Agenda

- Global Liquidity Trends
- Liquidity as a Science
- Incorporating Liquidity into your Workflow
- Bloomberg's Liquidity Assessment solution (LQA)

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Global Liquidity Trends – Global Liquidity Report

- Surveyed 1,000+ financial practitioners across the globe about liquidity
- Liquidity is important to a wide range of roles and functions
- Industry lacks a consistent methodology to assess liquidity
- Timely, accurate data remains the biggest challenge

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Global Liquidity Trends – Global Liquidity Report

- How confident are you in the accuracy of your liquidity analysis/estimates?
  - **69%** somewhat confident
  - **14%** Very confident

- What challenges do you face when using a proprietary or vendor solutions approach to assess liquidity?

Proprietary Solution	Vendor Solution
54% Gathering appropriate data 48% Time consuming process	45% Model transparency 41% Model Flexibility 40% Data accuracy

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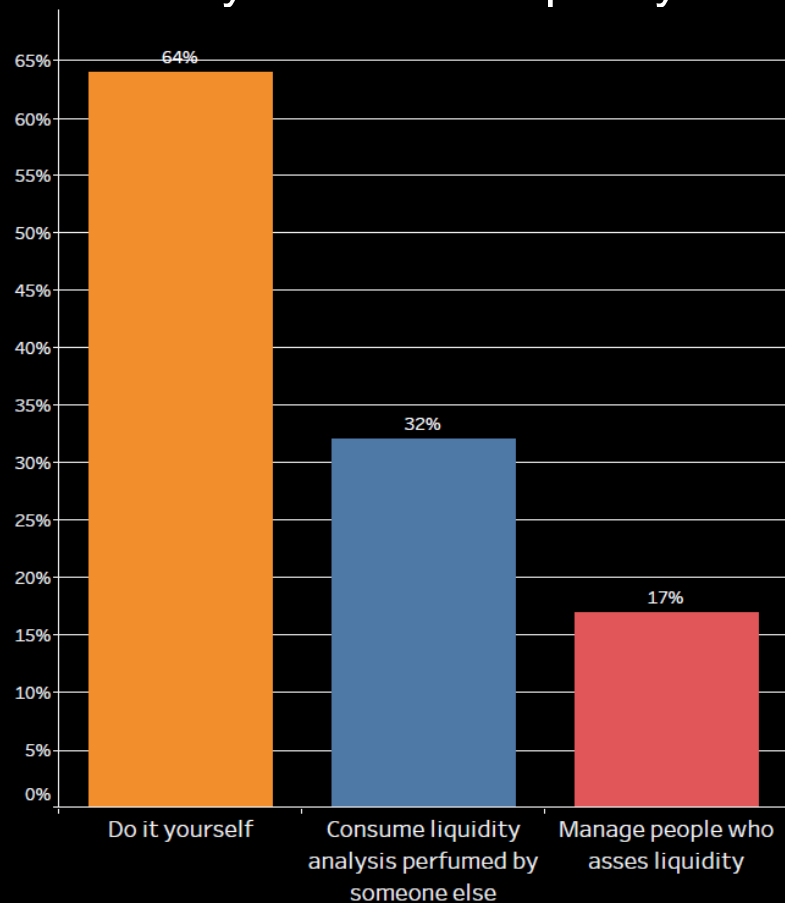# Global Liquidity Trends – Global Liquidity Report

- How important are these aspects of monitoring/assessing liquidity?
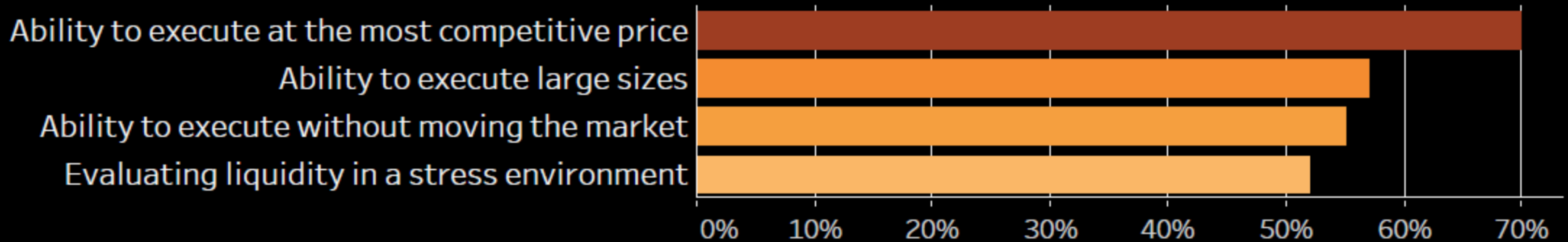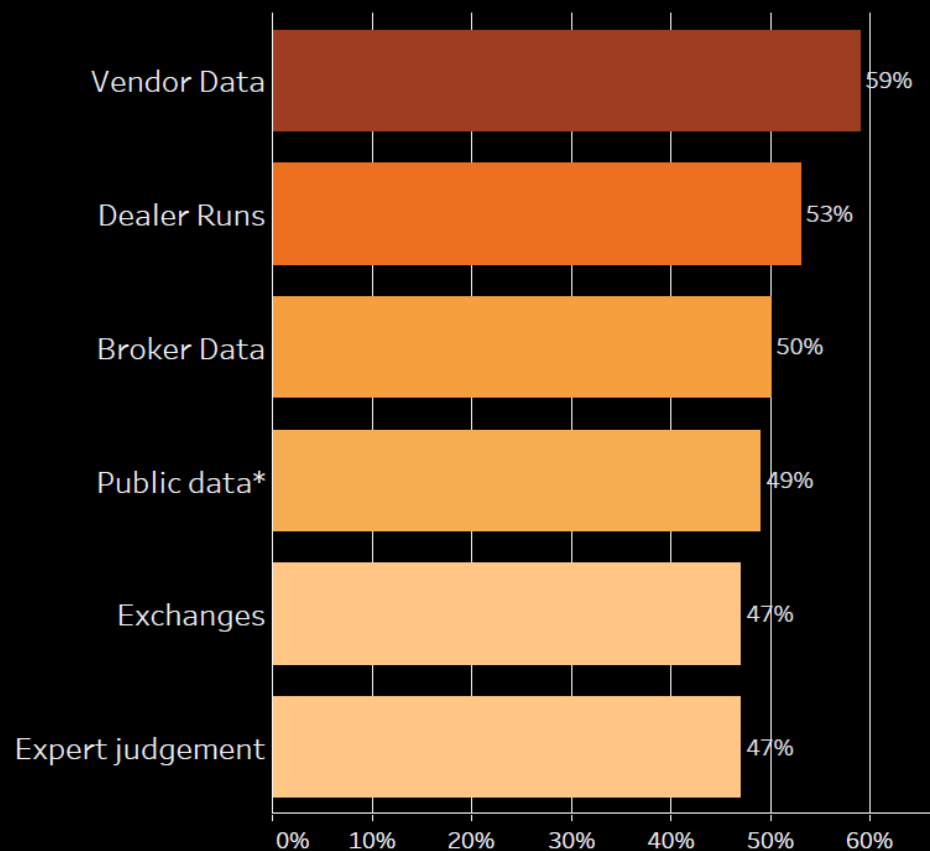

