

LSEG Academy

Carl A. Nabar

Director of Market Surveillance

May 2026

**Managing
Benchmark Risk and Trade
Surveillance in Modern Markets**

LSEG



Disclaimer

The content in this presentation is provided by LSEG for your personal information only and is not intended for trading purposes or deciding to carry out a transaction or trade. Nor does it provide any form of advice, or make any recommendation regarding financial instruments, investment, or product. LSEG shall not be liable for any errors, inaccuracies, or delay in content, or for any actions taken in reliance thereon. LSEG expressly disclaims all warranties, expressed or implied, as to the accuracy of any of the content provided, or as to the fitness of the information herein for any purpose.

About LSEG Academy

- **Learn Anytime, Anywhere:** 500+ on demand courses
- **Instructor-Led Classes:** Interactive, multiple languages
- **Market Insights & Intelligence:** Experts deliver industry market and briefing sessions
- **Certifications:** Learn essential skills and receive foundational certifications

Visit the [LEARNING CENTRE](#)



Trade Compliance

Store all your trades, media chats with a fu Global Relay.



LSEG Data Library for Python



Data Analysis



Analytics: LSEG Yield Book



The Municipal Markets



Getting Started

Discover the available features, build your layout, and explore useful apps for Fixed Income users.

[Start Learning](#) →



Traders

[VIDEO COURSE](#)

Leverage LSEG Solutions for identifying trading opportunities in the market, access real time pricing, reliable & accurate news and utilize our trading capabilities.

Workspace • Continuous Learning • 87 min



Sales

[VIDEO COURSE](#)

Discover the LSEG Solution for Sales professionals to identify market trends, analyze valuable insights, facilitate trades, and manage relationships effectively.

Workspace • Continuous Learning • 79 min



Middle and Back Office

[VIDEO COURSE](#)

Learn more about how LSEG supports Middle and Back Office functions to effectively manage business transactions and minimize business risks.

Workspace • Continuous Learning • 15 min



Risk Manager

[VIDEO COURSE](#)

Access the data and insights you need to monitor credit and market risk.

Workspace • Continuous Learning • 44 min

Agenda

-
1. Benchmark Landscape

 2. Global Regulatory Lens

 3. Modern Trading Dynamics

 4. Active Case Studies

 5. Live Demos



LSEG Surveillance Team Profile

Lee Yeomans

Quantitative Surveillance Manager (FX, Commodities, Rates)

Theory of Computation, Robot Operating Systems

Dr. Navtej Riyait

Head of Data Science (LSEG Trade Surveillance)

Swaps Valuation Modeling, Cross Asset Derivatives Pricing

Carl A Nabar

Head of Surveillance FX Product & Analytics, DSM

Dark Pools, ML/AI Applications, Cross Asset Solutions

Dr. Dmitriy Vinokurov

Senior Data Scientist

Developing Trading Applications

Dr. Navtej Riyait

Head of Data Science (LSEG Trade Surveillance)

Swaps Valuation Modeling, Cross Asset Derivatives Pricing

Dr. Rasika Withanawasam

Quantitative Surveillance & Technology

Machine Learning, LLM Applications, Data Mining



Managing Benchmark Risk – Overview

LSEG

Longstanding Deregulation

- **August 15th, 1971:** End of the Gold Standard, Fixed Exchange Rates
- **October 27th, 1986:** Big Bang, UK Stock Markets

Firm	Year	Trader	Losses	Market	Event	Action
Herstatt Bank	1974	Dany Dattel	\$0.75 Billion	Spot FX	1973-5 Recession	Nothing
Franklin Nat. Bank	1974	Peter Shaddick	\$200 Million	Spot FX	1973-5 Recession	Convicted
Allied Lyons	1991	Clifford Hatch	\$300 Million	Spot FX	ERM & S&L Crises	Resigned
Kashima Oil	1994	Unknown	\$1.5 billion	Forward FX	Louvre Accord Dies	Nothing
Barings Bank	1995	Nick Leeson	SG\$1.9 Billion	Short Nikkei Options	Kobe Earthquake	Jailed
All First Bank	2002	John Rusnak	\$0.8 Billion	Short Yen Options	Japanese Growth	Jailed
NAB	2004	Luke Duffy	A\$0.4 Billion	Short AUD Options	APRA Probe	Jailed
Ross Capital	2006	Wolfgang Flöttl	\$1.5 Billion	Short Yen Options	Refco Collapse	Acquitted
Aracruz	2008	Isac Zagury	\$2.5 Billion	Short Brazil Options	Lehman Collapse	Lawsuits
CITIC Pacific	2008	Frances Yung	\$1.8 Billion	AUD Exotic Options	Lehman Collapse	Nothing
Sebastian Holdings	2009	Klaus Said	\$0.5-1.0 Billion	Short Yen Options	Lehman Collapse	Lawsuits

- **Abolition of Fixed Commissions:** Negotiated commissions replaced fixed rates, reducing trading costs.
- **End of "Single Capacity":** Firms could act as both broker and dealer (market maker), buying and selling for clients and themselves.
- **Foreign Ownership:** Non-UK firms permitted to buy and own London-based brokers.
- **Technology Shift:** The move from traditional "open outcry" trading on the floor to electronic, screen-based trading via SEAQ.



Notes: The City of London which dominates FX and Commodity markets fundamentally changed in the 2 decades that preceded the 1990s with Regulation, Accounting and Pricing playing catch up.

The Gramm-Leach-Bliley Act eliminated the Glass-Steagall Act's restrictions against affiliations between commercial and investment banks in 1999. Article 66 Japan [1996] implemented 1998-2001 followed the deregulatory trend.

Overview of FX Benchmarks

- Passive hedgers utilized EOD London published levels (4pm LDN).
- Options markets used FIX for Calculation & Event based contracts written.
- Original window - 60 secs (now 300).
- Banks ran books in same instruments as clients within the FIX.
- **Conflicts of interest** exposed subsequently.
- **Collusive traders** formed groups to affect the FIX.

Weaknesses: Conflict of Interest, Lack of effective Governance.

Private forms of electronic communications used with group names:

- The Bandit Club
- The Mafia
- The Cartel

Notes: Banks faced complaints (criminal), individual traders were indicted in the US, convicted but subsequent appeals have quashed some decisions.



FX Benchmarks: Fines & Complaints

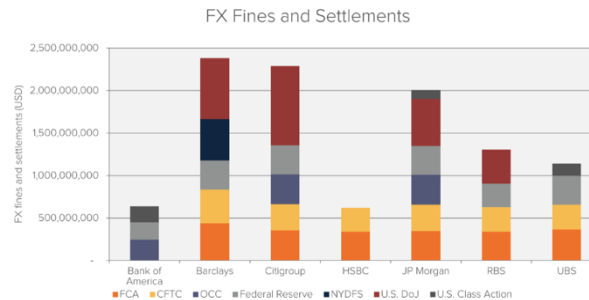
- Post-2008 Over \$10 Billion in **penalties** levied globally.
- One major FX Benchmark (4pm LDN) attracted most **attention**.
- Individual Traders **indicted** by the Department of Justice.
- FX trader **permanently excluded** from market by the Fed.

Federal Reserve Board seeking to impose a \$487,500 fine on former Barclays Bank PLC employee and permanently bar him from the banking industry

The Federal Reserve Board on Friday announced that it is seeking to permanently bar Peter Little, the former head of the foreign exchange (FX) spot desk at Barclays Bank PLC in New York, from employment in the banking industry and to impose a \$487,500 fine on him.

Little is alleged to have engaged in unsafe and unsound practices by using electronic chat rooms to coordinate with traders at competitor banks to influence FX pricing benchmarks and by engaging in manipulative trading. Little is also alleged to have failed to adequately supervise subordinate traders at Barclays who coordinated with and disclosed confidential information to competitors on Little's behalf.

The enforcement proceedings follow the Board's actions prohibiting former Barclays FX traders Christopher Ashton and Michael Weston from employment in the banking industry, as well as the Board's May 2015 enforcement action against Barclays for unsafe and unsound practices in its FX market practices. The action against Barclays required the firm to pay a \$342 million civil money penalty and to engage in extensive remediation.



Notes: Although slightly tangential, last year (2025), we saw Jane Street being fined \$560MM for manipulating an Equities Index using Cash and Options markets. The bought cash, bought puts on the same asset (index) and at expiry when above the strike they sold.

Key takeaway is that **event driven manipulation** is becoming more important to be aware of and mitigation strategies deployed.



Interest Rate Benchmarks: (LIBOR)

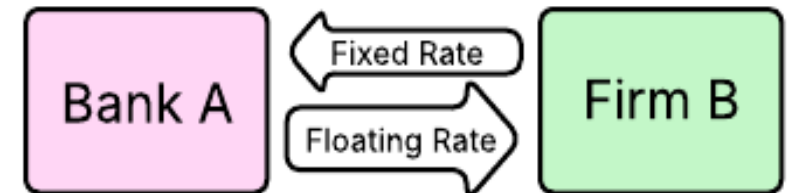
- **LIBOR** – Replaced by SOFR, SONIA & ESTR
- Floating Interest Rate used to calculate rate settings.
- IRS is a contract to exchange a Fixed rate for a Floating rate.
- **Calculation method:** was a polling of banks, removal of upper/lower and arithmetic average published.
- **Weakness:** Subjective, Not Transactionally Based, Conflict of Interest and Lack of effective Governance.

Payer Swap



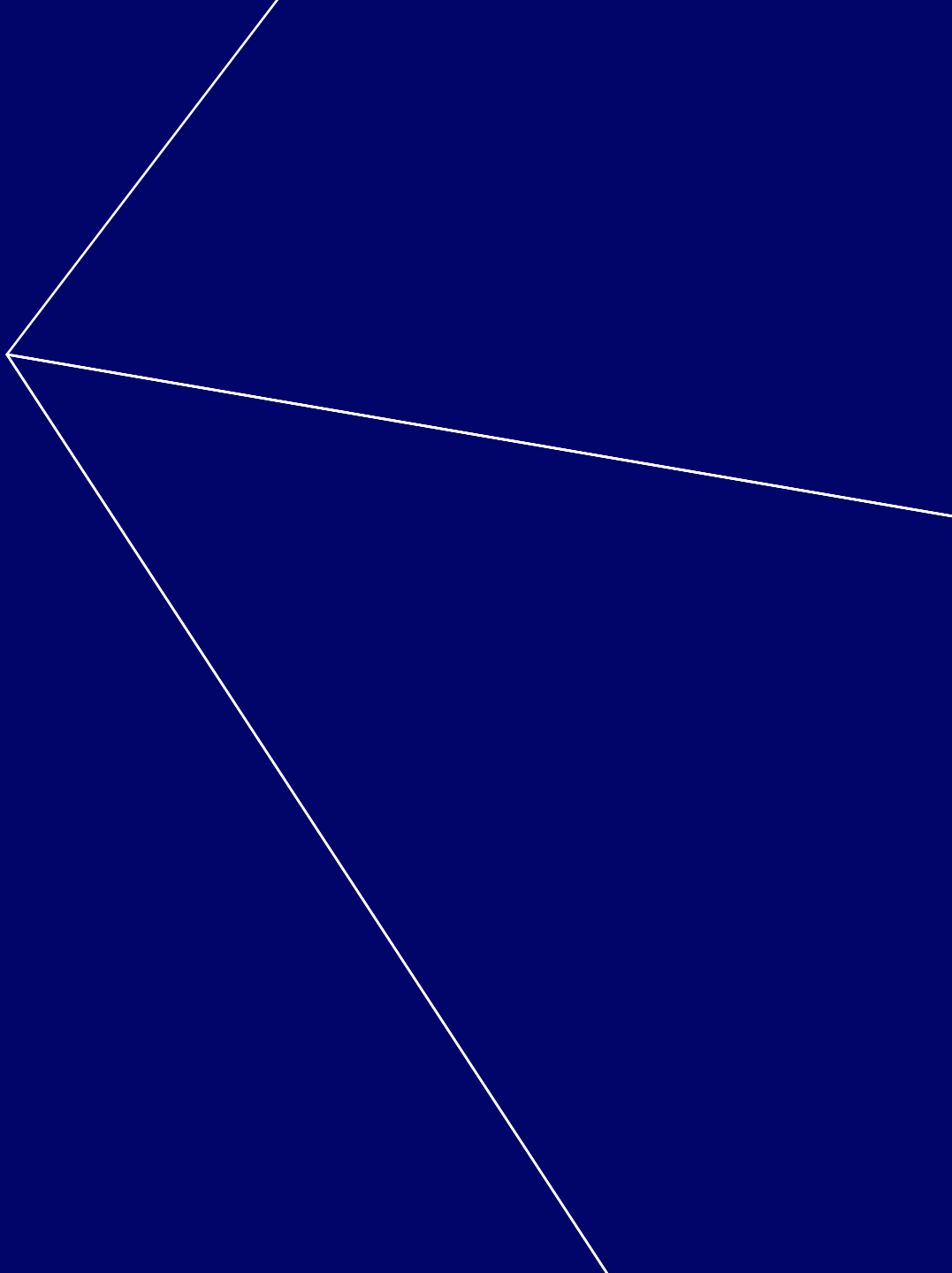
Floating rate has vulnerabilities to distortion. LIBOR Scandal involved how rates were distorted by financial institutions for their benefit.

Receiver Swap



Imperfect rates and systems:

- SOFR collateralized by US Treasuries — RFR, doesn't reflect private credit risk
- Single tenor only — no term structure
- Requires functioning Repo market
- Backward-looking (paid in arrears) — true borrowing costs not known until EOD



Managing Benchmark Risk – Regulatory Lens

LSEG

Benchmarks – Regulatory Lens

EU Benchmark Regulation (BMR)

- Requires administrators to be authorized or registered.
- imposes rules on transparency, governance, and data integrity in the EU.

IOSCO Principles for Financial Benchmarks

- The International Organization of Securities Commissions (Madrid).
- Sets out principles to ensure quality and integrity of benchmarks globally.

Dodd-Frank Act (2010)

- Additional oversight and rules for benchmarks in wake of LIBOR scandal.

Critical Benchmarks

- Some benchmarks are designated as “critical” due to their importance.
- Examples: EURIBOR, 4pm London Foreign Exchange Benchmark.
- ESMA applies stricter oversight and requirements for these Benchmarks.
- Enhanced reporting, governance, and transparency obligations.



