CGW customers

- **Production** – **January 6, 2019**

CME Group

iLink FIX Binary Order Entry

iLink FIX Binary has been refocused to deliver the following key features:

Layer	Feature	Customer Impacts
Presentation	Short Order Message	• Customers can create templates via the new iLink message with static information and a key prior to order submission • Streaming messages will not include the static data; instead, they will reference the applicable template
Presentation	Simple Binary Encoding (SBE)	• Improved performance and reduced variability • Streamlined, efficient message design • Fixed message sizes
Presentation	Spread & Legs	• Spread trades will now be fully reported in a single Execution Report message • Repeating group with spread and legs in 1 message
Session	FIXP Protocol	• Lightweight point-to-point binary protocol • Supports in-session recovery

iLink FIX Binary Order Entry

iLink FIX Binary will initially be available only on MSGW sessions

- Binary and ASCII will be supported in parallel for 6 months to allow customers to manage their own migrations
  - Legacy ASCII will be decommissioned following the parallel period on all MSGW sessions

- iLink FIX Binary will be available for Convenience Gateway sessions at a later date
  - Like MSGW sessions, ASCII and binary will be supported in parallel for 6 months, after which ASCII on CGW sessions will also be decommissioned

- Drop Copy will continue to publish source session messages in ASCII format.

Launch Timeline

- Client Impact Assessment: Q1 2019

- New Release: target in Q2 2019

- Production: target in Q1 2020

- Decommission of legacy iLink FIX ASCII **for MSGW sessions**: target 2H2020

CME Group

CME Reference Data API

CME Reference Data API is our new strategic solution for static product and instrument referential information

- Goal is to centralize static data in an out-of-band service available 24x7

- Dynamic data will continue to be streamed on the live market data feeds

Information delivered via a set of JSON RESTful web service APIs with real-time product and instrument information for all CME Group and CME Group-cleared markets.

Automate your product and instrument matrices, reducing manual setup.

Available information includes:

- Contract specifications

- Product codes and symbols for all CME Group venues

- Instrument lifecycle dates including first and last trade date, all notice dates, delivery dates and settlement dates.

Beta testing now; Contact your Global Account Manager to get access

Production Launch December 2018

CME Group

CME Group Data Insights: Settlements & Valuations

CME Group plans to create new MDP SBE channels for settlement and valuation data

Project Overview

- Settlement and Valuation Data
    - All Future and Option Settlements
    - Theoretical valuations for all Non-OI Future and Option instruments
    - High/Low prices
    - Volume and open interest

- Technology Overview
    - Realtime incremental feed
    - TCP recovery offered
    - Simple Binary Encoding (SBE) format
    - Will leverage Reference Data API for product and instrument information

- Includes products traded on CME Globex, OTC platforms and the Floor

- New Release launch Q1 2019

- Production launch 1H 2019

- Pricing TBA

CME Group

CME Group Data Insights: Settlements & Valuations

Theoretical Valuations Benefits - Futures

PJM METED Zone Peak Calendar-Month Day-Ahead LMP Futures End of Day
Valuation - NYM.47

- Settlements (Blue) will be complimented by Theoretical Valuations (Orange) produced by CME Settlement and Valuation teams

- With theoretical valuations the true asset values can be used for margin modeling, compliance, risk management and other firms specific needs