- What is the single most important aspect of monitor/assessing liquidity
  - **25%** Ability to execute at the most competitive price
  - **20%** Ability to execute without moving the market

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Global Liquidity Trends – Global Liquidity Report

- ## How do you assess liquidity?

- ## Where do you source liquidity data?

* For example: TRACE, MSRB

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Global Liquidity Trends – Global Liquidity Report

- How would you say market liquidity has changed in the past year?

- Of those who said liquidity conditions have improved:

  55% Change in market depth is a sign of improving liquidity

- Of those who said liquidity conditions have worsened:

  79% Change in market depth is a sign of worsening liquidity

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Global Liquidity Trends – Liquidity in the News

- **May 17th -** "Collapse in Liquidity" is the biggest concern in JPMorgan's Macro Quantitative and Derivatives Conference survey

- **June 3rd –** Neil Woodford suspends redemptions on his Equity Income Fund. "Financial markets . . . seem more and more a bigger house with smaller exit doors…and that would be exacerbated in case of market turmoil." Pascal Blanque, Chief Investment Officer, Amundi

- **June 5th –** Pimco says "challenging liquidity conditions" here to stay

- **June 6th –** Mark Carney (Governor of the Bank of England), "more than $30tn of global assets are held in investment funds that promise daily liquidity to investors despite investing in potentially illiquid underlying assets, such as [emerging market] debt"

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Liquidity as a Science

- **Create a consistent definition of liquidity**
  - Relationship between volume, cost and time

- **Re-define "liquidity questions" to seek specific quantitative metrics –** many requests for liquidity metrics remain 'under-defined'
  - "How liquid is this bond (in bps) compared to others in the sector?" (rather than "Is this bond liquid?")
  - "At what cost, could I sell $5 million of this security in 3 days?" (rather than "Can I sell this in 3 days?")

- **Use data to eliminate subjectivity and bias**
  - Collect trade, quote, and pricing data for the available universe
  - Allow the data to identify relationships, and extrapolate to a wider universe

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Incorporating Liquidity – Portfolio Construction

- Consider a set of bonds where the industry is "Internet Media"

Issuer Name	Ticker	Coupon	Maturity	Cntry	Region
Baidu Inc	BIDU	4.875	14-Nov-28	CN	APAC
Booking Holdings Inc	BKNG	3.600	1-Jun-26	US	AMER
Kakao Corp	DAUM	2.296	11-Apr-21	KR	APAC
eDreams ODIGEO SA	EDRSM	5.500	1-Sep-23	ES	EMEA
Expedia Group Inc	EXPE	3.800	15-Feb-28	US	AMER
Alphabet Inc	GOOGL	1.998	15-Aug-26	US	AMER
Match Group Inc	MTCH	5.625	15-Feb-29	US	AMER
Netflix Inc	NFLX	4.375	15-Nov-26	US	AMER
Perform Group	PERLN	8.500	15-Nov-20	GB	EMEA
Uber Technologies Inc	UBERUS	8.000	1-Nov-26	US	AMER
VeriSign Inc	VRSN	4.750	15-Jul-27	US	AMER
Yahoo Japan Corp	YAHOJP	0.500	6-Dec-28	JP	APAC

- How do you determine how which ones are 'most liquid'?

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Incorporating Liquidity – Portfolio Construction

- Using qualitative rules to define liquidity:

Issuer Name	Ticker	Coupon	Maturity	Cntry	Region	Credit Rating	HY/IG
Alphabet Inc	GOOGL	1.998	15-Aug-26	US	AMER	AA	IG
Kakao Corp	DAUM	2.296	11-Apr-21	KR	APAC	AA-	IG
Yahoo Japan Corp	YAHOJP	0.500	6-Dec-28	JP	APAC	A	IG
Booking Holdings Inc	BKNG	3.600	1-Jun-26	US	AMER	A-	IG
Baidu Inc	BIDU	4.875	14-Nov-28	CN	APAC	A-	IG
Expedia Group Inc	EXPE	3.800	15-Feb-28	US	AMER	BBB-	IG
VeriSign Inc	VRSN	4.750	15-Jul-27	US	AMER	BB+	HY
Netflix Inc	NFLX	4.375	15-Nov-26	US	AMER	BB-	HY
Match Group Inc	MTCH	5.625	15-Feb-29	US	AMER	BB-	HY
eDreams ODIGEO SA	EDRSM	5.500	1-Sep-23	ES	EMEA	B	HY
Uber Technologies Inc	UBERUS	8.000	1-Nov-26	US	AMER	B3	HY
Perform Group	PERLN	8.500	15-Nov-20	GB	EMEA	CCC+	HY