Benchmarks – ESMA Rules & Requirements

Rules & Requirements	Description
Authorization and Registration	All entities that administer benchmarks must be authorized or registered with the relevant national competent authority, which then reports to ESMA. ESMA maintains a public register of benchmark administrators and the benchmarks they provide.
Governance and Controls	Administrators must implement robust governance arrangements, including procedures for managing conflicts of interest, oversight functions, and internal controls to ensure benchmark integrity.
Methodology Transparency	The methodology used to calculate benchmarks must be transparent, documented, and made available to users. Any changes to methodology must be disclosed in advance.
Data Quality and Reliability	Benchmark administrators are required to use reliable and representative data, ensuring that benchmarks accurately reflect the economic reality they are intended to measure.

Notes: ESMA can apply Sanctions & Penalties. ESMA and national authorities can impose sanctions, including fines and prohibitions, for breaches of the Benchmarks Regulation. Administrators and contributors must adhere strictly to the rules to avoid regulatory action.

Benchmarks – ESMA Rules & Requirements (cont)

Rules & Requirements	Description
Reporting and Disclosure	Administrators must publish information about their benchmarks, including definitions, methodologies, and potential limitations. They must also report to regulators and ESMA.
Supervision and Enforcement	ESMA supervises critical benchmarks (those with significant impact on financial stability) and can intervene, suspend, or prohibit the provision of benchmarks if rules are breached.
Third-Country Benchmarks	Benchmarks provided by administrators outside the EU can only be used in the EU if they meet equivalent standards or are recognized/endorsed by EU authorities.
Code of Conduct for Contributors	Contributors of input data for benchmarks (such as banks or market participants) must comply with a code of conduct to ensure the integrity and accuracy of the data supplied.

Notes: ESMA can apply Sanctions & Penalties. ESMA and national authorities can impose sanctions, including fines and prohibitions, for breaches of the Benchmarks Regulation. Administrators and contributors must adhere strictly to the rules to avoid regulatory action.

Benchmarks – Dodd-Frank Provisioning

Swap Data Reporting and Recordkeeping

- Requires parties to swaps and derivatives contracts to report transaction swap data repositories (SDRs).
- Includes any reference to benchmarks within contracts, increasing transparency around how and where benchmarks are used.

Central Clearing and Exchange Trading

- Mandate that standardized derivatives (many of which reference financial benchmarks) be cleared through central counterparties and traded on regulated exchanges or swap execution facilities (SEFs).
- Reduces counterparty risk and brings benchmark-linked contracts under greater regulatory scrutiny.

Notes: Dodd-Frank does not address benchmarks in a single, dedicated section. Instead, its rules impacting benchmarks are integrated into broader reforms concerning derivatives, swaps, and market conduct. The Act aimed to reduce systemic risk and increase transparency, particularly in [how benchmarks are used and referenced in financial contracts](#).

Business Conduct Standards

- Imposes business conduct standards on swap dealers and major swap participants,
- Includes requirements related to the disclosure of material information about benchmarks, such as how they are determined and any associated risks.

Anti-Manipulation and Fraud Provisions

The Commodity Futures Trading Commission (CFTC) and Securities and Exchange Commission (SEC) gained expanded powers to police manipulation and fraud in financial markets, including the manipulation of benchmarks.

Benchmark Transition and Fallbacks

The Act does not explicitly address benchmark transition

However, Regulators have used their Dodd-Frank authority to guide the transition from certain benchmarks ensuring fair and orderly markets.

Benchmarks – Whistleblowing

Whistleblowers reporting FX Benchmark manipulation can receive up to 30% of Sanctions exceeding \$1Million (SEC, CFTC).

October 2021 ~ \$200 Million was awarded to a single whistleblower.

- Informant assisted enforcement actions [CFTC, Interest Rate Benchmark].
- Legally enshrined in Dodd-Frank’s Whistleblower program.
- Protection against retaliation and anonymity are provisioned for by SEC, CFTC.

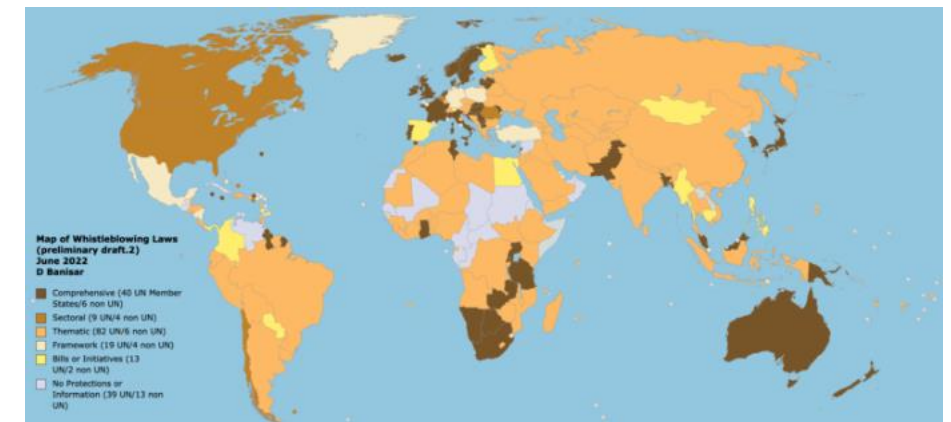
FCA whistleblowing program

- Firms must provide key person to oversee effectiveness of whistleblowing procedures.
- Internal procedures, training, confidentiality and protection from retaliation are all within scope.

Whistleblowing in financial surveillance gaps:

- Exposing hidden wrongdoing (Tax avoidance, Money laundering).
- Regulatory & Compliance Failures.
- Lack of Internal Controls.
- Misconduct.

Notes: Whistleblowing is becoming more globally normalized and therefore an additional layer of risk to non-compliant firms and culpable personnel within them.



A decorative graphic consisting of three white lines that meet at a central point on the right side of the slide. One line extends upwards and to the left, another extends downwards and to the left, and a third extends horizontally to the right.

Managing Benchmark Risk – Precious Metals

LSEG

Silver Benchmark - History

- **1897-2014:** Fix at Noon, 3 Banks (HSBC, Deutsche, Scotiabank)
- **2014-2026:** Silver Fixing awarded to CME Aug 15th, 2014.
- **2008-2016:** 8 Banks involved in Silver Manipulation (Spoofing, Benchmark Manipulation)
- **2016-2025:** 8 Bank Settlements Total **\$1.266 Billion**. (Goldman was for Platinum, Palladium, \$20MM only).
- **2023:** 2 JPM Traders Sent to Jail for Spoofing (Mike Novak, Gregg Smith)



Bank	Amount	Settlement Year	Manipulation Period
JPMorgan	\$920M	2020	2008-2016
Scotiabank	\$127.5M	2020	2012-2020
HSBC	\$76.6M	2018, 2023	2011-2020
Deutsche Bank	\$75.5M	2016, 2018, 2021	1999-2014
BofA/Merrill	\$25M	2019	2008-2014
UBS	\$20M	2018, 2025*	2013-2024
Goldman Sachs	\$20M	2025*	2008-2014
Morgan Stanley	\$1.5M	2019	2013-2014
Total	\$1.266B		

Silver – Recent Markets

Realtime View Customized View **Historical View**

Select Date: 2026-01-30 Select Region: Global

Instruments with Volatility Deviations on 2026-01-30 in GLOBAL:

Export

Flagged Instrument	Timestamp with Max Deviation	Annualized Volatility	Volatility Z-score	Open	High	Low	Close	Day Open	Price Move%
Gold	2026-01-30 18:45:00	101.57	6.9240	4801.4750	4829.5150	4801.4750	4829.5150	5432.4450	-11.1%
Palladium	2026-01-30 18:45:00	195.00	5.6402	1659.7550	1679.1155	1659.7550	1675.0000	2032.2500	-17.6%
Silver	2026-01-30 18:40:00	380.84	12.8042	76.2295	79.4745	76.2295	78.7216	117.5615	-33.0%
Platinum	2026-01-30 09:55:00	163.39	7.0060	2231.1800	2261.2000	2230.6800	2261.2000	2643.1500	-14.5%

Instrument-level Flags & News Updates

Flags News Updates

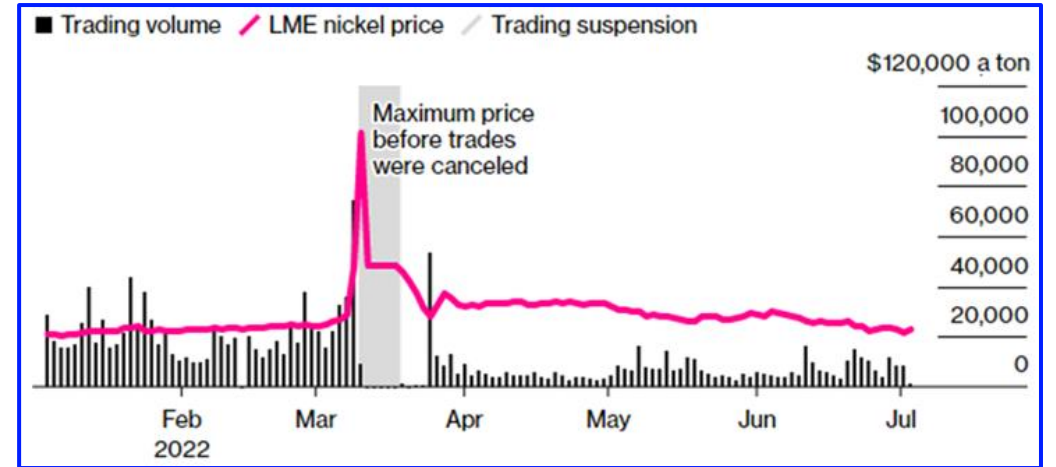
Export

Instrument	Timestamp	News Headlines
Silver	2026-01-30 21:50:04	BUZZ-US stocks weekly: Turbulence
Silver	2026-01-30 21:20:56	LIVE MARKETS-US stocks get a markdown, but precious metals suffer a meltdown
Silver	2026-01-30 21:07:59	Silver Intraday: caution.
Silver	2026-01-30 18:35:28	REFILE-BUZZ-AUD/USD-Bulls scatter after Trump nominated Warsh
Silver	2026-01-30 18:34:40	BUZZ-EUR/USD-Bulls get Warshed-out
Silver	2026-01-30 18:23:48	Spot silver slumps more than 30%



Notes: We run our own in house analytics over many markets, different asset classes which pick up Benchmark and non-Benchmark moves to alert the team. In this case we picked up an almost **13 Standard Deviation move** in Silver on Friday, January 30th when the market collapsed from \$120 to \$78. Not since the Hunt Brothers have we seen such volatility and only back then we had no real oversight of the market via widespread Benchmark usage. “Silver Thursday” Mar 27th, 1980.

Silver – Market Fragmentation



Notes: There are geopolitical forces impacting Silver hence the divergence seen in Paper Silver (Comex) and Physical Silver. How these are impacting Benchmarks on what metric of price is being evaluated. The future path of metals may be driven also by Asian reclassification of silver as a strategic material and thus restricting exports. **Benchmarks expanding from traditional US & UK/European based to growth in Asian-centric commodity Benchmarks.** As we saw with the Nickel (March 8th to 16th, 2022, increasingly markets are being influenced by Asian based players.

Beyond Silver – Other Benchmark Metals

Metals Real-Time Volatility

Update

Select Region:

Live Updates:

as at 2026-02-06 08:25:00 (UTC)

Instrument	Live Volatility	Live Price
Silver	103.85	74.0600
Palladium	97.98	1644.5000
Platinum	72.12	2006.9500
Gold	23.61	4870.4950

Instruments & Maximum Volatility Deviations on 2026-02-06 in GLOBAL:

Export

Flagged Instrument	Timestamp with Max Deviation	Annualized Volatility	Volatility Z-score	Open	High	Low	Close	Day Open	Price Move%	Flagged Status
Palladium	2026-02-06T01:25:00	271.21	4.1373	1569.2500	1585.7303	1555.9150	1563.4950	1583.2500	-1.2%	flagged
Platinum	2026-02-06T01:25:00	297.57	7.1294	1846.3829	1866.0291	1826.1163	1828.4000	1951.9532	-6.3%	flagged
Gold	2026-02-06T01:25:00	93.04	2.8803	4718.6150	4729.5600	4710.5750	4713.6800	4703.9200	0.2%	not flagged
Silver	2026-02-06T01:20:00	246.60	2.0779	69.4770	69.5381	68.5504	69.0430	67.1900	2.8%	not flagged

Instrument-level Flags & News Updates

Flags
 News Updates

Export

Instrument	Timestamp	News Headlines
Palladium	2026-02-06 06:39:45	PRECIOUS-Gold, silver gain in volatile trade; CME hikes margins again
Palladium	2026-02-06 03:51:14	PRECIOUS-Gold, silver set for weekly losses on tech selloff, stronger dollar
Palladium	2026-02-06 03:01:24	PRECIOUS-Gold, silver set for weekly losses on tech selloff and stronger dollar
Palladium	2026-02-06 01:02:05	Gold, silver extend losses on global tech rout, firmer dollar

Flags
 News Updates

Notes: News algorithm which collates relevant news activity around alerts so analysts can quickly assimilate event relationships. SLM interrogation tools with multi-language support. Model applies in a multi asset universe. View of other Benchmark Metals being flagged.



Managing Dark Benchmark Risk - Exotic Options

LSEG

Dark Benchmarks - Offshore market incidents

- Onshore fixed exchange regimes create specialized markets.
- Affects Swaps and Offshore cash markets.
- Qatari Riyal is a pegged currency onshore but has offshore market.
- Authorities are now more engaged in these specialized markets.

Qatar sues Luxembourg, UAE, Saudi banks in FX manipulation case

DOHA/LONDON (Reuters) - Qatar filed lawsuits on Monday against three banks, accusing them of causing billions of dollars of damage to its economy by what it called overseas currency manipulation in the wake of an Arab boycott against Qatar in 2017.

The cases, filed in London and New York, name Luxembourg-based Banque Havilland, the United Arab Emirates' First Abu Dhabi Bank (FAB) and Saudi Arabia's Samba Bank, according to filings seen by Reuters and a statement from Qatar's government communications office.

The Upper Tribunal has upheld the FCA's decision that Rangecourt SA (formerly Banque Havilland), Edmund Rowland, the former London CEO and Vladimir Bolelyy, a former Bank employee, acted without integrity.