CME Group

CME Group Data Insights: Settlements & Valuations

Theoretical Valuations Benefits - Options

Crude Oil Option ITM Value Curve for Jan 2019 Series
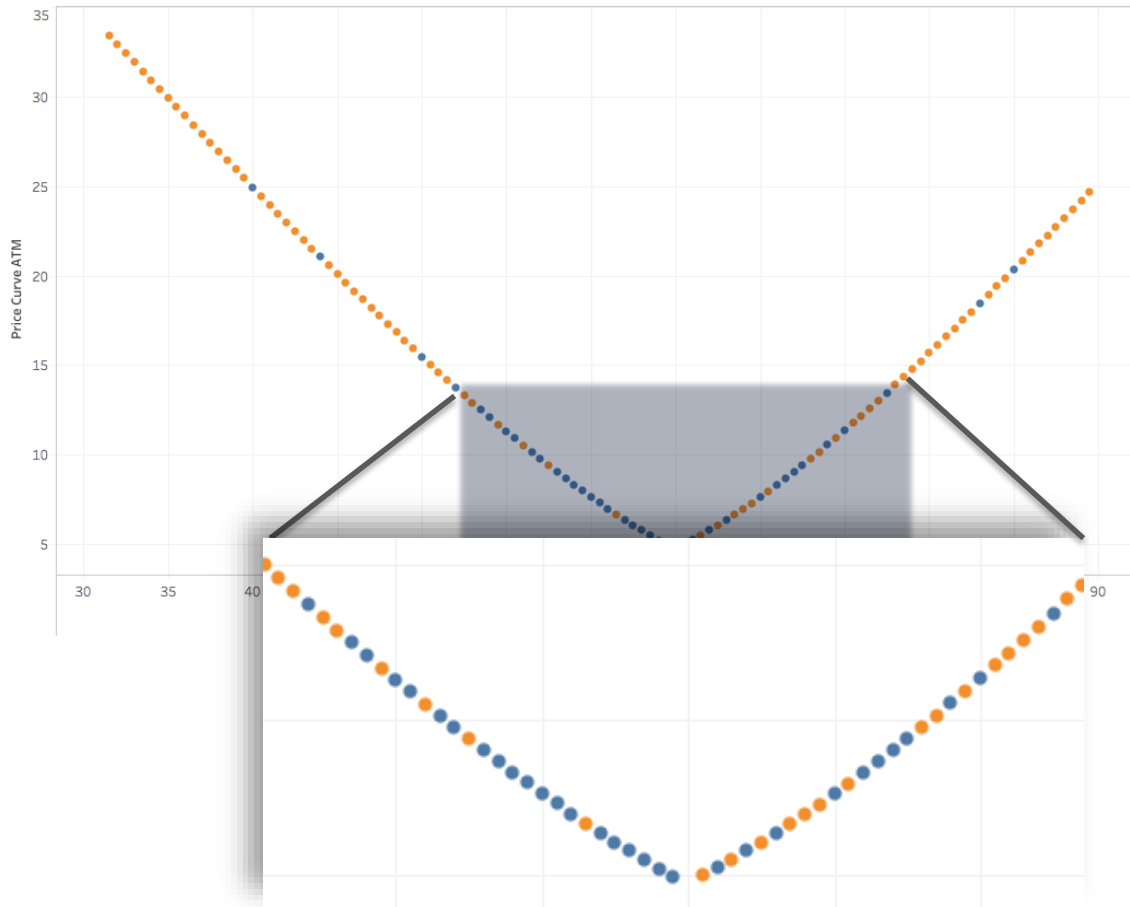
CL Option Settlements Counts
1 Trade Day Record Counts
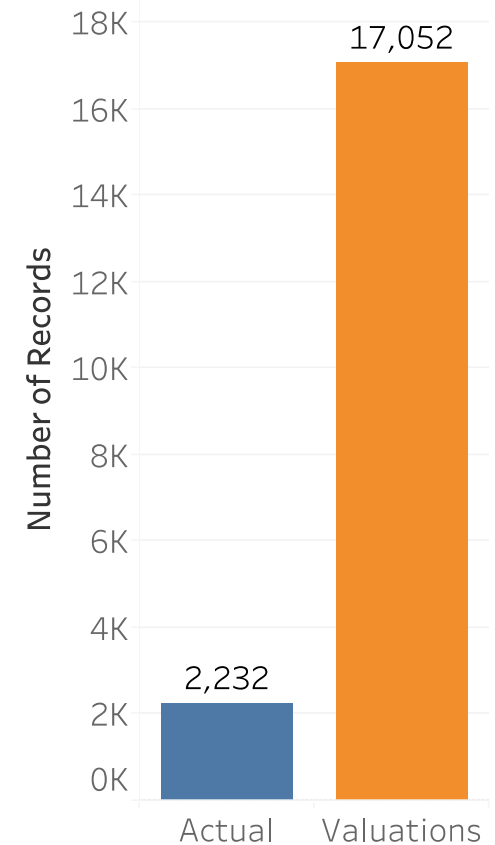
- Expect 5-8x the number of option valuations than currently receiving

- NYMEX DCM Valuations will launch first with other DCM later in 2019

CME Group

Decommission of ITC Functions

Decommission of ITC Functions Overview

Project Overview

- With the introduction of Settlement & Valuation data and Reference Data API many non-floor ITC data functions will become redundant and will be decommissioned in favor of a modern SBE architecture

- Additionally, unlike ITC, the Streamlined Settlement & Valuation data channels will support price decimals beyond 7 digits

- Floor data will continue to be disseminated on ITC

- Decommission timelines will be announced at a later date

Risk Management Tools Updates

ICC Product Restriction Policy (PRP) functionality

- Clearing Firm Risk Admins may set policy to block all accounts at selected Executing Firms from trading a specific product

- No need to register or set limits for individual accounts

- Supports account whitelisting under a PRP-blacklisted Executing Firm

- Launching Q1 2019

CME Group

Risk Management Tools Updates

CME Account Manager is a legacy monolith application

- Multiple tabs in a single User Interface (UI)

- Complex navigation

- Too many roles, functions and features

CME Account Manager is being phased out and its functions replaced by individual microservice UIs

- Each individual UI is specifically targeted to a customer type and business need

- These new UIs also allow us to offer API access
  - Starting with the ability to set ICC limits via the Account Management Services API

CME Account Manager functions are being deprecated as the new UIs roll out

- CME Account Manager will be decommissioned following the launch of all the new microservices

CME Group

CME Account Manager Microservices Rollout

Service	Function	New Release	Production	CME Account Manager Deprecation
Mass Quote Protections	MQP settings for CME Globex	Launched	Launched	Removed
Account Management Services (AMS)	Create, manage and view accounts and account-level risk settings for • ICC on CME Globex • PNTs via CME ClearPort CME Direct and CME Direct Mobile.	Launched	Launched	TBD

CME Account Manager Microservices Rollout

Service	Function	New Release	Production	CME Account Manager Deprecation
Entity Risk Management	Manage risk settings for users, firms and products: • ICC policies, alerts and product restrictions; • user credit controls for CME Direct and CME Direct Mobile	Launched	18 November	TBD
Risk Monitoring	Limits monitoring, reporting and audit screens	TBD	TBD	TBD
AMS API	API access to AMS functions	TBD	TBD	TBD

24

FirmSoft Administration Migration

In 2017 FirmSoft migrated to a new platform, which includes mobile capability, and new search and cancel by MSGW ID functionality.

User permissioning will migrate from the legacy FirmSoft Administration tool to User Administration in the CME Group Customer Center.

- User Administration is currently used to manage access to the following CME Group applications:
  - Firm Admin Dashboard, Risk Management Tools, Request Center Self-Service Tools, Deliveries Plus, Positions, Settlement Firm and Asset Management Firm

- Firms that have signed the **Self Service Agreement (SSA)** are eligible to manage access through User Administration.
  - Note: Upon completion of this migration period, firms that have not signed the SSA will revert to a paper-based process.