- Challenges: Granularity, changing market conditions, subjective (hard to defend)

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Incorporating Liquidity – Portfolio Construction

- Using 'soft' quantitative measures (# trades) to define liquidity:

Issuer Name	Ticker	Coupon	Maturity	Cntry	Region	TRACE Trades in 20 Days
Uber Technologies Inc	UBERUS	8.000	1-Nov-26	US	AMER	97
Expedia Group Inc	EXPE	3.800	15-Feb-28	US	AMER	30
Netflix Inc	NFLX	4.375	15-Nov-26	US	AMER	20
VeriSign Inc	VRSN	4.750	15-Jul-27	US	AMER	18
Booking Holdings Inc	BKNG	3.600	1-Jun-26	US	AMER	15
Alphabet Inc	GOOGL	1.998	15-Aug-26	US	AMER	13
Match Group Inc	MTCH	5.625	15-Feb-29	US	AMER	11
Baidu Inc	BIDU	4.875	14-Nov-28	CN	APAC	6
Kakao Corp	DAUM	2.296	11-Apr-21	KR	APAC	0
eDreams ODIGEO SA	EDRSM	5.500	1-Sep-23	ES	EMEA	0
Yahoo Japan Corp	YAHOJP	0.500	6-Dec-28	JP	APAC	0
Perform Group	PERLN	8.500	15-Nov-20	GB	EMEA	0

- Challenges: Lack of data, # trades leaves missing dimensions (does not account for cost or time)

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Incorporating Liquidity – Portfolio Construction
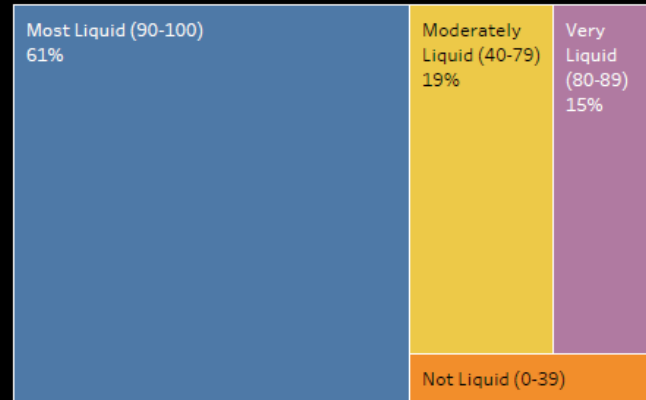
- Using a quantitative metric (liquidation cost):

Issuer Name	Ticker	Coupon	Maturity	Cntry	Region	Roundtrip Cost (LQC)
Baidu Inc	BIDU	4.875	14-Nov-28	CN	APAC	0.18%
Alphabet Inc	GOOGL	1.998	15-Aug-26	US	AMER	0.27%
Booking Holdings Inc	BKNG	3.600	1-Jun-26	US	AMER	0.31%
Match Group Inc	MTCH	5.625	15-Feb-29	US	AMER	0.32%
Uber Technologies Inc	UBERUS	8.000	1-Nov-26	US	AMER	0.34%
Expedia Group Inc	EXPE	3.800	15-Feb-28	US	AMER	0.39%
VeriSign Inc	VRSN	4.750	15-Jul-27	US	AMER	0.42%
Kakao Corp	DAUM	2.296	11-Apr-21	KR	APAC	0.43%
Netflix Inc	NFLX	4.375	15-Nov-26	US	AMER	0.54%
eDreams ODIGEO SA	EDRSM	5.500	1-Sep-23	ES	EMEA	0.54%
Yahoo Japan Corp	YAHOJP	0.500	6-Dec-28	JP	APAC	0.90%
Perform Group	PERLN	8.500	15-Nov-20	GB	EMEA	1.01%

- Challenges: Gathering data, extrapolating to a wider universe, consistency, transparency
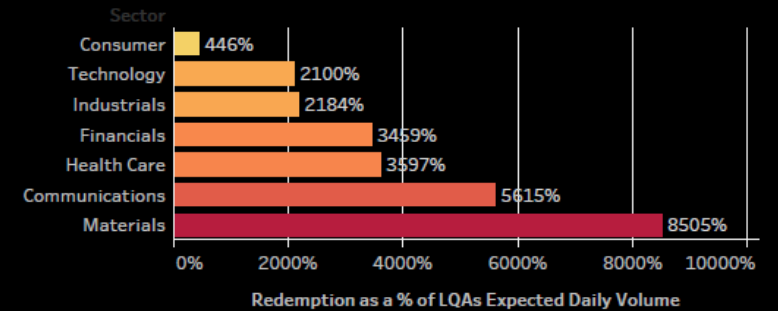
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Incorporating Liquidity – Considering Volume

- On June 3rd, Neil Woodford suspended redemptions on his flagship fund as a spate of losses fueled outflows

- While the underlying securities in the **Woodford Equity Income Fund** appear somewhat liquid, Bloomberg's LQA analytics reveal that the fund's positions are significantly larger than the available market capacity

- As a result, it would be difficult to fulfill redemption requests in a timely manner without significant market impact under a number of redemption scenarios.