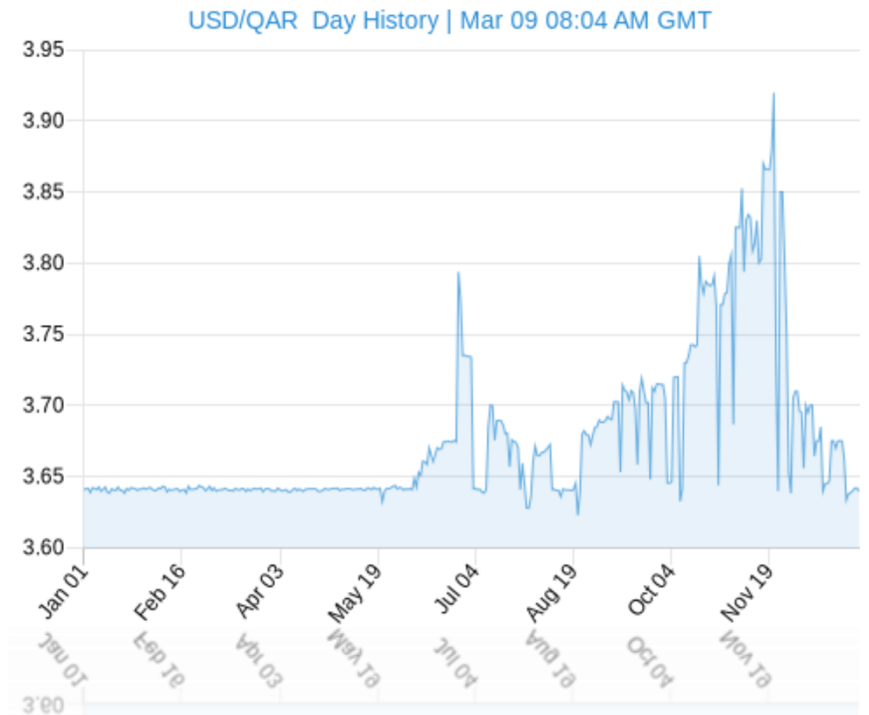
The Tribunal agreed with the FCA that significant fines should be imposed, deciding that fines of £4m, £352,000 and £14,200 were appropriate for Rangecourt SA, Mr Rowland and Mr Bolelyy respectively. The Tribunal also upheld the FCA's decision to ban Mr Rowland and Mr Bolelyy from working in financial services.

Banque Havilland created a plan (initially titled 'Setting fire to the neighbour's house fund') to harm the Qatari Riyal through manipulative trading strategies. The aim was to devalue the Qatari currency and break its peg to the US Dollar, harming the economy of Qatar. Banque Havilland intended to present this manipulative trading strategy to a sovereign wealth fund, Mubadala Investment Company. Mr Rowland and Mr Bolelyy were instrumental in this deliberate misconduct. Mr Rowland was trying to impress Mubadala in the hope of securing future financial benefit for Banque Havilland and his family. In making its findings the Tribunal held that Mr Rowland lied to both the FCA and in court. He also persuaded Mr Bolelyy to lie.

Steve Smart, executive director of Enforcement and Market Oversight at the FCA, said:

'Motivated by greed, Banque Havilland, Mr Rowland and Mr Bolelyy had a plan to seriously damage the Qatari economy. It is right that they have been held to account.'

USD QAR Historical Chart for Year 2017



Takeaways:

- ✓ A client may have their own personal view of what constitutes a “Benchmark” for them.
- ✓ There are thus a family of visible (published) and invisible (non-published) Benchmarks.
- ✓ These *dark* Benchmarks can be non-product (rule, law) or product led (Exotic Options).

Dark Benchmarks – Quick Options Refresh

Vanilla Options (Not irrelevant if strike is very large and pinned at Benchmark)

- **Calls** – Right to Buy, Fixed Strike, Fixed Quantity, Tenor (Expiration).
- **Puts** – Right to Sell, Fixed Strike, Fixed Quantity, Tenor (Expiration).
 - ✓ Exchange Traded (CCP Model) Or Over the Counter (OTC, Bilateral).

Exotic I – 1st & 2nd Generation

Weakly Path Dependent (**Focus for Benchmarks**)

- A Single Event forms part of the contracts
- KO, KI, Bets (European, American), Window Barriers.
- Strongly Path Dependent where the path determines the outcome
- Asians (Single and Double Average rate contracts)

Exotic II – Structured Products – 3rd Generation (**Not focus for Benchmarks**)

Accrual Options

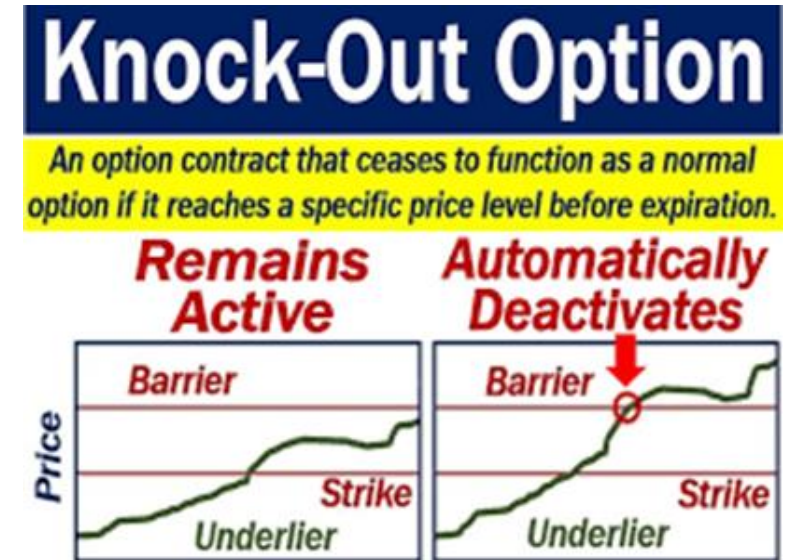
Fade, Time Swap, Range Accrual, Accumulator

Liability Management Products

Boosted Fade Forward Knock Out, Ratchet Strike Forward, Multiplicity Forward, Bull-Bear Accumulator Forward.

Structure Deposits and Notes

Dual Currency Option Note, Highway Deposit, Rainbow Note, Coast Note, Fort Knox Note, Forward Volatility Agreement, Volatility Swap

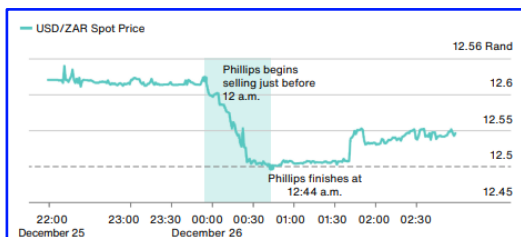


Notes: We are trying to uncover Dark Benchmarks. Options play a role in how the underlying Cash instrument behaves (Spot, NDF, Other Cash underlying). This role can be mostly background noise to locally dominant in some instances. This is known as Singularity Risk. It bears consideration for Benchmarks.

Dark Benchmarks – American Style Exotics

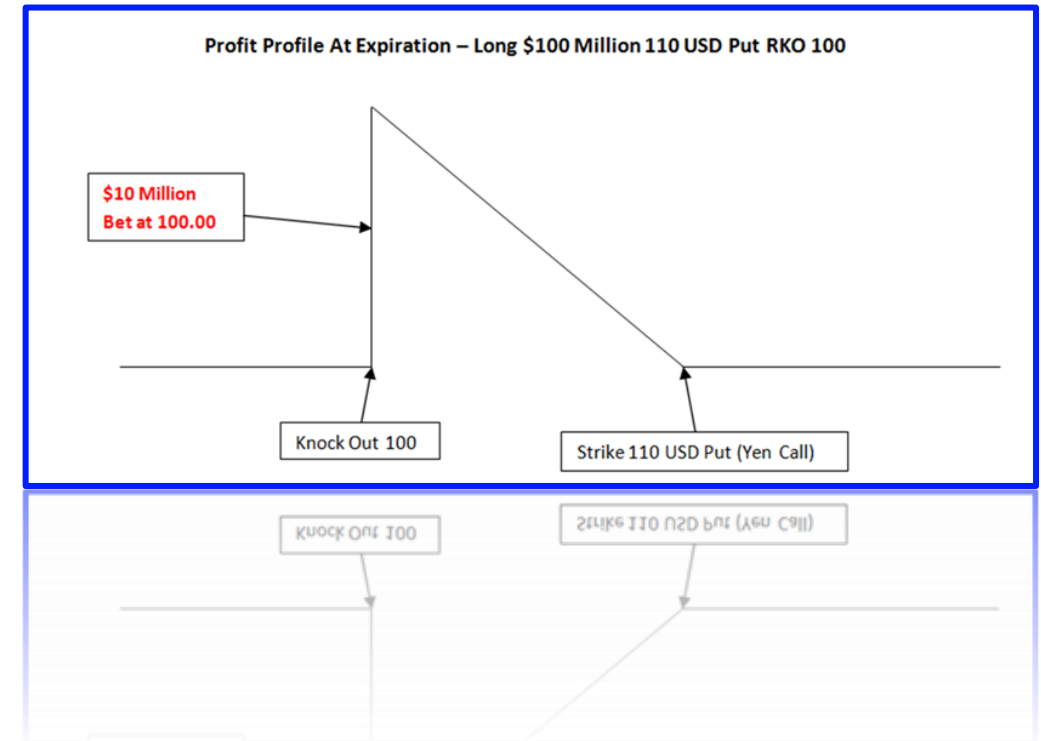
Consider the following contract:

- USD/JPY, \$100 Million Notional Option Quantity
 - Strike 110.00 USD Put
 - RKO 100.00 (“The Barrier”) **American Style Trigger**
 - Bet Size = Notional Amount*(Absolute (Strike-Barrier)/Barrier)
 - Bet Size here = \$100 Million * ((110-100)/100) = \$10 Million
 - This is a significant bet over a small range of spot
- -To Rationalize the power, it would take **\$100,000,000,000** Spot position to Bet \$10 Million over 1 Pip
 - -The trigger is always “live” and can adversely affect Benchmarks inadvertently as a consequence of the optionality (gamma) and exit risk associated with barrier event (delta jump, exit risk).



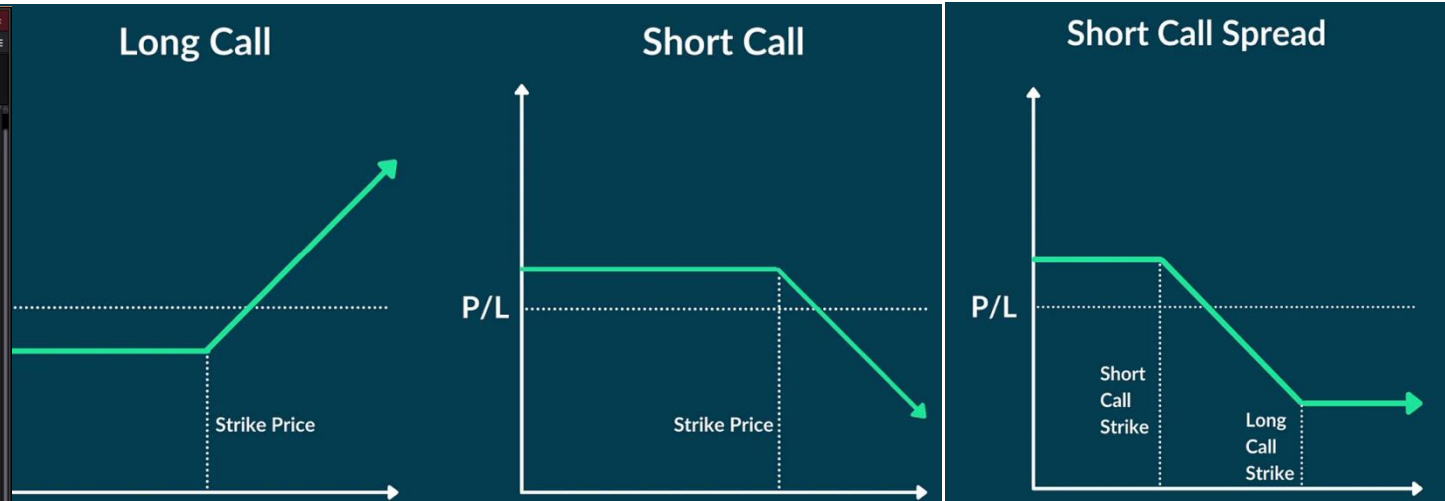
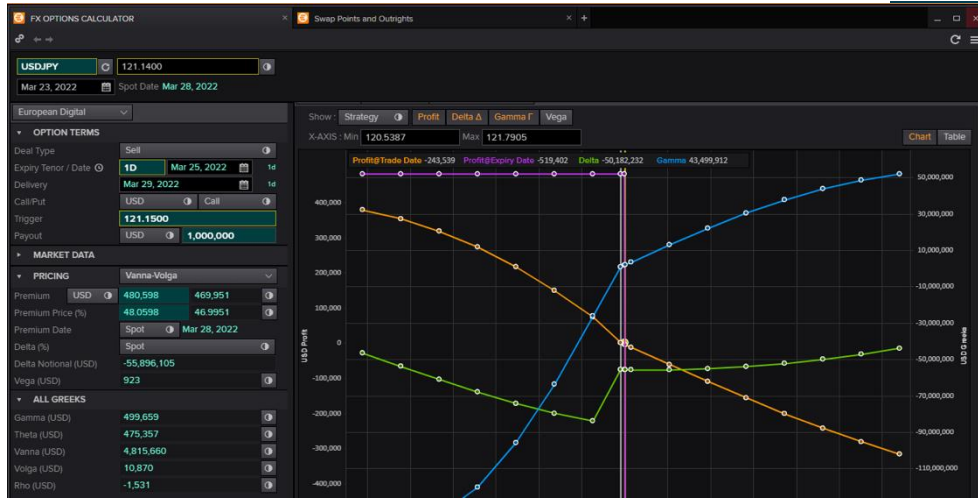
Notes: We have specific models for Benchmark related Alerting now, as well as a Barrier related Alerting sniffer algorithm, which attempts to detect the possible presence of large European, American or Window Barriers.

Weakly Path Dependent Options can directly impact Benchmarks, Strongly Path Dependent Options such as Asians are less impactful which include Single and Double Average rates. American style barriers have been in the news recently with the 12.50 One Touch Option in Rand [2017-2024].