- Customer migration will begin in January 2019.
  - Global Account Management (GAM) will follow up with FirmSoft Administrators to schedule the migration.

CME Group

CME Direct – 2018 Enhancements

Equities-style options grid

- Quickly create an options grid based on underlying futures contracts
- Grid will automatically load all option expirations based on the underlying term order

Create Hedged Strategies

- Using grid displayed options volatility and delta create a hedged strategy to RFQ or trade.
- Create from:
  - Volatility (Bid/Offer/Market Implied)
  - Delta

Global Block Reporting

- CME Direct timer accurately reflects submission requirements for Spreads, Combinations, Extended Trading Hours, Asian Trading Hours.
- Users also receive a notification when the execution time for a deal exceeds the Block trade reporting time.

CME Group

Agenda

- **Globex Technology Roadmap**

- **Product Updates**
  - **SOFR & SONIA Futures**
  - **BTIC**
  - **Bitcoin Futures**
  - **Black Sea Wheat**
  - **FX Link**
  - **Energy**
  - **Liquidity Tool**

CME Group

SOFR & SONIA

SOFR – First 5 Months:

- 1 Trillion in notional value

- 137 Billion in notional open interest

- 80+ global participants

- Now live: SOFR Swap Clearing

SONIA – First month:

- Live with Quarterly contracts

- Capital efficient margin offsets against other CME Group STIR products
  - 50% vs Eurodollars

- Week 1 volume 15,000, Week 2 > 25,000

CME SOFR Futures
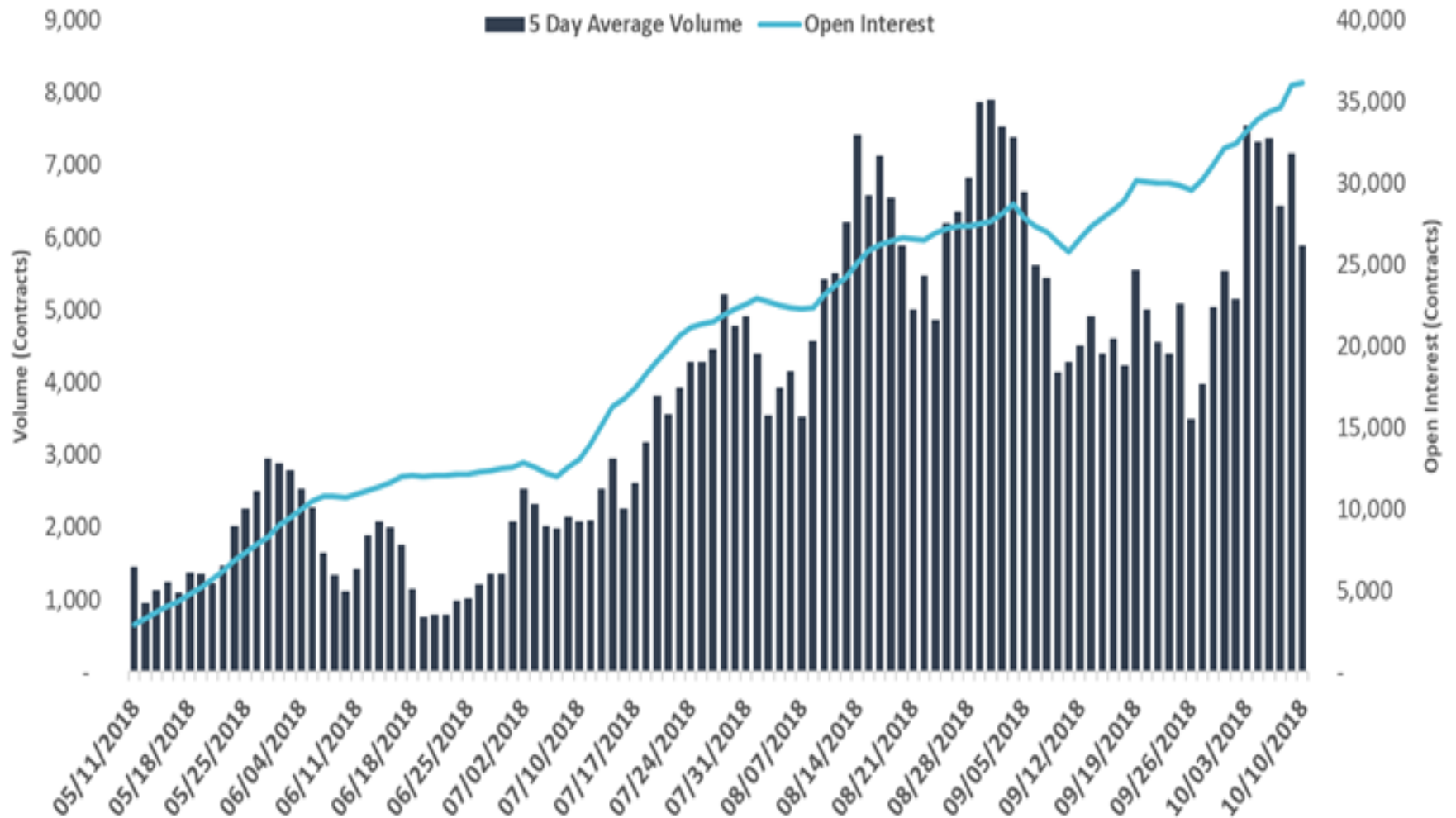
Basis Trade at Index Close (BTIC) – Record Volumes

- Basis Trade at Index Close on major U.S. indices all reached record highs in October, culminating in 108,068 contracts traded on October 12.