Liquidity Scores by Security

Most Liquid (90-100) 61%	Moderately Liquid (40-79) 19%	Very Liquid (80-89) 15%
	Not Liquid (0-39)	

5% Redemption vs LQA Expected Daily Volume

Sector
- Consumer: 446%
- Technology: 2100%
- Industrials: 2184%
- Financials: 3459%
- Health Care: 3597%
- Communications: 5615%
- Materials: 8505%

Redemption as a % of LQAs Expected Daily Volume

Liquidation Timeline by Scenario
Redemptions are applied pro-rata across the portfolio assuming a 20% particpation rate
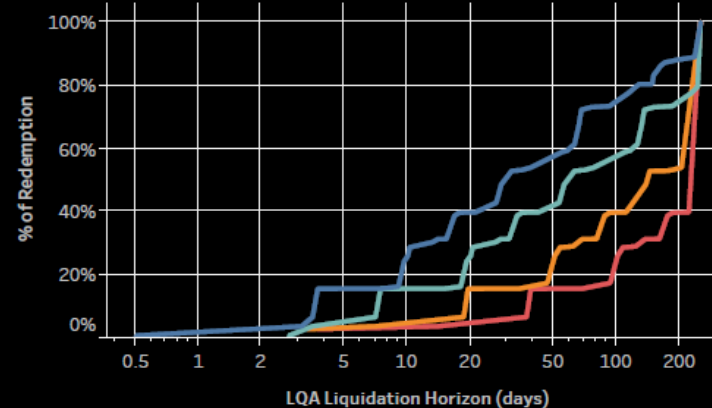
(Y-axis: % of Redemption, 0% to 100%)
(X-axis: LQA Liquidation Horizon (days), 0.5 to 200)

- 5% Redemption
- 10% Redemption
- 5% Redemption + Stress*
- 10% Redemption + Stress*

Average 5 Day Liquidation Cost by Scenario

Scenario	5 Day Liquidation Cost (bps)
5% Redemption	83 bps
10% Redemption	103 bps
5% Redemption + Stress*	123 bps
10% Redemption + Stress*	153 bps
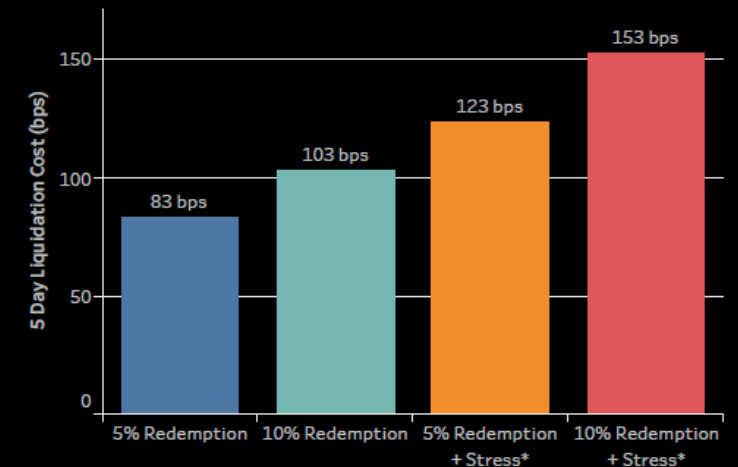
* This stress scenario consists of a 50% increase in price volatility, and 30% decrease in expected daily volume (EDV) applied at the security level

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Incorporating Liquidity – Pre/Post Trade Analysis

- Analyze the impact of volume on cost and horizon

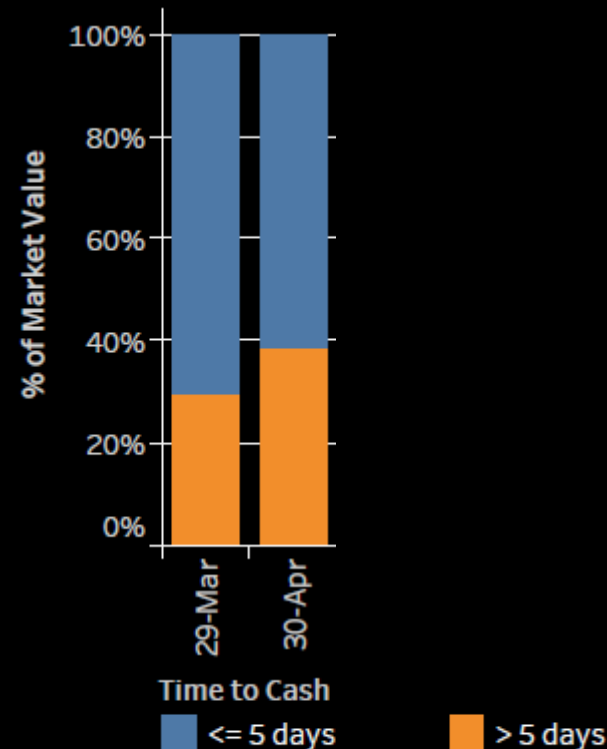## Liquidation Cost (LC) Analysis - Trading Horizon = 1 Day

Ticker	Trade Size	Expected LC	25th Percentile LC	50th Percentile LC	75th Percentile LC
BIDU 4 7/8 11/14/28	5,000,000	0.09%	0.07%	0.09%	0.11%
	10,000,000	0.11%	0.09%	0.10%	0.13%
	15,000,000	0.12%	0.09%	0.11%	0.14%
GOOGL 1.998 08/15/26	5,000,000	0.11%	0.09%	0.11%	0.13%
	10,000,000	0.13%	0.11%	0.13%	0.15%
	15,000,000	0.15%	0.12%	0.14%	0.17%