Dark Benchmarks – European Style Exotics

Example: Overnight \$/¥ 121.15 Yen Put European Digital, Payout \$1MM, Seller's Profile.



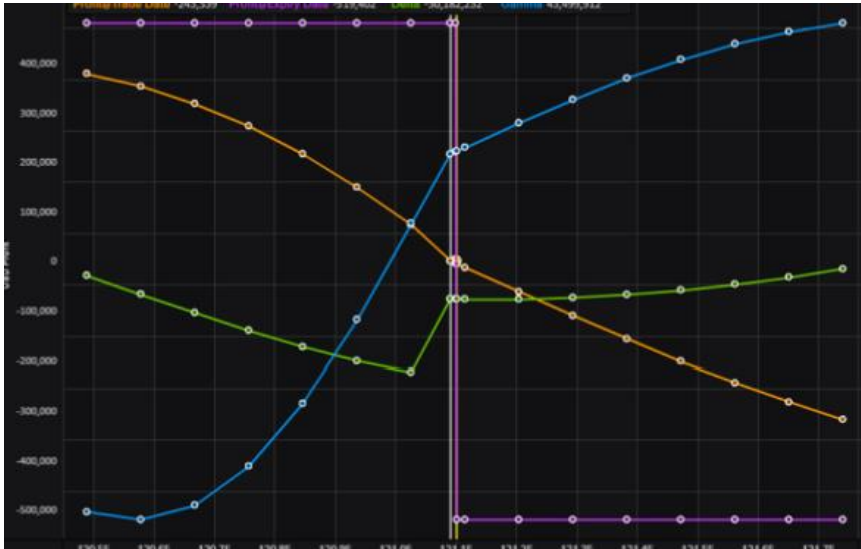
- \$/¥ 121.15 USD Call European Digital - \$1MM Payout - 10am NY Cut. Seller's Profile.
- American style digital - making and losing large amounts of money in 1 pip is big risk but how big – can we model it?
- The Digital (purple) looks like a short Call spread (in this case).
- **Key to understanding the risk to Benchmarks.**

Solving $X - Y = P$ (1) and $X(L) - Y(H) = 0$ (2)
ie $X = PH / (H - L)$ and $Y = X - P$.

Hi K	121.20	Lo Face	1,212,000,000
Lo K	121.10	Hi Face	1,211,000,000
Payout	1000000		

Notes: European Barriers can directly impact Benchmarks likely for major Option expirations such as 10am New York and 3pm Tokyo cut offs but can impact others as customized products are routinely sold to customers by Barrier Determining Agents (Banks).

Dark Benchmarks – European Digital in Gold



LBMA XAU Morning & Afternoon (3pm) Fixes

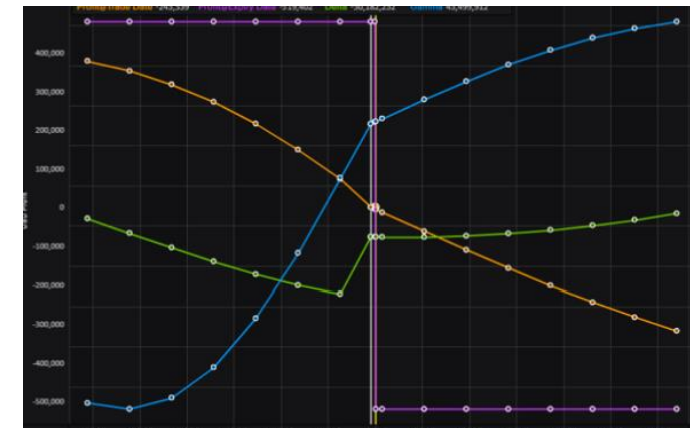
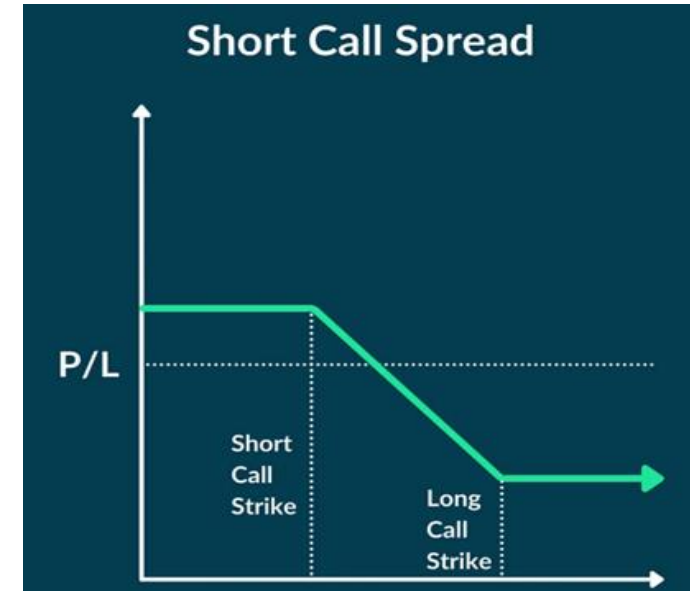
June 13, 2012	\$1,612.75 oz	\$1,619.50 oz
June 14, 2012	\$1,619.00 oz	\$1,613.50 oz
June 15, 2012	\$1,622.25 oz	\$1,627.25 oz
June 18, 2012	\$1,623.50 oz	\$1,615.50 oz
June 19, 2012	\$1,628.50 oz	\$1,625.50 oz
June 20, 2012	\$1,618.75 oz	\$1,601.00 oz
June 21, 2012	\$1,600.00 oz	\$1,582.00 oz
June 22, 2012	\$1,570.50 oz	\$1,565.50 oz
June 25, 2012	\$1,569.00 oz	\$1,570.00 oz
June 26, 2012	\$1,583.25 oz	\$1,576.00 oz
June 27, 2012	\$1,567.50 oz	\$1,573.50 oz
June 28, 2012	\$1,567.75 oz	\$1,558.50 oz

- **Barclays fined £26MM**
- Failures related to Gold Fixing
- Trader Dan Plunkett fined and banned.
- European Call Digital:
 - Strike \$1,558.96, Expiration June 28th, 2012.
 - Barrier Determining Agent - Barclays
 - Barrier Basis – XAU LBMA FIX 3pm London.
 - Barclays Short the option, Client Long the option.

Notes: [FINAL NOTICE: Daniel James Plunkett](#)

Dark Benchmarks – European Digital in Gold

- Barclays sold a gold digital options contract for \$4.4m, managed by trader Plunkett.
 - Payout of \$3.9m triggered if gold fixed above \$1,558.96 at 3pm on 28 June 2012.
 - If gold stayed below the barrier, Barclays kept the money — and Plunkett profited.
 - Plunkett had direct personal stake in the outcome.
 - This **conflict of interest** set the scene for manipulation.
-
- Being short the digital means being short a synthetic call spread.
 - Static spot hedges immediately above and below the barrier work against the option seller
 - This is **toxic singularity risk on a pinned strike** (at the exact wrong moment).
 - Selling Gold directly above the Digital was not mathematically correct.
 - This is a story about Options, less a story about Gold. The FIX is collateral damage.



Notes: [FINAL NOTICE: Daniel James Plunkett](#)

Dark Benchmarks – European Digital in Gold

Hi K	1560.4600	Lo Face	2,028,598,000
Lo K	1557.4600	Hi Face	2,024,698,000
Payout	3900000		

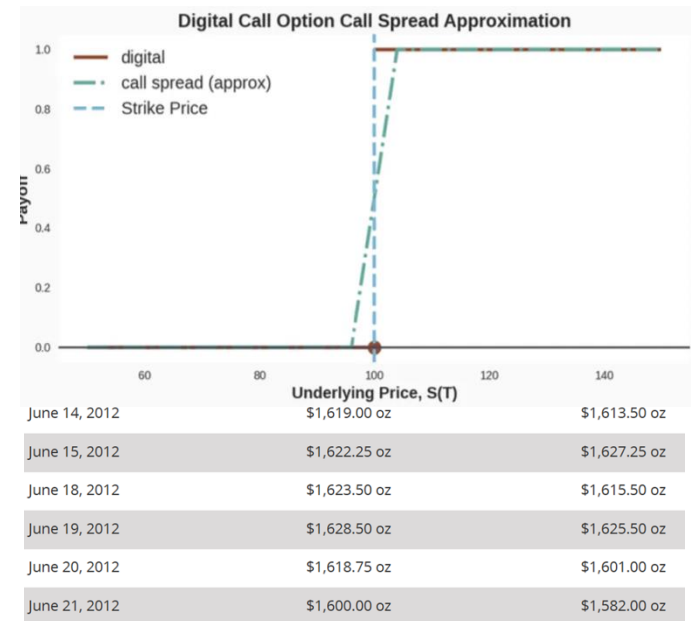
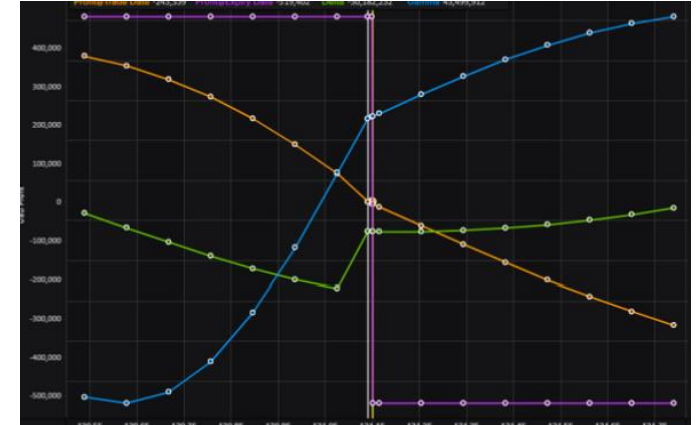
Solving	$X - Y = P$ (1) and $X(L) - Y(H) = 0$ (2) ie $X = PH / (H - L)$ and $Y = X - P$.	Hi K	1558.96001	Lo Face	303,997,202,717,519
		Lo K	1558.95999	Hi Face	303,997,198,817,519
		Payout	3900000		

- ✓ This is a very large position, and it is cross asset (FX, Commodities).
- ✓ To translate it into Gold terms, divide the Notional by ~1558.
- ✓ This is about 1.25 Million Ounces per leg. 100-300K is reasonable size.

Also being short the digital means being short a synthetic call spread which means the static spot hedges above and below the barrier work against the option seller at the very moment they need them not to.

It is **extremely explosive around expiry and highly localized to the strike.**

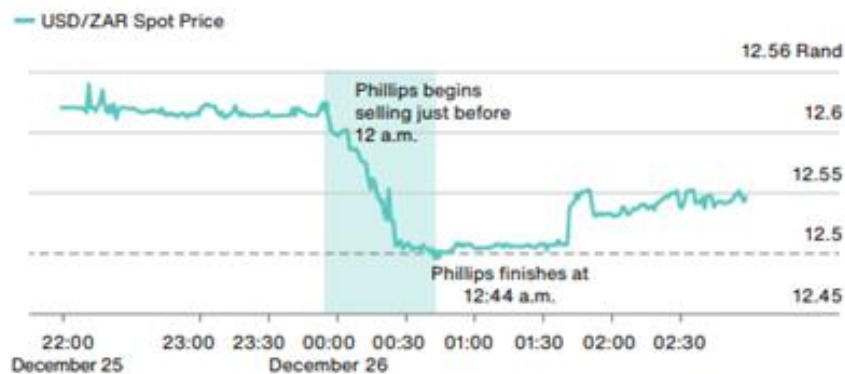
Notes: [FINAL NOTICE: Daniel James Plunkett](#)



Dark Benchmarks – Options Growth

Inside Safran's \$54bn FX options book

French aircraft parts supplier emerges as key exotics player



PHILLIPS Intentionally Manipulates the USD/ZAR Rate on Boxing Day 2017

With the \$20 Million One Touch Option set to expire in a matter of days without having been triggered, on December 26, 2017 (Boxing Day), PHILLIPS engaged in a scheme to intentionally and artificially manipulate the USD/ZAR rate to drive the rate below 12.50 and trigger payment under the \$20 Million One Touch Option. PHILLIPS caused and sought to cause the USD/ZAR exchange rate to fall below 12.50 by engaging in FX spot trades in which he caused hundreds of millions of USD to be exchanged for ZAR. PHILLIPS engaged in this USD/ZAR FX spot trading for the express purpose of artificially driving the USD/ZAR rate below 12.50. On December 26, 2017, in the hours that followed the completion of the USD/ZAR FX spot trading directed by PHILLIPS, the USD/ZAR rate once again increased and returned to levels above the 12.50 barrier and did not go below that rate for the remainder of the day.

In particular, during the span of less than an hour between shortly before midnight London time on December 25, 2017 (Christmas day), and approximately 12:45 a.m. London time on December 26, 2017 (Boxing Day), PHILLIPS personally directed a Singapore-based employee ("CC-1") of a bank ("Bank-3") to sell, on behalf of Hedge Fund-1, a total of approximately \$725 million USD in exchange for approximately 9,070,902,750 ZAR. During the course of that approximately one-hour period, PHILLIPS, through his trading, caused the USD/ZAR rate to fall substantially until the rate went just below 12.50. As soon as PHILLIPS had achieved his objective and the USD/ZAR rate fell below 12.50 due to PHILLIPS' manipulative spot trading activity, PHILLIPS immediately directed that CC-1 cease trading. PHILLIPS provided trading instructions to CC-1 through Bloomberg chat messages while PHILLIPS was located in South Africa and while CC-1 was located in Singapore. In these Bloomberg chat messages, PHILLIPS explicitly directed CC-1 to continue selling until the USD/ZAR rate fell below 12.50 and PHILLIPS expressly stated that PHILLIPS' purpose in directing these trades was to drive the USD/ZAR rate below 12.50 stating, among other things, "my aim is to trade thru 50," "[n]eed it to trade thru 50. 4990 is fine," and "[g]et it thru." Once PHILLIPS was informed by CC-1 that the USD/ZAR had traded at below 12.50, PHILLIPS immediately instructed CC-1 to "stop" trading and asked for proof "of the print."