Basis Trade at Index Close (BTIC) on Major Indices

Futures Product	CME Globex Ticker	Bloomberg Code	New Volume Record
E-mini S&P 500	EST	STEA	95,048
E-mini Nasdaq-100	NQT	QNTA	15,830
E-mini Russell 2000	RLT	RLBA	7,927
E-mini Dow ($5)	YMT	YMTA	3,140

Data as of October 12, 2018

Source: CME Group

CME Group

Bitcoin Futures – Q3 Highlights Tremendous Growth

- ADV reached 5,053 contracts, +41% versus Q2 and equal to ~$177M notional or 25,265 equivalent bitcoins

- Average daily OI continues to grow at over 2,800 contracts, +19% versus Q2

- Bid-ask spread remains tight at under two ticks wide, reflecting unrivalled liquidity compared to past quarters

- Over 1,700 active accounts are trading

CME Bitcoin Futures Average Daily Volume (ADV) and Open Interest (OI)
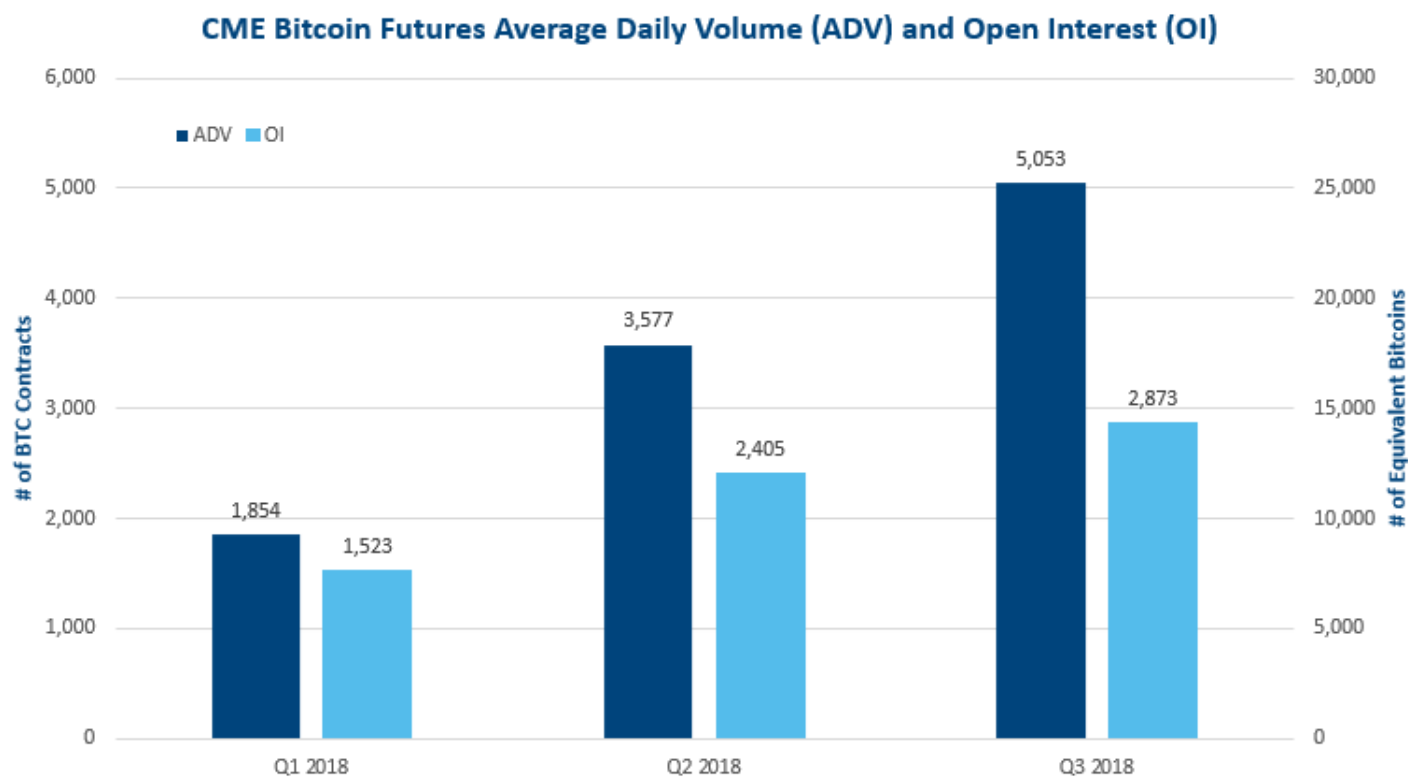
Source: CME Group

CME Group

Black Sea & Australian Wheat volumes & open interest

- \>115K lots of Black Sea Wheat futures (BWF) traded in 2018 (>5 million tonnes)