Liquidation Horizon (LH) Analysis - Cost Threshold = 0.10%

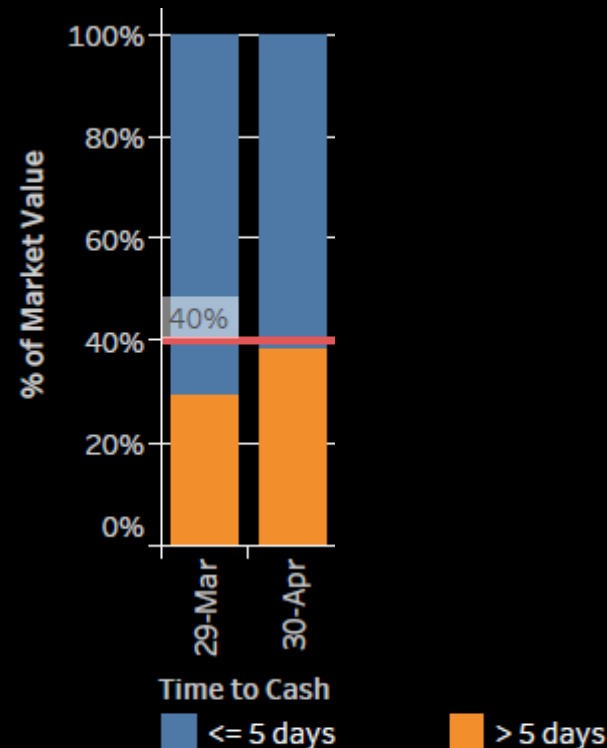| Ticker	Trade Size	Expected LH (Days)	25th Percentile LH	50th Percentile LH	75th Percentile LH
BIDU 4 7/8 11/14/28	5,000,000	0.5	0.3	0.4	0.6
	10,000,000	0.6	0.3	0.5	0.7
	15,000,000	1.3	0.7	1.1	1.6
GOOGL 1.998 08/15/26	5,000,000	0.5	0.3	0.4	0.6
	10,000,000	1.3	0.7	1.1	1.7
	15,000,000	2.4	1.5	2.5	3.9

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Incorporating Liquidity – Risk Limits

- Goal: Satisfy a large redemption request without significant market impact
- Parameters:
  - Redemption size: 10%
  - Cost threshold: 50 bps
  - Confidence level: 90%
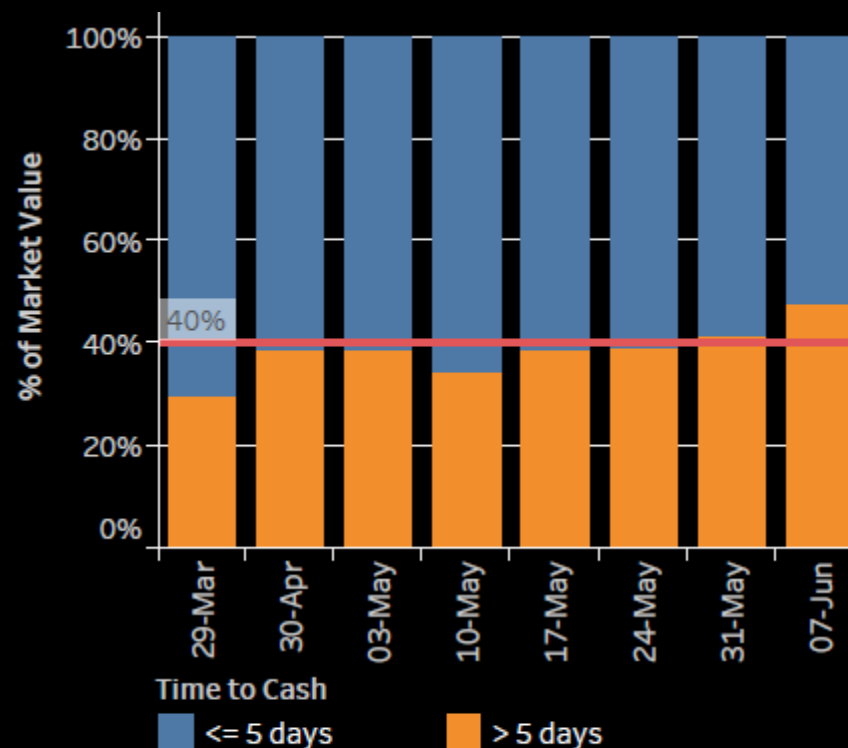 - Target: Convert to cash in 5 business days

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Incorporating Liquidity – Risk Limits

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  – Redemption size: 10%
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Incorporating Liquidity – Risk Limits

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  - Redemption size: 10%
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  - Target: Convert to cash in 5 business days

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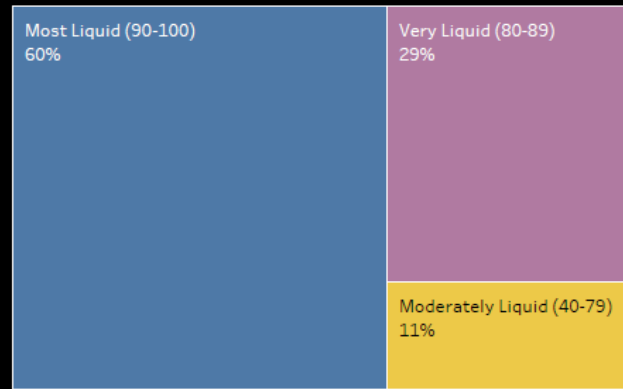# Incorporating Liquidity – Stress Testing

- Systematically assess liquidation cost and horizon under multiple scenarios

- Customize scenarios using:
  - Redemption Size
  - Bid-Ask Spread
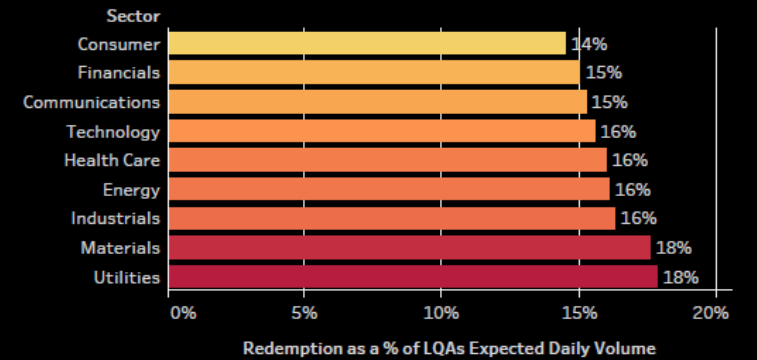 - Expected Daily Volume
  - Price Volatility
  - Confidence