- Table 1 OTC foreign exchange turnover by instrument.....
- Table 2 OTC Foreign exchange turnover by instrument, counterparty and maturity
- Table 3 OTC foreign exchange turnover by currency and counterparty.....
- Table 4 OTC foreign exchange turnover by currency.....
- Table 5 OTC foreign exchange turnover by currency pair.....
- Table 6 Geographical distribution of OTC foreign exchange turnover.....

OTC foreign exchange turnover by instrument

"Net-net" basis,¹ daily averages in April in billions of US dollars

Table 1

Instrument	2010	2013	2016	2019*	2022*	2025
Foreign exchange instruments	3,973	5,357	5,066	6,581	7,468	9,595
Spot transactions	1,489	2,047	1,652	1,979	2,085	2,957
Outright forwards	475	679	700	998	1,157	1,847
Foreign exchange swaps	1,759	2,240	2,378	3,198	3,798	3,986
Currency swaps	43	54	82	108	124	172
Options and other products ²	207	337	254	298	303	634
<i>Memo:</i>						
Turnover at April 2025 exchange rates ³	3,506	4,648	4,751	6,320	7,311	9,595
Exchange-traded derivatives ⁴	144	145	115	127	154	207
Exchange-traded derivatives ⁴	144	142	112	151	124	501
OTC derivatives ⁴	3,200	4,498	4,636	6,193	7,157	9,388
<i>Memo:</i>						

Notes: Options continue to grow at very strong rates in depth (**volume doubled in 3 years or 28% CAGR**) and complexity. Furthermore, we are starting to see exotic options investigations involving them – the American style barrier has been in the news recently with the 12.50 One Touch Option in Rand [2017-2024] involving a London based investment fund.

Dark Benchmarks – Swaps – Positive Points

USD/RUB	Spot	110.0000
---------	------	----------

A Pip in Spot matters over time and attrition!

	rub - q	usd - r	e(rub)	e(usd)	fractional	df	F	FP	Normalized	Quantity	Carry	Per Day
1d	0.12	0.0007	0.999666722	0.999998	0.002778	1.000331	110.0365	0.036459	364.6	10000000	3314.438	3314.438
1w	0.27	0.0008	0.994763757	0.999984	0.019444	1.005248	110.5773	0.577298	5773.0	10000000	52481.68	7497.383
1m	0.34	0.0023	0.972064291	0.999808	0.083333	1.028541	113.1396	3.139552	31395.5	10000000	285413.8	9513.795
3m	0.32	0.0053	0.923116346	0.998676	0.25	1.081853	119.0038	9.003793	90037.9	10000000	818526.6	9094.74
6m	0.3025	0.0083	0.859632764	0.995859	0.5	1.15847	127.4317	17.431678	174316.8	10000000	1584698	8803.878
1y	0.275	0.0133	0.759572123	0.986788	1	1.299137	142.905	32.905042	329050.4	10000000	2991367	8309.354

USD/RUB	Spot	80.0000
---------	------	---------

Spot Change %	37.50000000
Forward Point Change	37.50000000

	rub - q	usd - r	e(rub)	e(usd)	fractional	df	F	FP	Normalized	Quantity	Carry	Per Day
1d	0.12	0.0007	0.999666722	0.999998	0.002778	1.000331	80.02652	0.026516	265.2	10000000	3314.438	3314.438
1w	0.27	0.0008	0.994763757	0.999984	0.019444	1.005248	80.41985	0.419853	4198.5	10000000	52481.68	7497.383
1m	0.34	0.0023	0.972064291	0.999808	0.083333	1.028541	82.28331	2.283311	22833.1	10000000	285413.8	9513.795
3m	0.32	0.0053	0.923116346	0.998676	0.25	1.081853	86.54821	6.548213	65482.1	10000000	818526.6	9094.74
6m	0.3025	0.0083	0.859632764	0.995859	0.5	1.15847	92.67758	12.677584	126775.8	10000000	1584698	8803.878
1y	0.275	0.0133	0.759572123	0.986788	1	1.299137	103.9309	23.930939	239309.4	10000000	2991367	8309.354

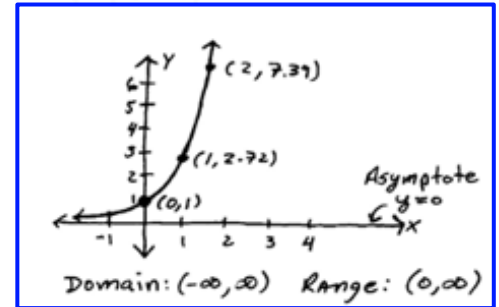
A Client could agree 1Month Points at 22,800 Spot basis 80 and be filled at 31,400 off Spot basis 110 but what if the firm managing that order was advance and over buying Spot in or around the Benchmark window.

Notes: Knowledge of Customer orders (Swaps, Outright Forwards) ahead of Spot leg being agreed has a risk of Front Running which can manifest itself in a Spot based Benchmark concern IF that Spot leg is based off a published or dark contractual based Benchmark.

Graph $f(x) = e^x$

$f(x) = e^x$	
x	$y = f(x)$
(-1)	.3679 $f(-1) = e^{-1} \approx .3679$
(0)	1 $f(0) = e^0 = 1$
(1)	2.7183 $f(1) = e^1 \approx 2.7183$
(2)	7.3891 $f(2) = e^2 \approx 7.3891$

(5)	148.4132 $f(5) = e^5 \approx 148.4132$
(1)	2.7183 $f(1) = e^1 \approx 2.7183$



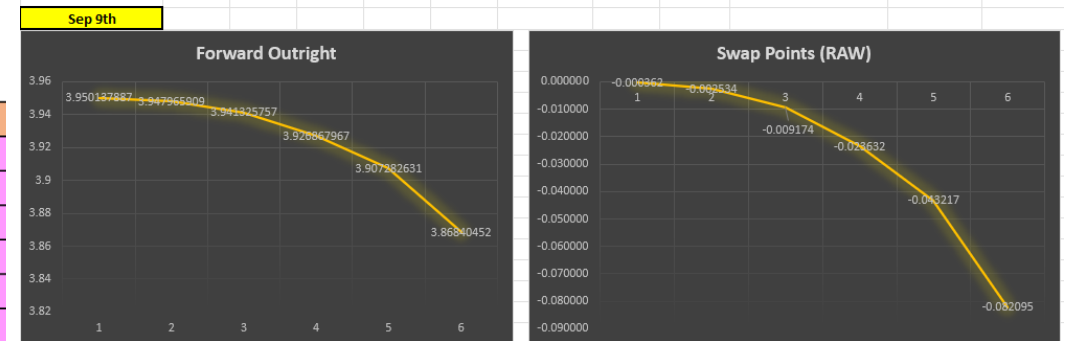
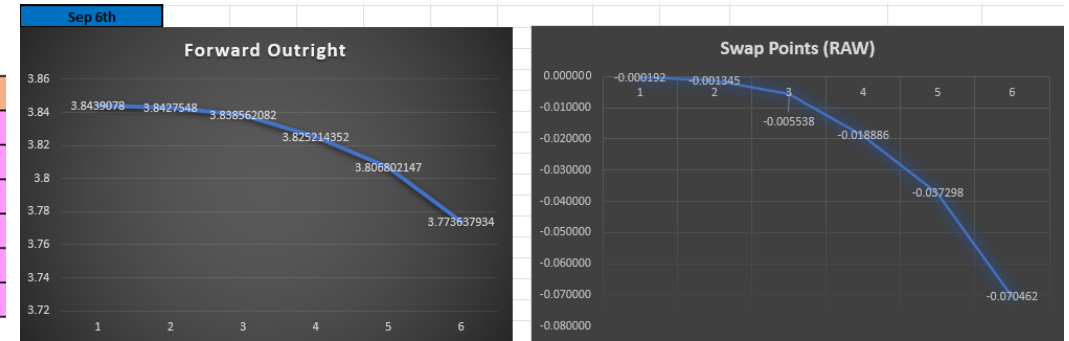
Dark Benchmarks – Swaps – Negative Points

Sep 9th USD/ILS Spot 3.9505

	Chart Area	usd- r	e(ils)	e(usd)	fractional	df	F	FP	Normalized
1d	0.02	0.053	0.999944	0.999853	0.002778	0.999908338	3.950138	-0.000362	3.6
1w	0.021	0.054	0.999592	0.998951	0.019444	0.999358539	3.947966	-0.002534	25.3
1m	0.0271	0.055	0.997744	0.995427	0.083333	0.997677701	3.941326	-0.009174	91.7
3m	0.034	0.058	0.991536	0.985605	0.25	0.994017964	3.926868	-0.023632	236.3
6m	0.036	0.058	0.982161	0.971416	0.5	0.989060279	3.907283	-0.043217	432.2
1y	0.037	0.058	0.963676	0.94365	1	0.979218965	3.868405	-0.082095	821.0

Sep 6th USD/ILS Spot 3.8441

	ils - q	usd- r	e(ils)	e(usd)	fractional	df	F	FP	Normalized
1d	0.035	0.053	0.999903	0.999853	0.002778	0.999950001	3.843908	-0.000192	1.9
1w	0.036	0.054	0.9993	0.998951	0.019444	0.999650061	3.842755	-0.001345	13.5
1m	0.0367	0.054	0.996946	0.99551	0.083333	0.998559372	3.838562	-0.005538	55.4
3m	0.0376	0.0573	0.990644	0.985777	0.25	0.995087108	3.825214	-0.018886	188.9
6m	0.0395	0.059	0.980444	0.970931	0.5	0.990297377	3.806802	-0.037298	373.0
1y	0.041	0.0595	0.959829	0.942236	1	0.981670075	3.773638	-0.070462	704.6



A pip in spot matters over time and attrition!

A Client could agree 1 Month Points at -55 Spot basis 3.8441 and be filled at -92 off Spot basis 3.9505 but what if the firm managing that order was advance and over buying in the Benchmark.

Notes: Knowledge of Customer orders (Swaps, Outright Forwards) ahead of Spot leg being agreed has a risk of Front Running which can manifest itself in a Spot based Benchmark concern IF that Spot leg is based off a published or dark contractual based Benchmark.

IRP/CIA Formula

- Continuous Compounding Interest Rates (Method 1)
- Forward Rate = $S * e^{-r_1(d/y)} / e^{-r_2(d/y)}$
- Discrete Accruing Interest Rates (Method 2)
- Forward Rate = $\frac{(1 + [r_2 * (\frac{d}{y})])}{(1 + [r_1 * (\frac{d}{y})])} * S$

- Spot – Spot Rate
- r1, r2 – Reference, Counter Currency Interest Rate.
- d, y – actual days in contracts, number of actual days in a year

Dark Benchmarks – Swaps – Metals

- “3 Month Gold Swap I’ll quote you 0.40% at 0.50% in 10,000 Ounces, Spot Basis 2300.”
- **Where are the Swap Points? What is being quoted? What is the carry being quoted?**
- Step 1 : Swap Basis Conversion = Spot * (De-annualization Factor) * Quoted Interest Rate
- Step 1 : $2300 * (3 \text{ Months} / 1 \text{ Year}) * (0.40/100)$
- Step 1 : $2300 * (90/360) * (0.40/100) = \underline{\$2.30}$ (Carry or Swap Points in Dollar Terms)
- Step 2 : Outright = Spot + Carry = \$2,300+\$2.30 = \$2302.0 All In.
- Metals typically have experienced upward sloping/positive carry/contango curves.

- **What would FX Swaps look like if we quoted in Bullion terminology?**
- Remember our theoretical 1 Year Swiss Swap (Spot=1.2500, \$=5%, SF=3%, Points -0.0248 and Outright=1.2252)?
- How would we quote that in Bullion terms?
- FX Bullion Conversion = Swap Points * (De-annualization Factor) * (Reciprocal Spot) * 100.
- FX Bullion Conversion = $-0.0248 * (1) * (0.8000) * 100 = -1.984\%$ (Negative Carry, Backwardation in Commodity Language)
- FX Bullion Style Quote could be something like, 2.00 at 1.96 in \$250Million



Notes: Knowledge of market variations, here in Precious metals but also understanding other markets like Base Metals with bespoke carry conventions for Contango and Backwardated curves, does not change the core principles of establishing Benchmark oversight analytics if the data is understood, is rich and is legally available to use.



Managing Benchmark Risk – The Future

Artificial Intelligence, Betting and Crypto (ABC)

LSEG

Benchmarks – Artificial Intelligence

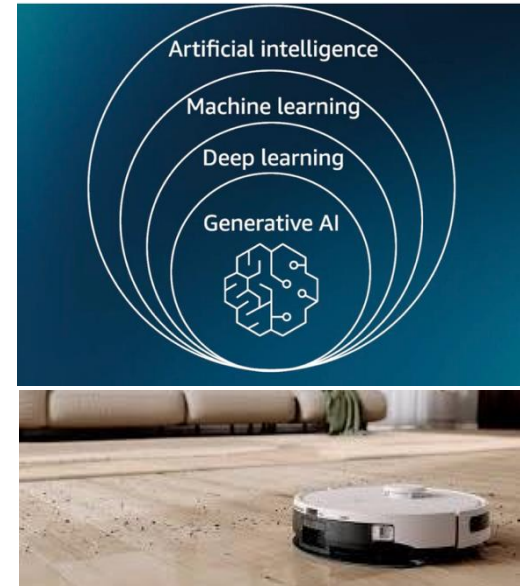
Main AI Genres

- ✓ **Generative AI** (a type of artificial intelligence that creates new, original content by learning patterns from datasets)
- ✓ **Predictive AI** (a branch of artificial intelligence that analyzes historical data using machine learning and statistical modeling to identify patterns and forecast future events, trends, or behaviors)

Is this really AI?

- Does the Task need effort or training for a human to perform?
- Was the system behavior previously coded by a human, or emerged from searching any database?
- Do the system make decisions autonomously and posses some degree of flexibility to the environment?

Notes: Machine learning is a subset of AI. AI covers broad areas like robotics and natural language processing. Machine Learning is used for predictive analytics, recommendation systems, and data analysis and it is often used to achieve AI goals.