- BWF record trading day 31 July – 3600 lots

- Black Sea Wheat Open Interest of 20000 lots, out to July 2019

- 4700 lots of Australian Wheat traded in 2018, OI of 1900 lots out to Feb 19

Black Sea Wheat (BWF) activity

Australian Wheat (AUW) activity
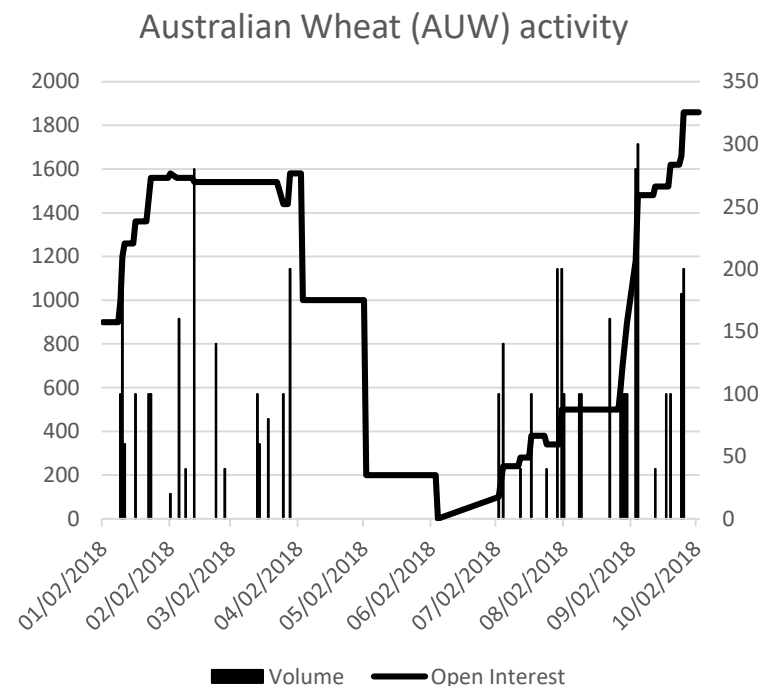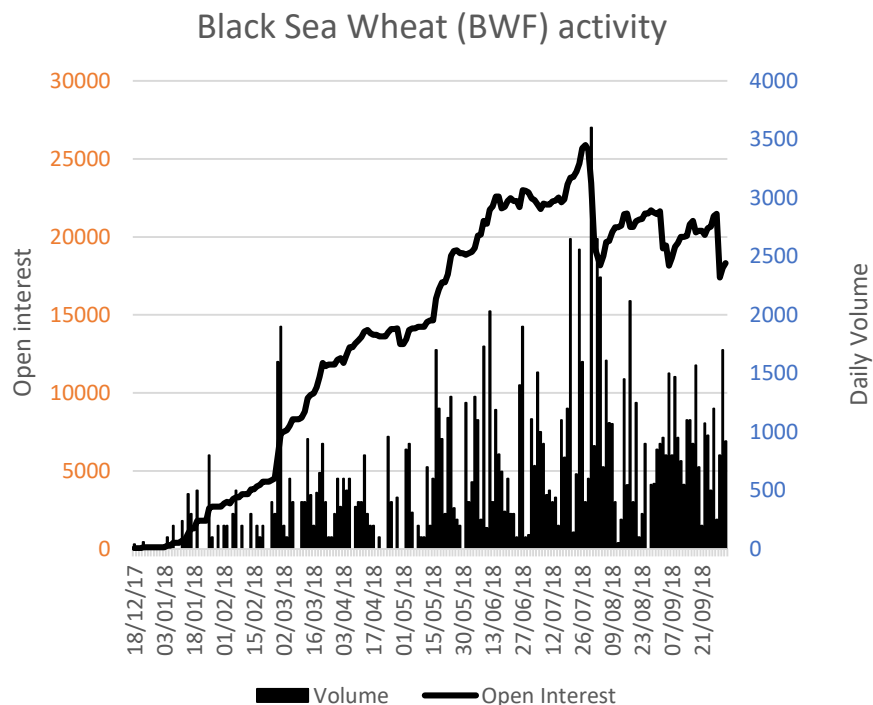
FX Link

Volume is growing, top-of-book is building, liquidity coverage is expanding

① **Record 17,898 contracts (>$1.7B notional) on October 11.**

- **Record five-day rolling average volume of more than 11,000 contracts.**

FX Link
5-Day Rolling Avg. Round Turn Volume

CME Group
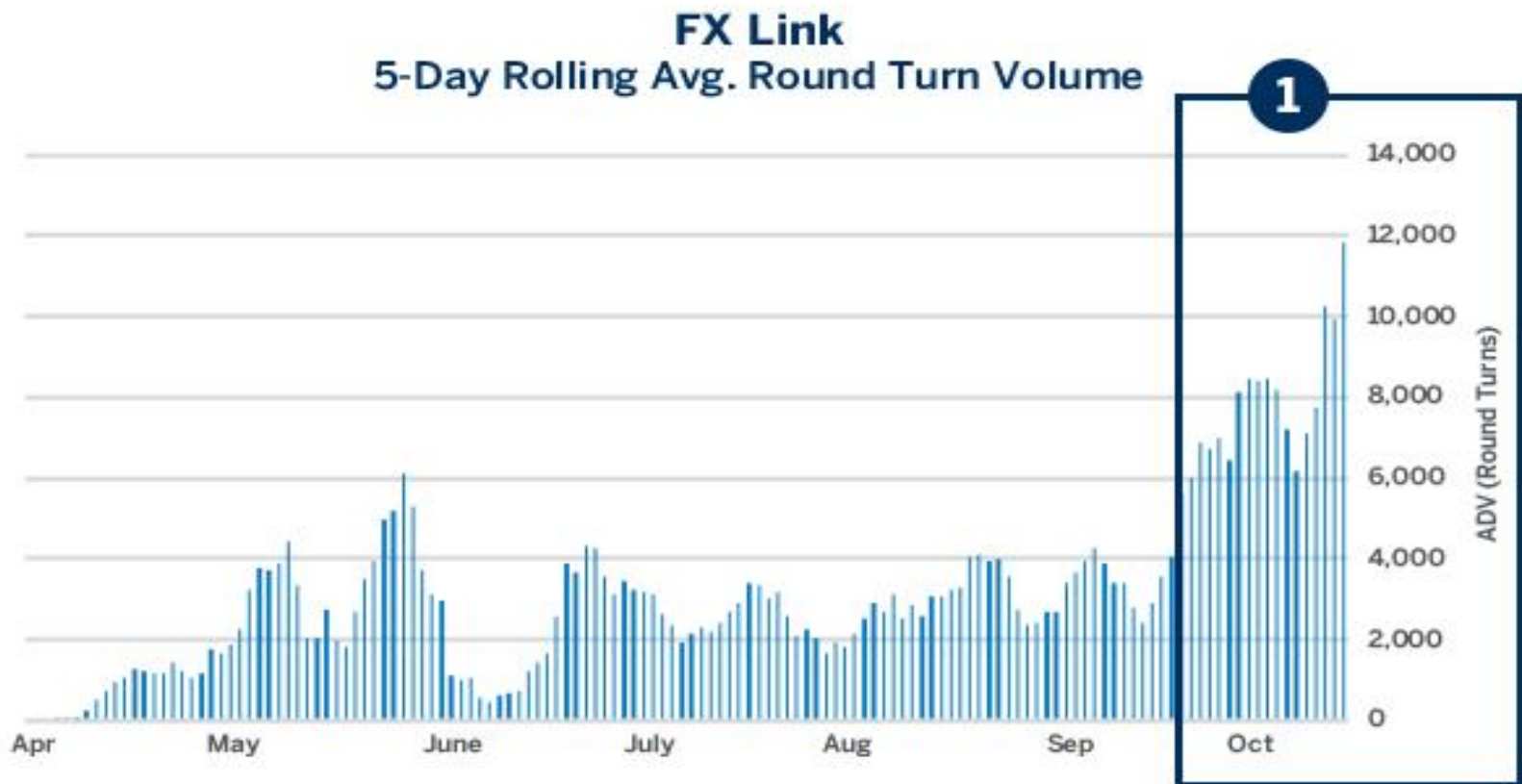
WTI Futures: Global Crude Oil Benchmark