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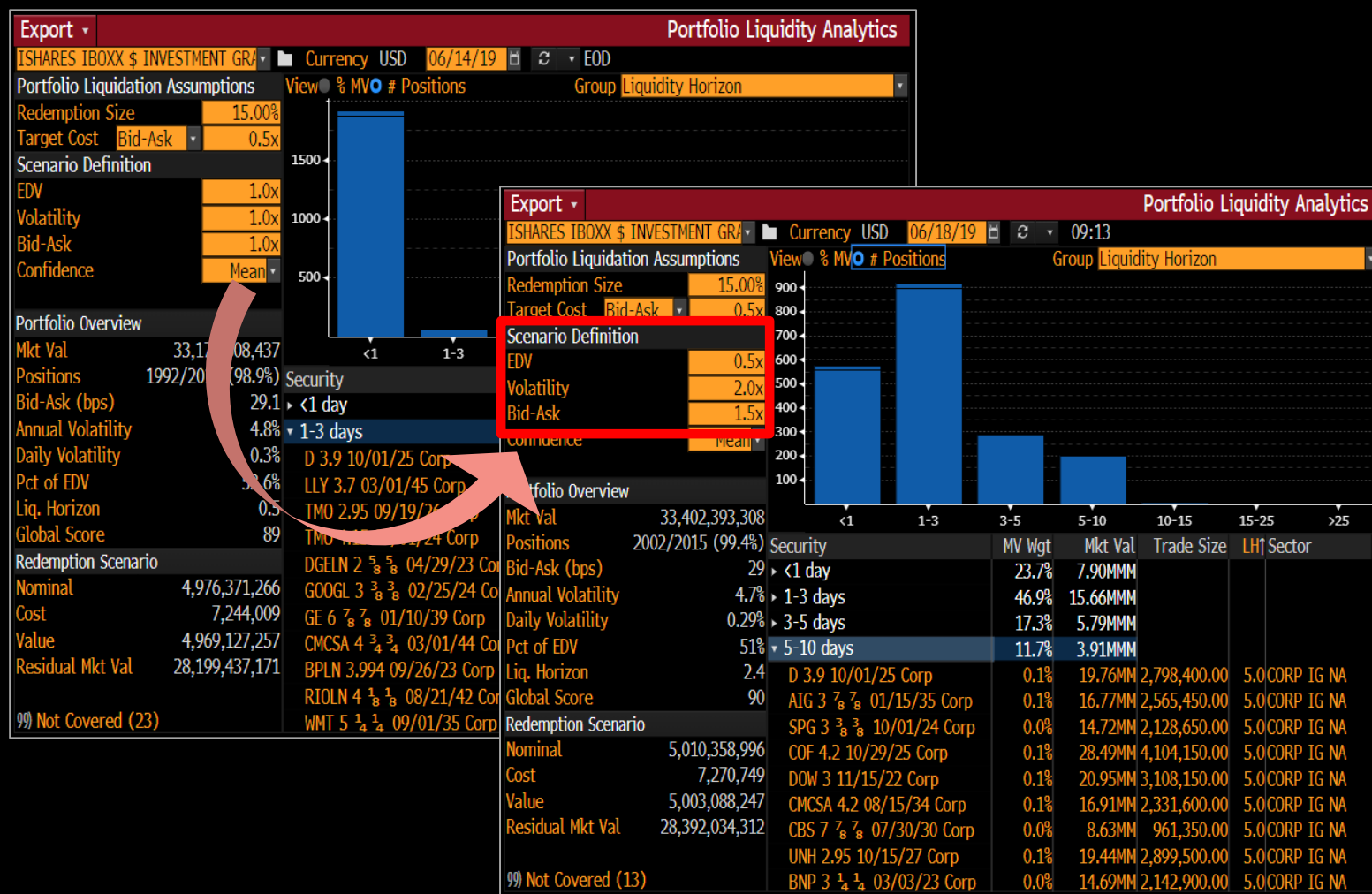
Incorporating Liquidity – Investor Reporting

- Detailed data-driven metrics give investors confidence in a fund's liquidity
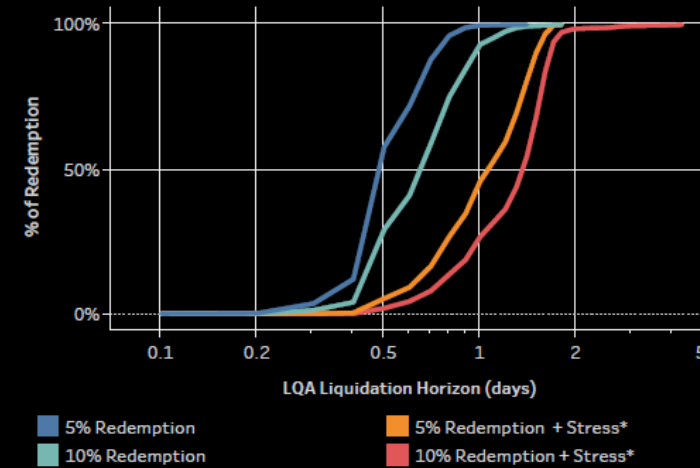
Liquidity Scores by Security

Most Liquid (90-100)
60%

Very Liquid (80-89)
29%

Moderately Liquid (40-79)
11%

5% Redemption vs LQA Expected Daily Volume

Sector	
Consumer	14%
Financials	15%
Communications	15%
Technology	16%
Health Care	16%
Energy	16%
Industrials	16%
Materials	18%
Utilities	18%

Redemption as a % of LQAs Expected Daily Volume

Liquidation Timeline by Scenario
Redemptions are applied pro-rata across the portfolio with a cost of half bid-ask spread

X-axis: LQA Liquidation Horizon (days) — 0.1, 0.2, 0.5, 1, 2, 5
Y-axis: % of Redemption — 0%, 50%, 100%

- 5% Redemption
- 10% Redemption
- 5% Redemption + Stress*
- 10% Redemption + Stress*