Benchmarks – Artificial Intelligence

1. Creating Robot Analysts
2. AI Tools to Code Benchmark Analytics ([Spec Driven Development \(SDD\)](#))
3. [Model Context Protocol \(MCP\)](#)
 - ✓ Open Source [Anthropic, 2024] allowing Standardized Access (LLMs to Data)
 - ✓ Database Query, Web Searching, API Interaction
 - ✓ Industry adopted approach

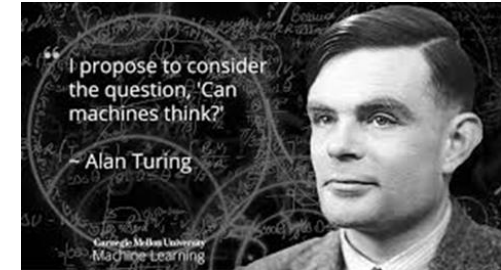
Spec Driven Development

- ✓ Build Multi Layer Specifications
 - From Upper Level to Functional Features
 - To Implementation Requirements
- ✓ We then would use AI to:
 - Generate Plans, Code, Tests, Run Tests
- ✓ Developer Checking Results along the way.

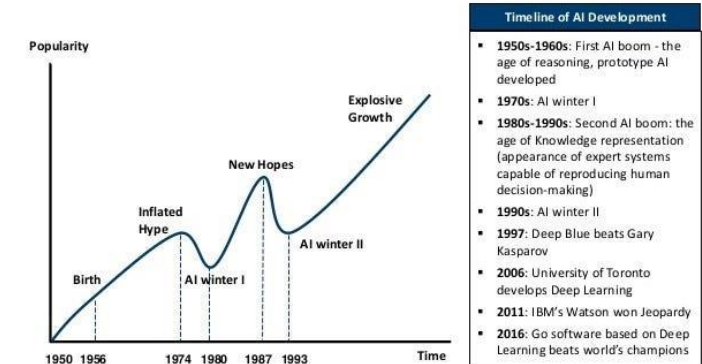
Notes: Useful AI, opens up quicker ways to produce better (in this case) Control Data Analytics and Tooling for Companies and their staffers in a rapidly more complicated world. [AI Agents start to look like modern day compilers.](#)

Instead of trying to produce a programme to simulate the adult mind, why not rather try to produce one which simulates the child's? If this were then subjected to an appropriate course of education one would obtain the adult brain.

— Alan Turing —



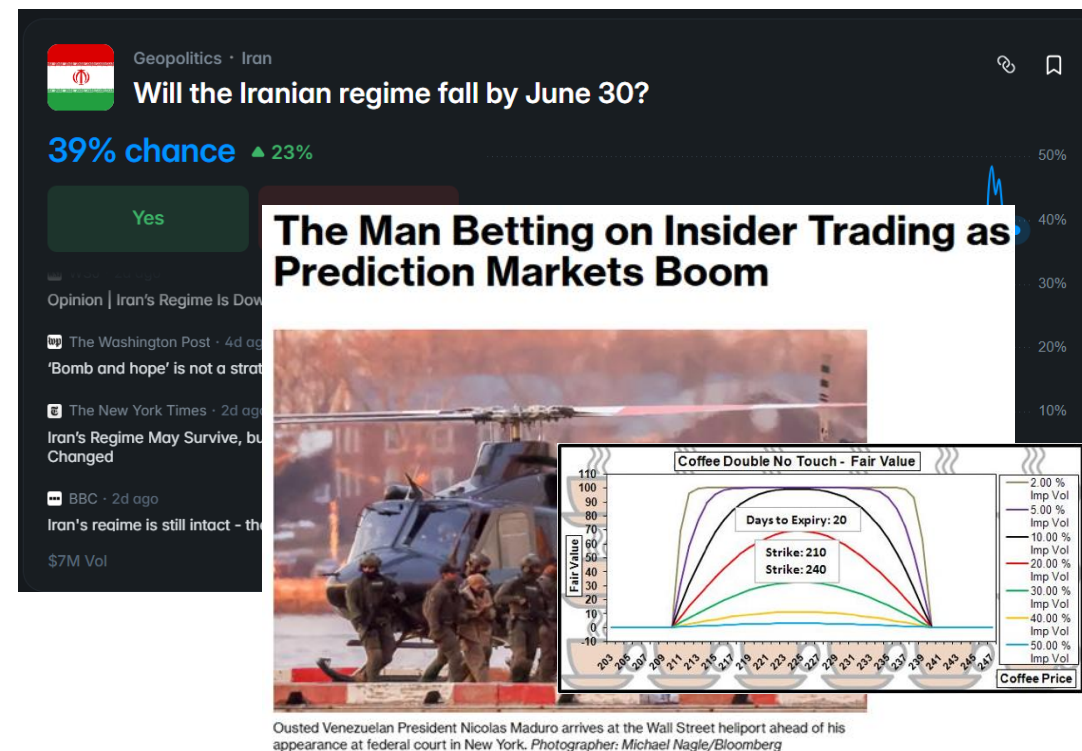
AI HAS A LONG HISTORY OF BEING “THE NEXT BIG THING”...



Benchmarks – Betting

- Betting Platforms are proliferating: [Polymarket](#) & [Kalshi](#).
- New genre has moved from traditional markets to new markets.
- New tools such as Insider Finder:
 - ✓ Monitors anomalous transactions.
 - ✓ Flags suspicious moves.
- Major Investor expansion:
 - ✓ Private Equity, Exchanges (ICE) and Other Investors.
- FX Betting inside/outside Benchmarks
 - ✓ Blue Square
 - ✓ IG
 - ✓ FX Products include Range Binaries (Double No Touches)

Notes: Betting on benchmarks appears to be an emerging area, with the market moving from sports betting to political events and now into more esoteric financial outcomes. The use of digital assets may have a relationship. Treated as a Financial Derivatives Contract [CFTC].



- Polymarket is taking bets on an active missing-person case.
- Users can wager on whether alleged kidnapper of Nancy Guthrie will be arrested by February 28.
- Case has been turned into a live gambling contract.
- Lawmakers are now facing calls to intervene.
- Serious ethical and regulatory concerns.

Benchmarks – Crypto

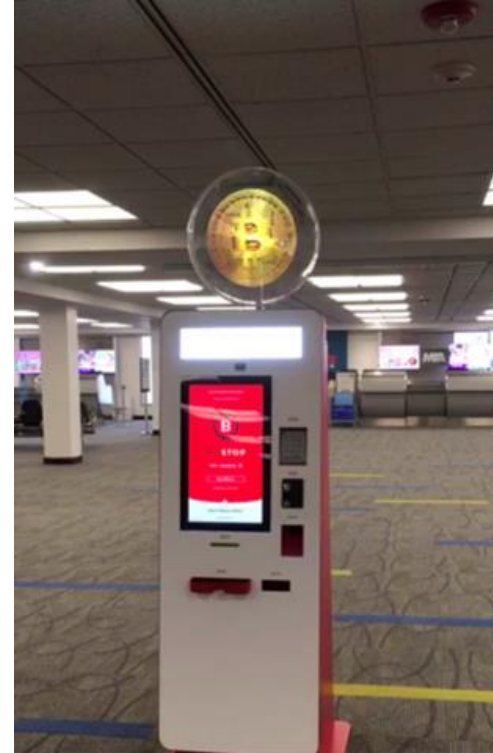
Digital Currencies Grow

- Exchanges have flourished; Securitization is evolving (Tokenization).
- Private issuance of money, Markets exist in Spot, Forwards/Loans, Options, Trade 24x7.
- Variants emerging:
 - **Linked to Nothing.**
 - **Linked to Something (Gold, Real Estate, T-Bills).**
 - **Other (Crypto Kitties, NFTs).**

Regulation, Accounting & Tax Treatment

- **Genius Act** [2025] Framework for Stablecoin issuers.
- **SEC** (Crypto as a security?).
- **CFTC** (Crypto Sprint initiatives to oversea Spot markets).
- **US GAAP** (FASB) – Indefinite-lived intangible assets.
- **IFRS** (IASB) – IAS38 – Cost Model (Cost less impairment) or Revaluation model (Fair Value).
- **Tax Reporting** – Mandatory under 1099-DA [Brokers, 2025]

Benchmarks – Crypto



Notes: Surveillance has been thus far limited to Insider Trading, Wash Trading & Spoofing.

Greater efforts have been in Blockchain forensics, AML, Reporting [CARF – Crypto-Asset Reporting Framework – mandates the exchange of tax info between jurisdictions].

Benchmarks on Crypto based levels may have a role to play in the future if crypto continues its expansion into the mainstream of financial product offerings.

Benchmarks – Crypto

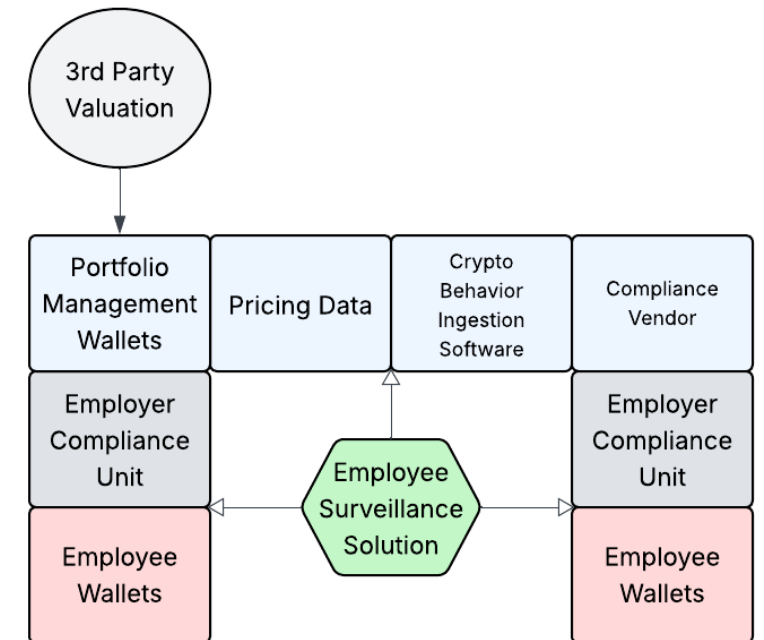
If Betting on Benchmarks is disguised by Crypto, then we have another future strand.

- Possible Need For an Employee Compliance Solution
- Current Regulatory Actions:
 - ✓ **Coinbase Insider Trading Complaint(SEC)**
<https://www.justice.gov/usao-sdny/pr/former-coinbase-insider-pleads-guilty-first-ever-cryptocurrency-insider-trading-case>
 - ✓ **Open Sea Insider Trading (DOJ)**
<https://www.justice.gov/usao-sdny/pr/former-employee-nft-marketplace-charged-first-ever>
 - ✓ **Binance Insider Trading (CFTC)**
<https://www.cftc.gov/PressRoom/PressReleases/8680-23>

What is needed

- **Blockchain, Wallet, Crypto Exchange(API) Behavior Ingestion Software**
- **Yes/No Messaging and Automation**
- **Real-time Behavior Monitoring**
- **Compliance Audit Function**

Notes: If Crypto has a relationship to other assets, then Surveillance must logically follow that natural path.



Plus ça change

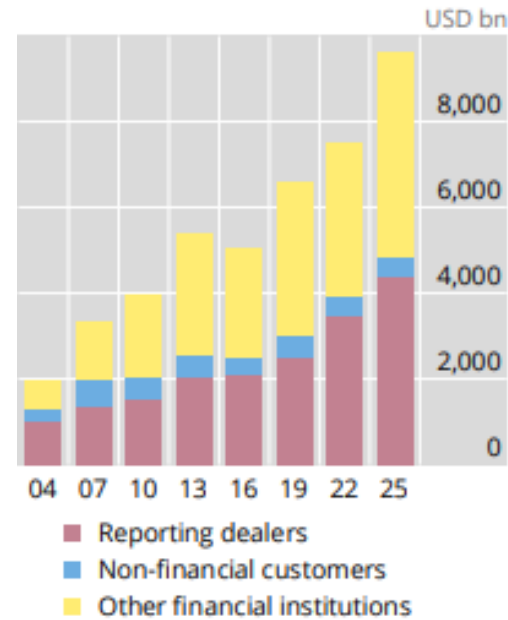
- Liquidity Internalization
- Shadow Bank growth
- High Frequency
- Dark Pool Growth
- Higher Volatility Markets
- Product Complexity growth

Foreign exchange market turnover by counterparty¹

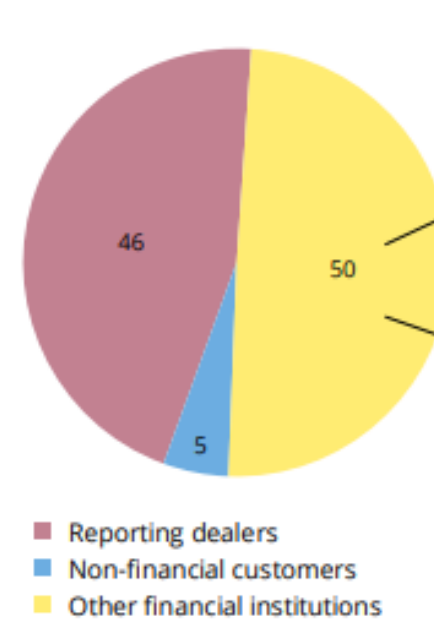
Net-net basis, daily averages in April

Graph 3

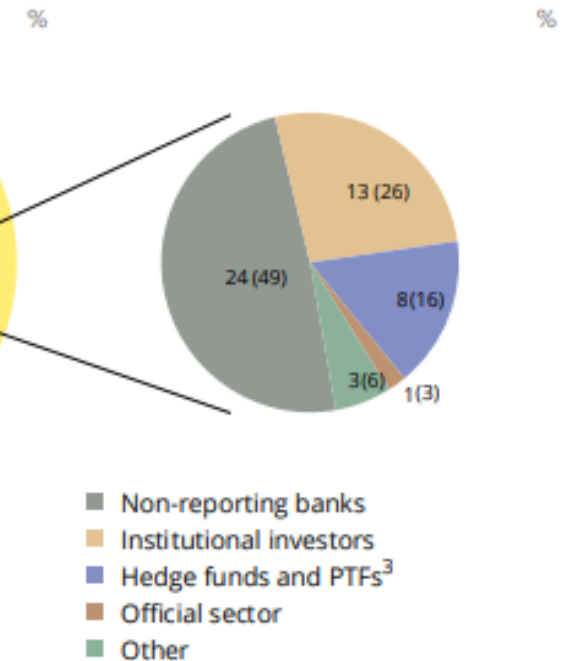
A. 2004–25



B. 2025



C. Breakdown of other financial institutions²



¹ Adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis. ² For definitions of counterparties, see explanatory notes in the annex. Shares in overall total, with shares in other financial institutions in brackets. ³ Proprietary trading firms.