- WTI Crude Oil Futures (CL) broke the single-day open interest record on May 16, 2018 with **2,713,986** lots outstanding

- Volume remains strong with **1.22mm** WTI Futures contracts traded per day in 2018 YTD

- As crude oil exports soar and cargoes find homes across the world, international traders look to hedge using NYMEX WTI

WTI Futures Volumes Climb and Open Interest Hits Record Levels
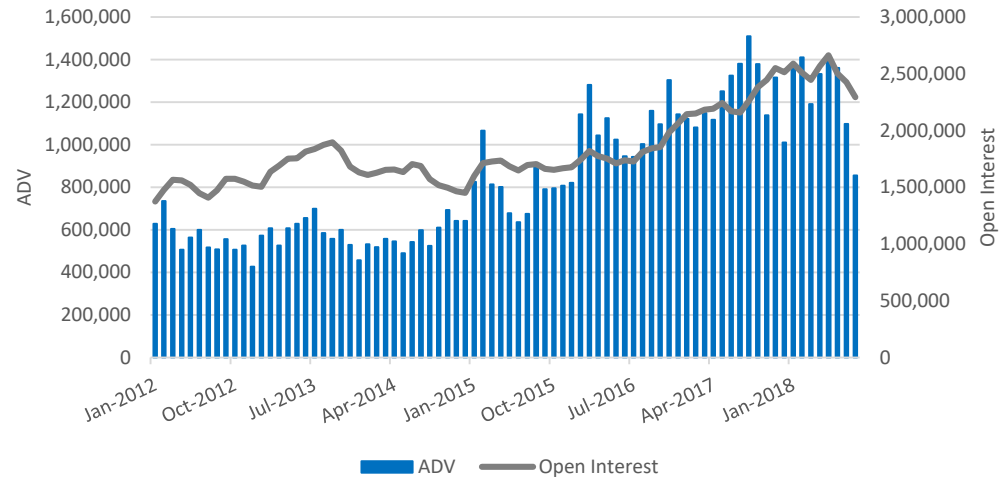
NYMEX WTI Open Interest Rivals ICE Brent's as International Markets Push for WTI Hedge

CME Group
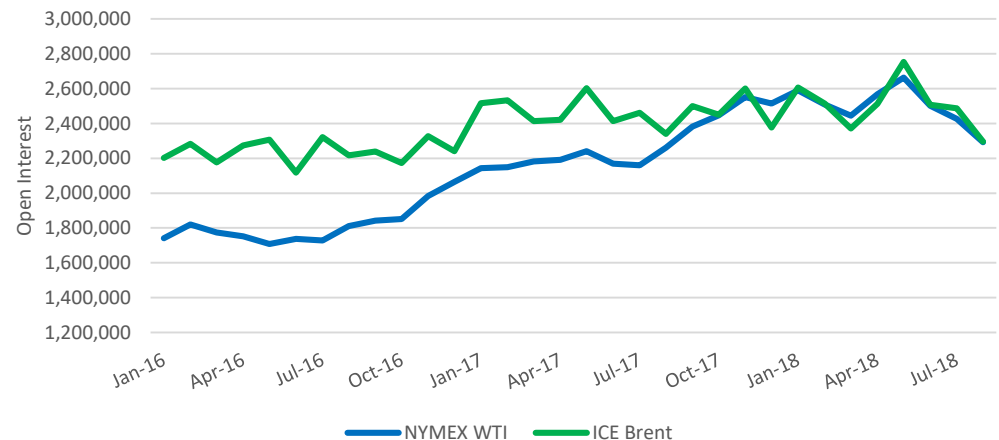
WTI Trading Up During Asian and European Hours