Average 5 Day Liquidation Cost by Scenario

Y-axis: 5 Day Liquidation Cost (bps) — 0, 5, 10, 15

Scenario	Cost
5% Redemption	8 bps
10% Redemption	9 bps
5% Redemption + Stress*	12 bps
10% Redemption + Stress*	14 bps
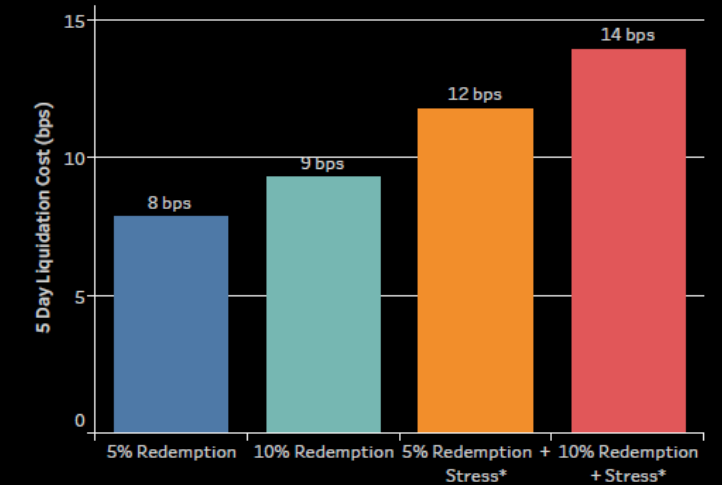
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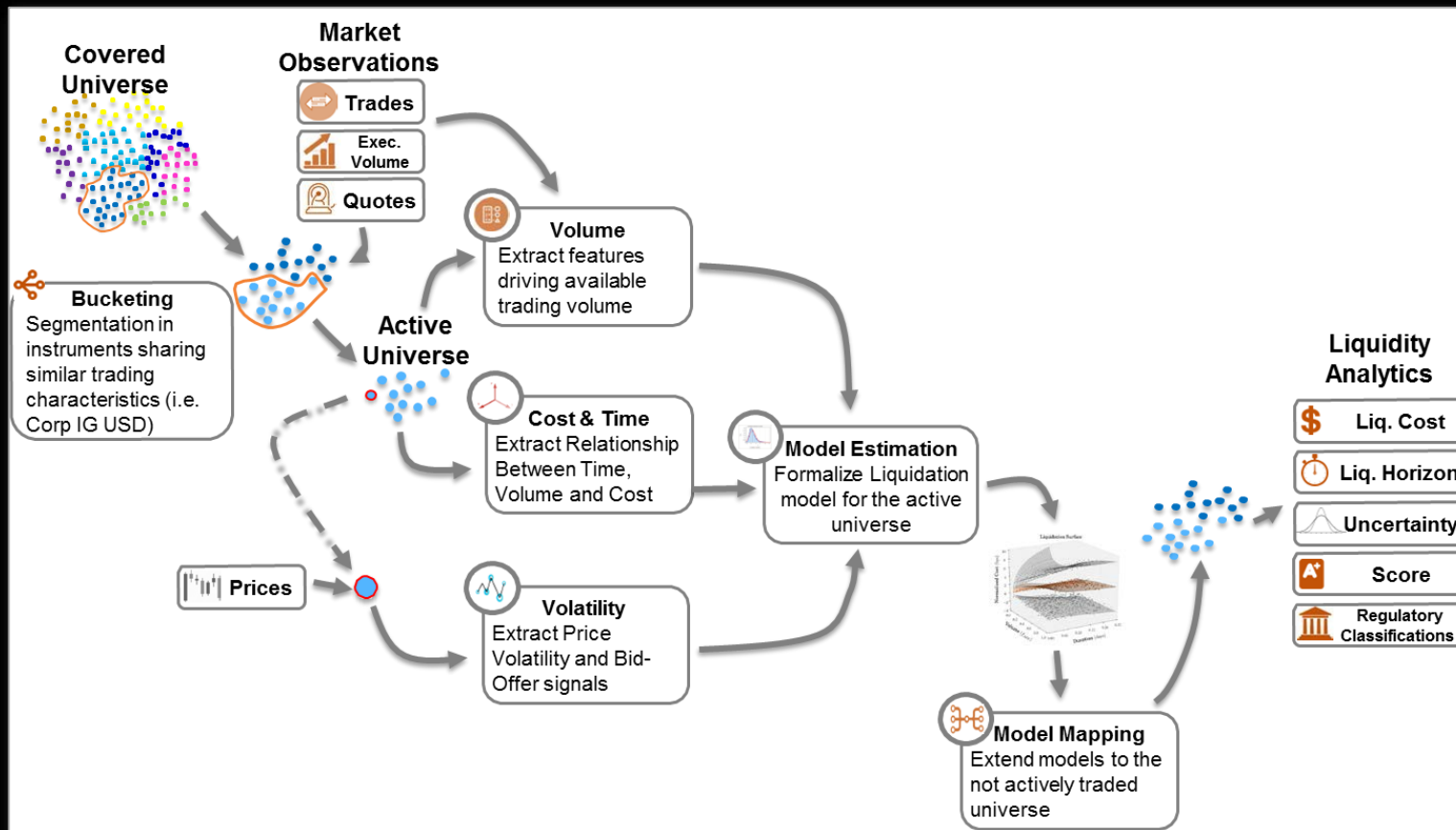# Bloomberg's Liquidity Assessment Solution (LQA)