Source: BIS Triennial Central Bank Survey. For additional data by counterparty, see Tables 2 and 3.

Find out more at [Trade Surveillance Solutions | LSEG](#)



LSEG Trade Surveillance Solutions

Insider Dealing Benchmark Module




LSEG

Demo - Backstory

We have built a multi element algorithm which monitors mathematically anomalous price activity, any statistically significant variations in a participant's trading and we happily share the granular elements with clients of the platform itself.

We have started this in FX and Commodities but in principle it is asset class and product agnostic to include Interest Rate Products, Equities, NDFs and Swaps if supported by the data to drive the models.

Precious Metals Benchmarks

Category	Benchmark Name	Ccy Pair	Date
Metals Benchmarks	Silver SIFO 12.00pm London for LBMA	XAG/USD	 30 Jan 2026
Metals Benchmarks	Gold GOFO 10.30am London for LBMA	XAU/USD	 30 Jan 2026
Metals Benchmarks	Gold GOFO 3pm London for LBMA	XAU/USD	 30 Jan 2026

Category	Benchmark Name
Americas Benchmarks	BRL on 1 FEE 12.00pm New York time (New York FED)
Americas Benchmarks	MXN 1 FEE (above) and MEX01 12.30pm Mexico City time for Banco de Mexico
European Benchmarks	ZAR 1FEE for NY Fed.

Benchmark Name	Ccy Pair	Date
Wellington 11am	USD/CAD	1st August 2025
Tokyo 9.55am	USD/HKD	15th August 2025
Tokyo 3pm	EUR/GBP	22nd October 2025
London 1pm	EUR/DKK	11th September 2025
New York 10am	USD/YEN	3rd November 2025
London 4pm	AUD/USD	29th August 2025
New York 5pm	GBP/USD	7th November 2025

Find out more at [Trade Surveillance Solutions | LSEG](#)

Demo – What you will see

We have chosen 13 with simulated test data, random pairs and dates:

1.Options (4)

- ✓ **10am New York** which represents about 65-70% of all Options daily expiries in the OTC market.
- ✓ **3pm Tokyo** which represents about 25-30% of all Options daily expiries.
- ✓ **Wellington 11am** which is local to New Zealand for Kiwi Options and some other Commodity currencies and Crosses.
- ✓ **London 1pm** which is typically used for European local markets.

2.Regional (6)

- ✓ **European**
- ✓ 4pm London covers the big daily Benchmark for passive hedgers and structured product (options) Buy side clients. This is still the dominant value during the trading day Benchmark consumers.
- ✓ **Americas** we have Regionals in here – Brazil and Mexico which are the 2 dominant markets in Latin America.
- ✓ **Asian** – 9.55am Tokyo which is a Benchmark Local specific currency rate publication along with 11am UK, 12 Noon EST, 2pm CET and 5.30pm Tel Aviv.

3.Metals (3)

- ✓ **Silver** (1) and **Gold** (2)
- ✓ 2024 saw the addition of Metals Benchmarks (XAU, XAG, XPT, XPL)

Find out more at [Trade Surveillance Solutions | LSEG](#)

Regional Benchmarks I – Americas, APAC

Category	Benchmark	Which Pairs
Americas Benchmarks	5pm New York	All Dollar Pairs
Americas Benchmarks	MXN 1 FEE (above) and MEX01 12.30pm Mexico City time for Banco de Mexico.	MXN
Americas Benchmarks	ARS on EMTA 12.30pm Buenos Aires time (poll of ~ 7 Banks).	ARS
Americas Benchmarks	BRL on 1 FEE 12.00pm New York time (New York FED).	BRL
Americas Benchmarks	BRL on BRBZ 6am Sao Paulo time (Banco Central do Brasil).	BRL
Americas Benchmarks	CLP on CLPOB= 10.00am Santiago time (Banco Central de Chile).	CLP
Americas Benchmarks	12.00pm Bogota time for Colombian Banking Superintendency.	COP

Category	Benchmark	Which Pairs
Asian Benchmarks	CNY see SAEC 9.15am Beijing Time for SAFE.	CNY
Asian Benchmarks	AUD 1FEE and HSRA at 9.55am Sydney time for AFMA data.	AUD
Asian Benchmarks	RBNZ 2pm NZ/Wellington WMR Spot fixing	Kiwi
Asian Benchmarks	11.00am Singapore time. for Assoc. of Banks in Singapore.	SGD
Asian Benchmarks	INR 1FEE & RBIB 12.00pm Mumbai time for Reserve Bank of India.	India
Asian Benchmarks	IDR ABSIRFIX01 11.00am Singapore time for Associations of Banks in Singapore.	IDR
Asian Benchmarks	PHP PHPESO 11.30am Manila Time for Philippine Dealing System.	PHP
Asian Benchmarks	THBFX 11.00am Bangkok time for the Central Bank of Thailand.	THB

Notes: We have developed an Insider Dealing based set of patterns to operate for a pack of Benchmarks in FX and Commodities. This can obviously be extended to other windows, asset classes and products if the data supports the expansion.

This is non exhaustive and can be expanded as data supports more regional currencies both onshore and offshore.

Find out more at [Trade Surveillance Solutions | LSEG](#)

Regional Benchmarks II – European

Category	Benchmark	Which Pairs
European Benchmarks	4pm London	All Dollar Pairs
European Benchmarks	5pm London	All Pairs
European Benchmarks	ZAR 1FEE for NY Fed.	ZAR
European Benchmarks	BOE/SAF GBP/USD (Old Lady) 11am London.	GBP
European Benchmarks	CZK under CNB2 is under 2.15 FFT for Ceska Narodni Banka (Czechia).	CZK
European Benchmarks	RUB at 1pm Moscow time (ECB)	RUB

Notes: We have developed an Insider Dealing based set of patterns to operate for a pack of Benchmarks in FX and Commodities. This can obviously be extended to other windows, asset classes and products if the data supports the expansion.

This is non exhaustive and can be expanded as data supports more regional currencies both onshore and offshore.

Find out more at [Trade Surveillance Solutions | LSEG](#)

Regional Benchmarks III – Options

Category	Benchmark	Which Pairs
Options Benchmarks	10am New York	All Pairs
Options Benchmarks	3pm Tokyo	Mostly Yen Crosses, Aussie, Kiwi, maybe China and some others
Options Benchmarks	11.10am Wellington time for Reserve Bank of New Zealand Options Cut Off	Kiwi
Options Benchmarks	1pm London.	European Emergings like PLN, HUF, CZK
Options Benchmarks	9am Tokyo.	Mostly Yen Crosses, Aussie, Kiwi, maybe China and some others
Options Benchmarks	11.30am Hong Kong.	HKD
Options Benchmarks	Hungary 12pm Noon.	HUF
Options Benchmarks	Poland 11am.	PLN
Options Benchmarks	1.15pm Brazil (SP).	BRL
Options Benchmarks	TWD 1FEE and TAIEX1 at 11.00am New York for Taipei Forex Inc.	TWD
Options Benchmarks	Gold (XAU) 9.30am New York/EST.	XAU

Notes: We have developed an Insider Dealing based set of patterns to operate for a pack of Benchmarks in FX and Commodities. This can obviously be extended to other windows, asset classes and products if the data supports the expansion.

This is non exhaustive and can be expanded as data supports more regional currencies both onshore and offshore.

Find out more at [Trade Surveillance Solutions | LSEG](#)

Regional Benchmarks IV – Metals

Category	Benchmark	Which Pairs
Metals Benchmarks	Gold GOFO 10.30am and 3pm London for LBMA.	XAU
Metals Benchmarks	Silver SIFO 12.00pm London for LBMA.	XAG
Metals Benchmarks	Platinum 9.45am and 2pm London for LBMA.	XPT
Metals Benchmarks	Palladium 2.00pm London for LBMA.	XPL

Notes: We have developed an Insider Dealing based set of patterns to operate for a pack of Benchmarks in FX and Commodities. This can obviously be extended to other windows, asset classes and products if the data supports the expansion.

This is non exhaustive and can be expanded as data supports more regional currencies both onshore and offshore.

Find out more at [Trade Surveillance Solutions | LSEG](#)

Regional Benchmarks V – Future State (Possibles)

Region	Currencies	Comments
Americas	Colômbia, Canada, Costa Rica, DR, Perú, Paraguay.	Pegged, Non-Pegged or Pegged to US Basket (Bolivia, El Salvador). We include Caribbean pairs generally too as possible.
APAC	Hong Kong SAR, South Korea, Philippine Peso, Taiwan Dollar, Malaysia, Sri Lanka, Vietnam, Onshore China	Pegged, Non-Pegged. We include Polynesian and Central Asian Regionals as possible.
Europe	Czech Koruna, Hungarian Forint, Scandis, Turkish Lira, CHF	Currencies on pathway to Eurozone considered (7), Not Microstates (Andorra, Monaco, San Marino and the Vatican City).
Middle East, Africa	Qatar Offshore, Egyptian Pound, Israeli Shekel, Nigerian Naira, Tanzania Shilling.	Pegged, Non-Pegged or Pegged to US Basket (Kuwait, Morocco). There are many more possible pairs in the region.
Regional Non-Spot	Swaps from Overnight to 2 Year, NDFs from 1 Week to 2 Year	Possible but selective if feasible. With sufficient rich data the approach can extend to rates.

Notes: These tables are extensive but also dependent on data richness and availability to operate. We would need to examine any new pairs & products for feasibility.

Find out more at [Trade Surveillance Solutions | LSEG](#)

Country	HICP inflation rate ^{[10] (4-1)}	Convergence criteria (valid for the compliance check conducted by ECB in their June 2022 Report)		ERM II member ^[23]	Exchange rate ^{[24] (2) (4-3)}	Long-term interest rate ^{[20] (4-2)}	Compatibility of legislation ^[27]
		Excessive deficit procedure ^[19]	Debt-to-GDP ratio ^[22]				
Reference values ⁽⁴⁻¹⁾	Max. 4.9% ⁽⁴⁻¹⁾ (as of April 2022)	None open (as of 23 May 2022)	Max. 60% (Fiscal year 2021) ^[20]	Min. 2 years (as of 23 May 2022)	Max. ±16% ⁽⁴⁻³⁾ (for 2021)	Max. 2.8% ⁽⁴⁻²⁾ (as of April 2022)	Yes ^[27] (as of 25 March 2022)
EU members (outside the eurozone)							
Bulgaria	5.9%	4.1% (exempt)	25.1%	2 years	0.0%	0.5%	No
Czech Republic	6.2%	5.9% (exempt)	41.9%	No	3.1%	2.5%	No
Denmark	3.6%	-2.3% (surplus)	36.7%	23 years, 6 months	0.2%	0.2%	Unknown
Hungary	6.8%	6.8% (exempt)	76.8% (exempt)	No	-2.1%	4.1%	No
Poland	7.0%	1.9%	53.8%	No	-2.7%	3.0%	No
Romania	6.4%	7.1%	48.8%	No	-1.7%	4.7%	No
Sweden	3.7%	0.2%	36.7%	No	3.2%	0.4%	No

Legend:
■ Criterion fulfilled
■ Criterion potentially fulfilled: if the budget deficit exceeds the 3% limit, but is "close" to this value (the European Commission has deemed 3.5% to be close by in the past)^[28] then the criteria can still potentially be fulfilled if either the deficits in the previous two years are significantly declining towards the 3% limit, or if the excessive deficit is the result of exceptional circumstances which are temporary in nature (i.e. one-off expenditures triggered by a significant economic downturn, or by the implementation of economic reforms that are expected to deliver a significant positive impact on the government's future fiscal budgets). However, even if such "special circumstances" are found to exist, additional criteria must also be met to comply with the fiscal budget criterion.^{[29] (3)} Additionally, if the debt-to-GDP ratio exceeds 60% but is "sufficiently diminishing and approaching the reference value at a satisfactory pace" it can be deemed to be in compliance.^{[29] (4)}
■ Criterion not fulfilled

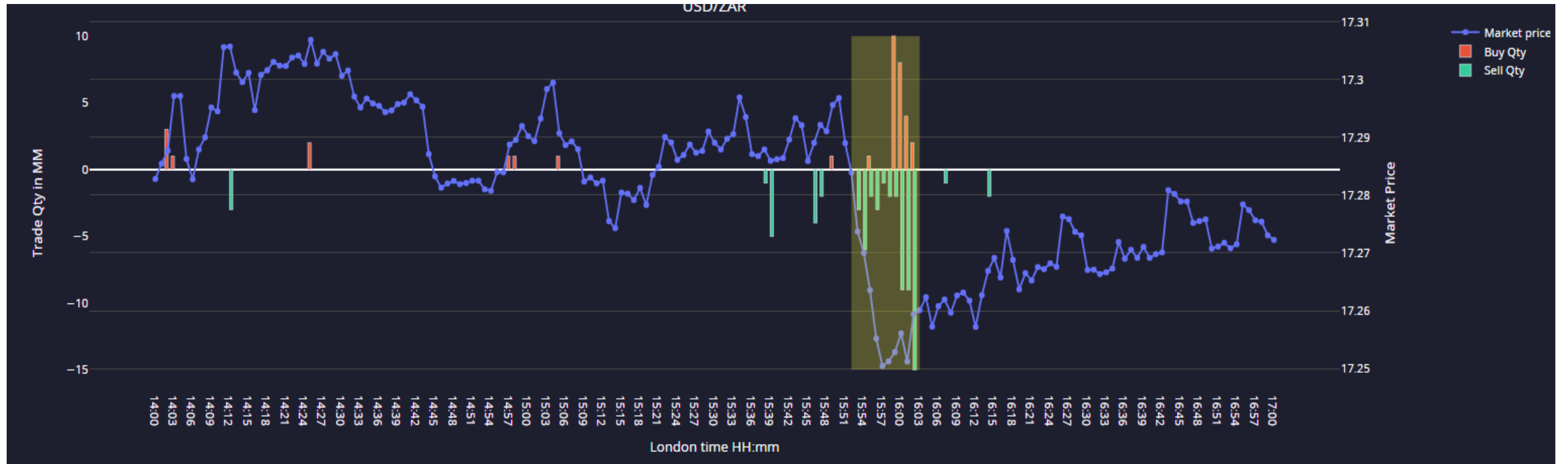
The Infinite Benchmark – Total Flexibility

Parameter	Current State	Going Infinite
Analysis Window	10-minute window unevenly skewed around the Benchmark	Infinite windows per Benchmark possible. Window size and skew are infinite.
Statistics	Defined Historical Data for Look Back Period	Configurable, dependent on client preferences.
Dark Benchmarks	Might cover some but not all	Can be built custom by a client for their structured products, local laws or other facet important to that client.
Currencies	Defined Portfolio but could be expanded	Dealer's Choice, choose what FX, Commodity is supportable by data richness.
Beyond Spot	Defined Portfolio but could be expanded	Swaps, NDFs, Base Metals, Crypto, Energy, Interest Rates, Food & Fiber even Vanilla Options (Spot, Forward Premium) possible in theory if there is a market in implied volatility Benchmark products are theoretically possible if likely hard to support from a data and libraries standpoint.