WTI Crude Oil Futures (CL) ADV During non-U.S. Trading Hours
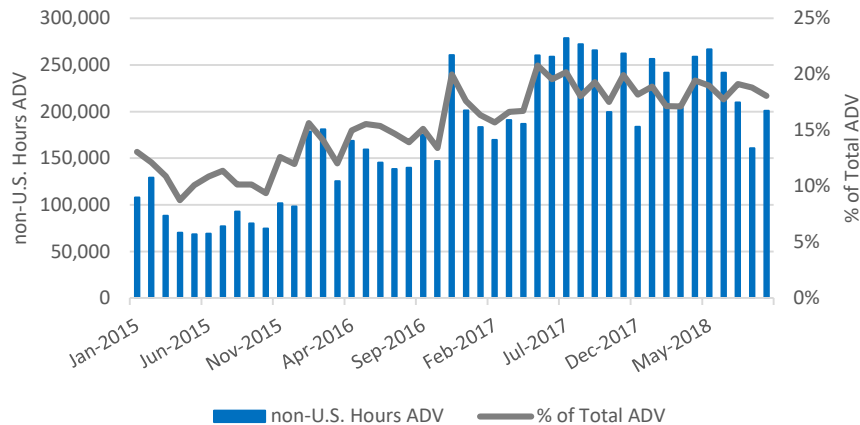
- **18%** of CL volume was traded during Asian and European hours during September 2018 as international traders take advantage of increased, around-the-clock liquidity

- 2018 YTD CL ADV during non-U.S. hours hits **226,000**

- Non-U.S. hours volume in WTI Options (LO) increased **78%** in September vs. one year ago

- Volume during London morning hours increased **69%**

WTI Crude Oil Options (LO) Trading During Non-U.S. Hours Increases

CME Group
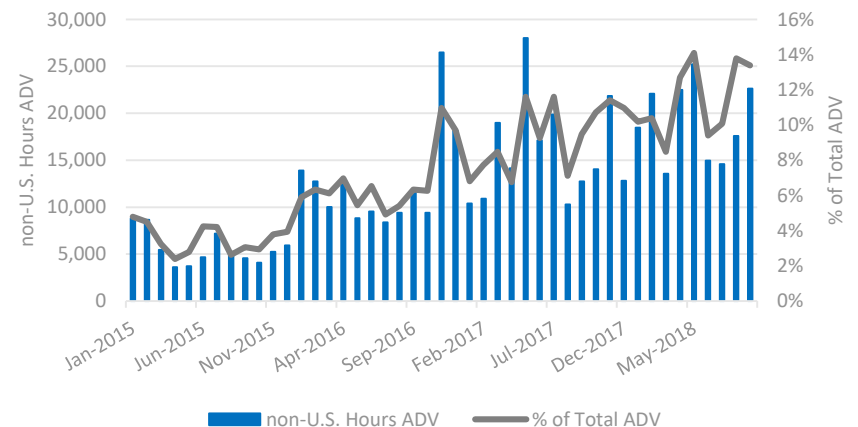
Electronic Liquidity in Crude Oil Options at All-Time High

WTI Crude Oil Options (LO) Electronic Growth
Driven by On-Screen Spread Trading

Legend: Outrights, % Electronic, Spreads
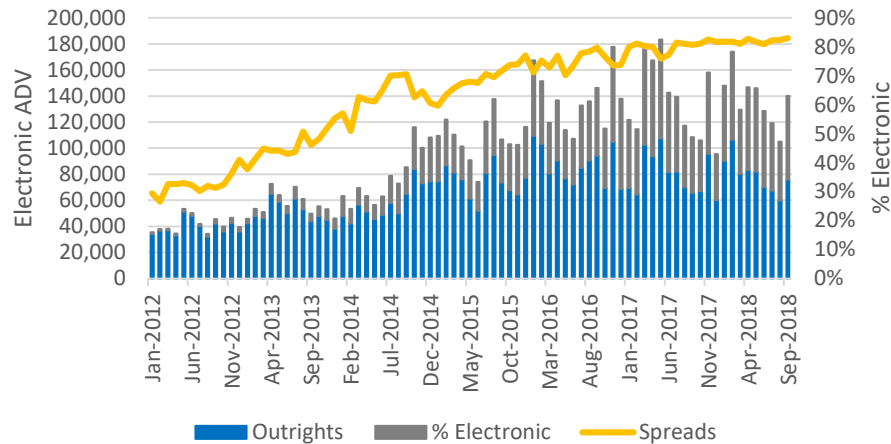
- **80%+** of total LO volume has traded on-screen for over a year straight

- A record **46%** of total electronic volume came from on-screen spread trading via CME's "Request for Quotes" (RFQ) functionality in September 2018

- Brent options (futures-style) hit record volume in September 2018 of **13,000/day**

- BZO was **35%** electronic in September

Brent Crude Oil Futures-Style Margin Option (BZO)
Electronic Volume Growth

Legend: ClearPort, Globex, Open Interest
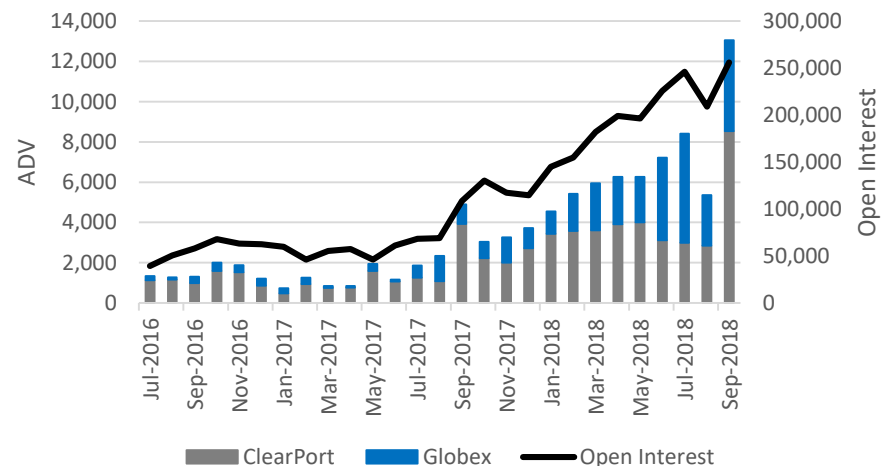
New - NYMEX WTI Houston Futures - HCL