Notes: The Infinite Benchmark was made to allow clients to expand more flexibly without constant requirement for releases. It has limits defined by data and in some cases libraries. It is a very powerful tool in the right hands.

Find out more at [Trade Surveillance Solutions | LSEG](#)

Market Prices vs Participant's Traded Volumes

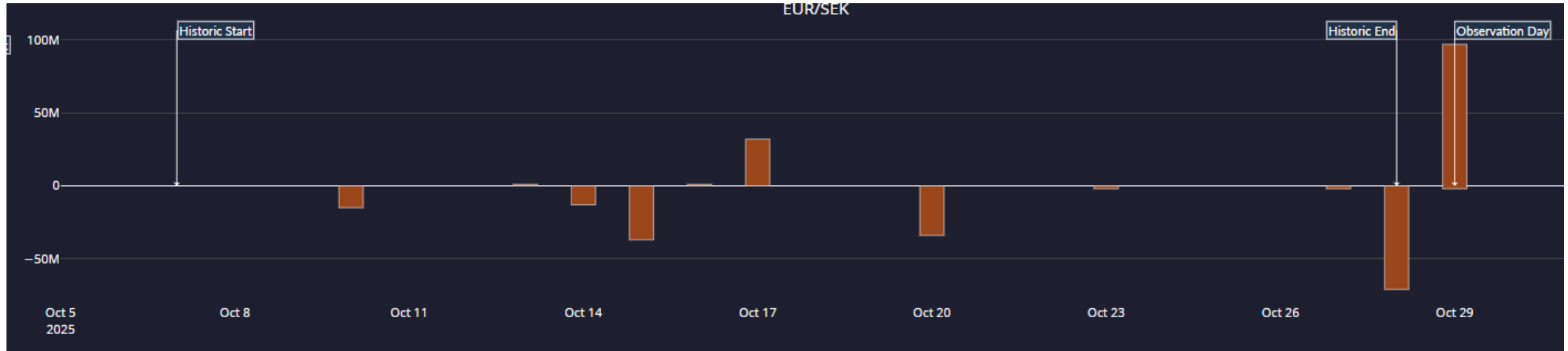


Notes: Here the analytics has detected a possible Insider Dealing based Alert for the 4pm London Benchmark in USD/Rand.

Highlighted window, Participant's simulated buying and selling activity and the price movement during that period all exposed for Users, within the application for ex-post analysis by competent regulatory professionals.

Notes: Find out more at [Trade Surveillance Solutions | LSEG](#)

Participant's Recent Traded Volumes

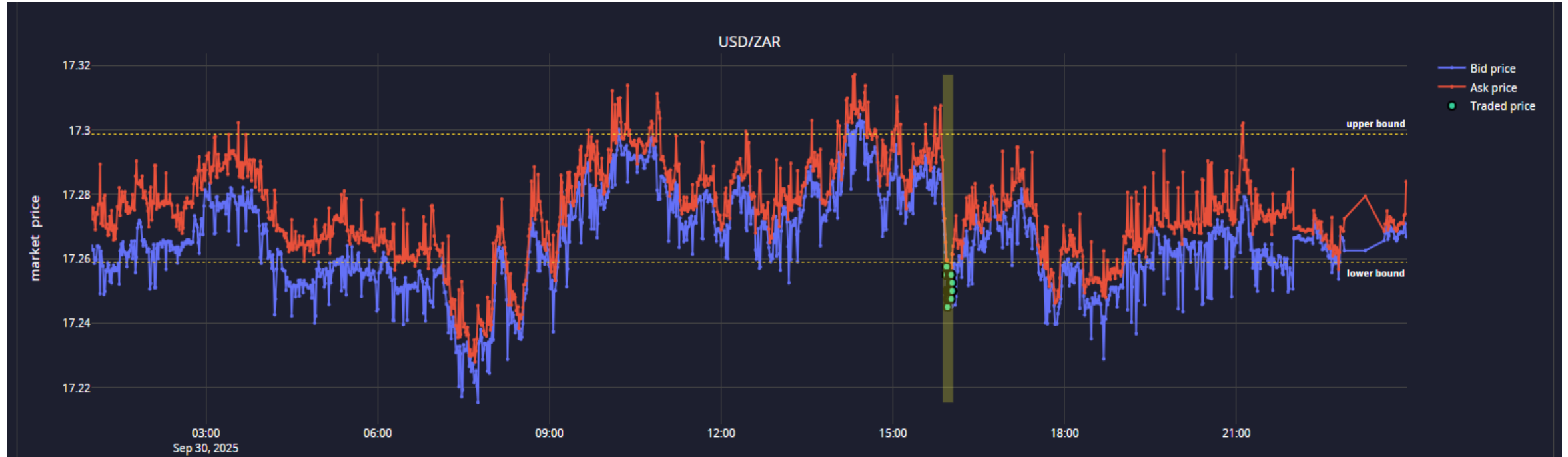


Notes: Here the analytics has detected a possible Insider Dealing based Alert for the 4pm London Benchmark in EUR/SEK (Euro/Swedish Kroner).

Highlighted window, Participant's simulated trading volumes on a daily basis for that exact window for a quick and easy reference for whether the activity that day in that window warrants a deeper analysis by competent Regulatory professionals.

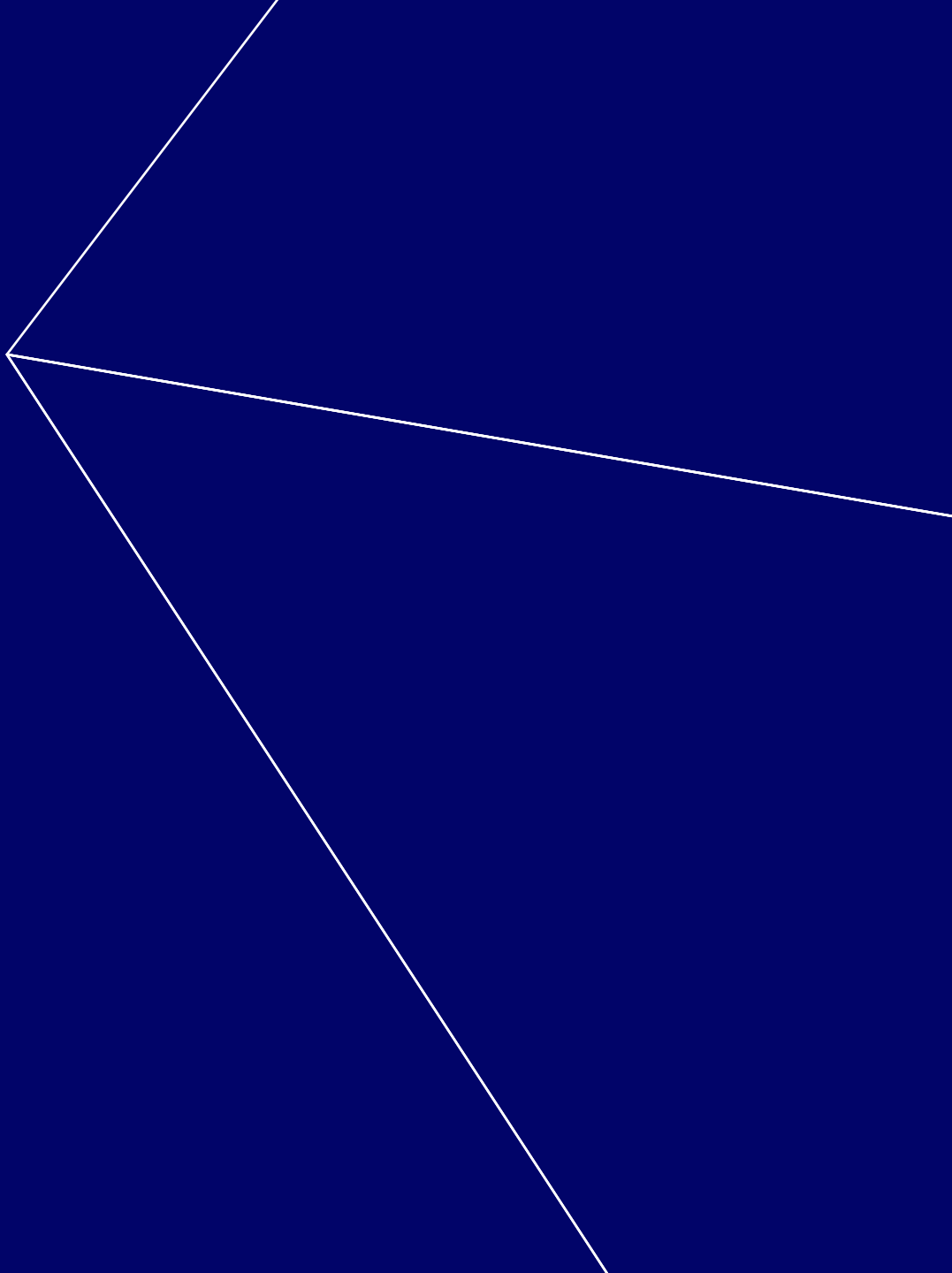
Notes: Find out more at [Trade Surveillance Solutions | LSEG](#)

Intraday Market Prices over a Period



Notes: A quick visual guide of price activity in the market from our streaming RD APIs showing visuals for analysis. This is highlighting a simulated 1 Day period in EUR/Swedish (SEK) as a result of an Insider Dealing alert for the 4pm London Benchmark window.

Notes: Find out more at [Trade Surveillance Solutions | LSEG](#)



Surveillance as a Service (SaaS)

Professional Services, Customer Solutions

LSEG

Off Platform: Surveillance as a Service

Key Features

- Personalized LSEG Trade Surveillance (LTS) Consulting Services
- Customized Surveillance Analytics
- Current Technologies & future ones leveraged
- Versatile & modular approach
- Fast and flexible deliveries
- Pure Consulting, Data & Analytics Services

Market Drivers

Your data, your problem, our solution.

Surveillance is a multi-billion-dollar market. Regulatory risk costs increase every year due to stricter regulations & active enforcement, requiring companies to mitigate risks and enhance operational efficiencies as they navigate MAR, REMIT I/II, Global Code & Local Regulations.

Surveillance as a Service (SaaS) is a unique solution delivered by LTS Professional Services that allows customers to get direct access to an organically grown knowledge engine consisting of Regulatory Risk seasoned professionals, experienced market specialists and world class Data Scientists who will analyze any customer's business to evaluate risks, gaps and solutions.

This service package is designed to examine the customer's specific business, regulatory and surveillance requirements and deliver an analysis with a fast to market modular set of solutions.

Notes: Global and Local control data analytics for financial and nonfinancial clients from improved BI/MI, classic surveillance to newer ML/AI solutions on the cutting edge.

Customer Solutions accommodates Financial and Non-Financial Clients.

Service Package Details

Fully flexible approach which can be exploratory, once-off or recurring as fits the requirement. Our dedicated consultants will be available to assist customers from initiation through to the delivery stage and beyond. Post delivery, we will see how solutions are operating and how best to augment or extend the portfolio for numerically & textual based expansion.

Consultancy Package

Customers will have access to Regulatory Risk, Market and Data Science consultants who will partner with them to understand their specific workflow. High level surveillance analytics, data centric, and other business-related recommendations will be provided.

Custom Solution Package

Customers can expect one or more of the following:

- An LTS Professional Services Consultancy Report
- Data centric custom surveillance analytics
- Delivery on-premises, in the Cloud or via an API service
- Workflow solutions
- Adapting Surveillance Analytics for non-Financial clients

Off Platform: Surveillance as a Service

Professional Services Fee

This service follows the standard daily rates for Customer Consulting fees. Cost and duration of the service will depend on the customer's market and complexity of requirements.

Customer and Competitor Landscape

LTS Professional Services aims to expand the surveillance services to a wider field of big data analytics in areas such as physical commodities, exchanges, digital assets, public sector clients, and non-financial sectors.

All this customization is only possible as this is not a platform offering, with no front end, but rather it is access to a human library of knowledge and experience which will turn into valuable reports, artifacts and analytics.

CONNECT FOR SUCCESS

Connect with your Professional Services colleagues to discuss opportunities and involve them in client discussions. They will be able to ask key questions and help clients understand the benefits of using LSEG Professional Services.

ENGAGE WITH CUSTOMERS ABOUT SURVEILLANCE

Our consultants provide a focused blend of technical proficiency and business experience to unlock the value of Market Surveillance for our customers by optimizing their workflows. With global reach and capabilities, our consultants work with customers around the world, helping them with changing regulatory requirements. Partnering for success, Professional Services helps cultivate long-term partnerships with proven results.

Advanced Value for Customers



Industry Partnerships

We collaborate with industry players such as Research Labs and QPS to facilitate solutions for customers.



Fast and flexible delivery

The models are flexible and more powerful than traditional client models.



Scalable Solutions

All use cases are replicable and scalable, with the objective of making development cost effective.



Market Expertise

LTS Professional Services group consists of risk and data & analytics experts with proven track record.



Customized Solution

All outputs will be based on customer's requirements. Regulation, operation history and transactions will all be determined during the initial phase of the project.



Partnership with Professional Services

A dedicated team of Consultants will be assigned to evaluate the customer's requirements and closely work together and support the customer throughout the consultancy or solution development phases.

Notes: Global and Local control data analytics for financial and nonfinancial clients from improved BI/MI, classic surveillance to newer ML/AI solutions on the cutting edge.

Customer Solutions is Asset Class & Product Agnostic, Flexible and Off Platform.

Thank You

Find out more at [Trade Surveillance Solutions | LSEG](#)