- **Delivers into the Enterprise system – ECHO, Enterprise Houston Ship Channel (EHSC), and Genoa Junction**

- **Gain access to the most robust crude infrastructure in Houston, with connections to major refiners, robust storage capacity and export terminals**

- **Specifications are reflective of Midland crude, and provide a consistent, quality barrel of crude oil**
  - 40-44 API
  - .275 Sulfur
  - 4 ppm Nickel
  - 4 ppm Vanadium

- **Access liquidity electronically or through the block market**
  - HCL-CL and HCL-BZ exchange listed spreads on Globex
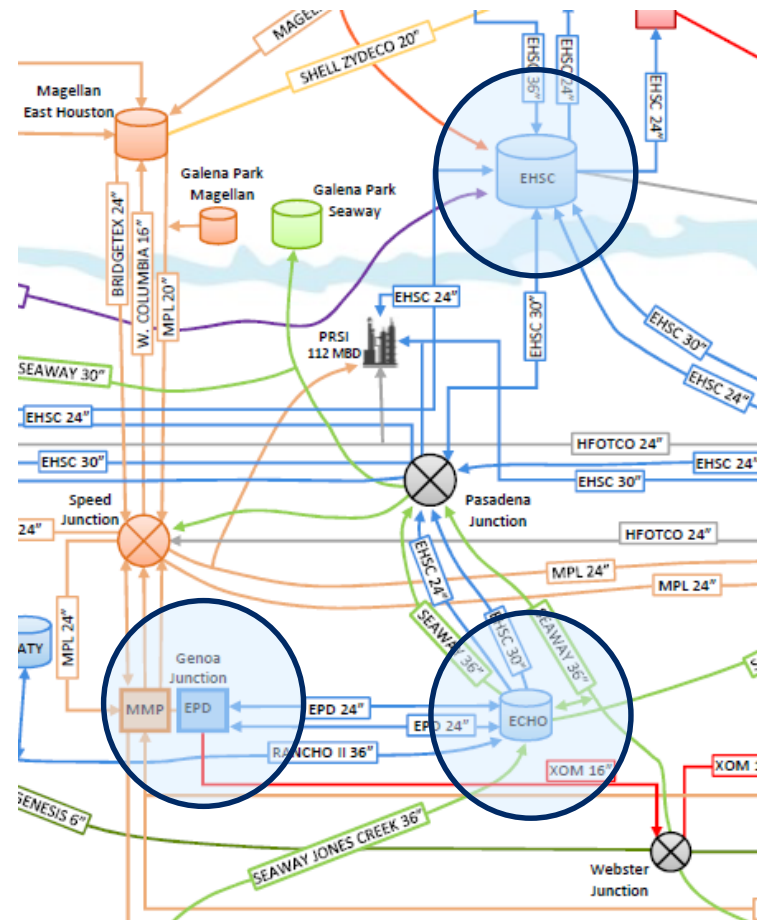
CME Group

CME Liquidity Tool

Powerful new tool to measure market liquidity

- Current and historical liquidity of CME Group futures and options across asset classes

- Features:
    - Bid-ask spread
    - Book depth
    - Cost to trade

- Free of charge

- Available to integrate

- www.cmegroup.com/liquiditytool
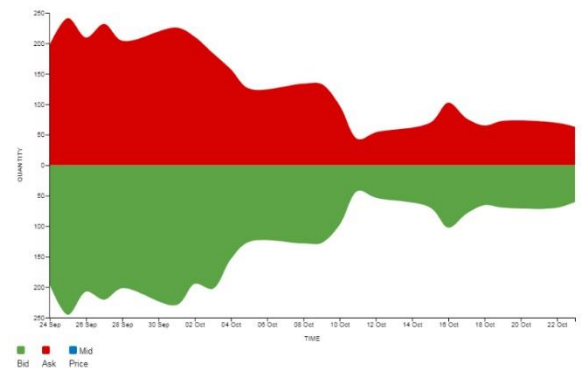
CME Liquidity Tool

Several views and data slices available

Users can select from 19 core products over three time zones and three separate analyses

Reference of Important Dates

Topic	Date
Account Management Services (AMS) Production Launch	28 Oct 2018
End-to-End Note Field New Release	22 Oct 2018
Price Precision TEST Product Launch	18 Nov 2018
CME Account Manager MicroService - Entity Risk Management Production Launch	18 Nov 2018
Reference Data API Launch	December 2018
FirmSoft Administration Customer Migration	January 2019
iLink Behavior Harmonization – CGW Production Launch	6 Jan 2019
ICC Product Restriction Policy (PRP) Launch	January 2019
Price Precision Production 2 Year Note reduced tick Launch	13 Jan 2019
Consolidated Fills – Production Launch	February-March 2019
iLink Enhancement - End-to-End Note Field Production Launch	31 Mar 2019
iLink Enhancement - Clearing Instructions Production Launch	31 Mar 2019
iLink Enhancement - Tag 50 Validation Production Launch	31 Mar 2019
Streamlined Settlement & Valuation Channel Production Launch	1H 2019
iLink FIX Binary New Release	Q2 2019

CME Group

Questions

Please contact your Global Account Manager (GAM) with any questions or concerns at globalaccountmanagement@cmegroup.com or via phone in the U.S. at +1 312 634 8700, in Europe at +44 203 379 3754 or in Asia at +65 6593 5505.

Thank you!

Disclaimer

CME Group