- Data-driven model to measure liquidity

- Liquidity surface relating volume, horizon, and cost at a position-level

- Machine learning techniques used to extrapolate to instruments with minimal trade data
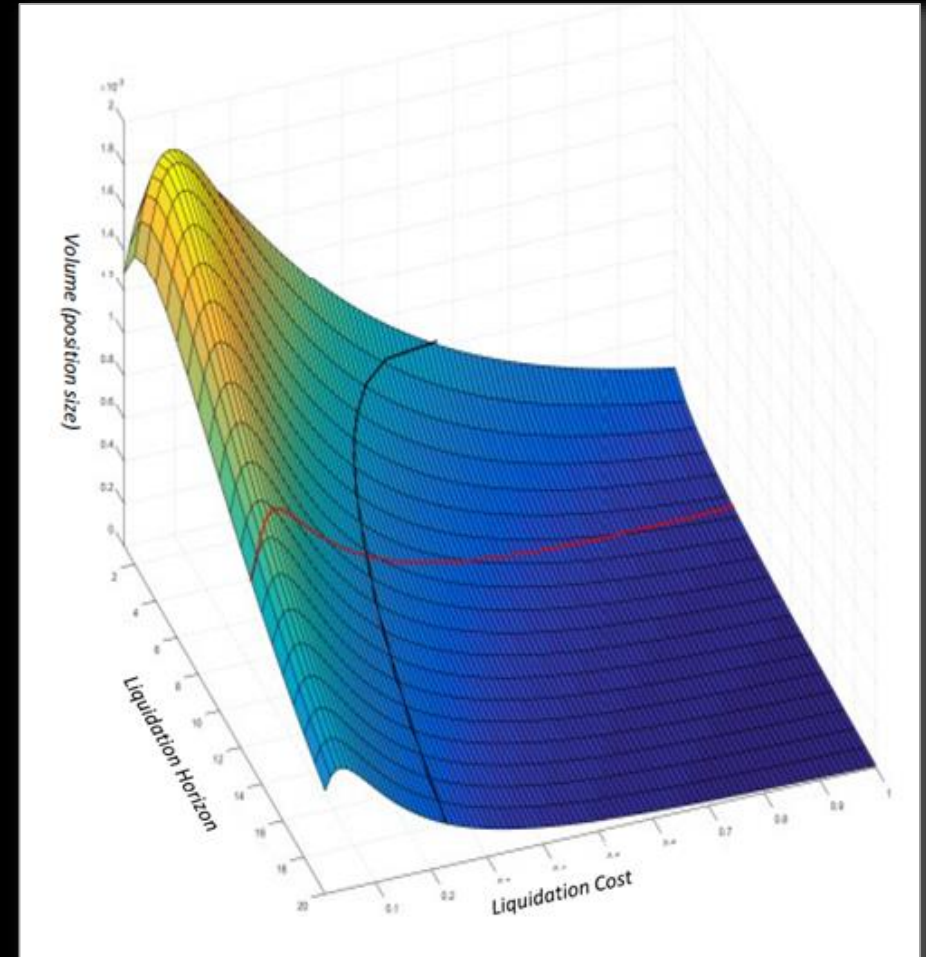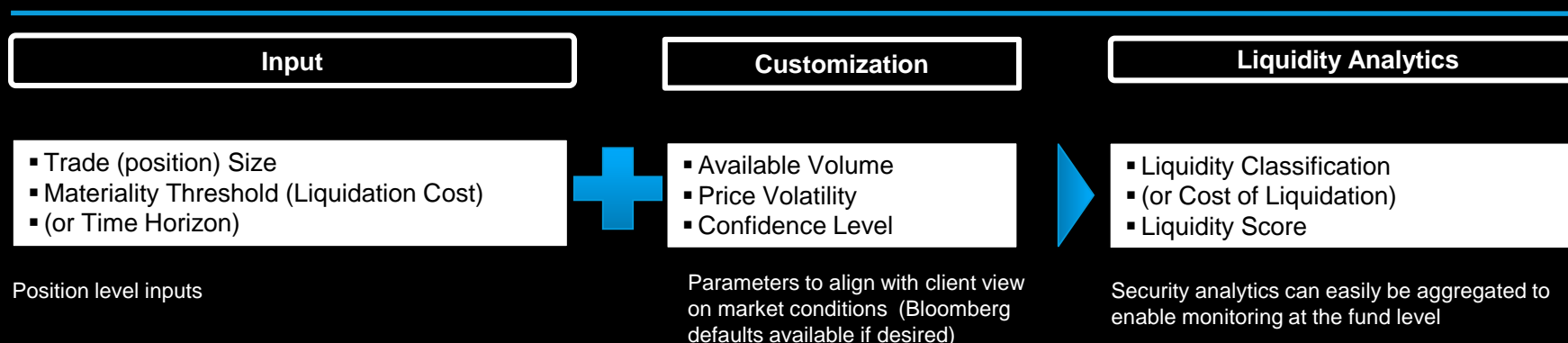
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Bloomberg LQA – Machine Learning Process

Bloomberg LQA – Enterprise Data Feed Workflow

- Data provided via Bloomberg's Data License platform
- Client submits a request, and receives a response with the LQA data

Input	**Customization**	**Liquidity Analytics**
• Trade (position) Size • Materiality Threshold (Liquidation Cost) • (or Time Horizon)	• Available Volume • Price Volatility • Confidence Level	• Liquidity Classification • (or Cost of Liquidation) • Liquidity Score
Position level inputs	Parameters to align with client view on market conditions (Bloomberg defaults available if desired)	Security analytics can easily be aggregated to enable monitoring at the fund level

POSITION DATA					MARKET INPUTS				LIQUIDATION HORIZON ANALYSIS		REGULATORY FIELDS	
ISIN	SECURITY DESCRIPTION	POSITION SIZE	MATERIALITY THRESHOLD		PRICE VOLATILITY	EXPECTED DAILY VOLUME	LQA BID-ASK SPREAD		LIQUIDATION HORIZON	TIME TO CASH	AIFMD	SEC 22e4
FR0012278539	ARKEMA	2,300,000	0.1489%		0.80%	3,786,748	0.3257		0.4	2.4	2-7 days	HL
XS1508392625	ATF NETHERLANDS BV	4,700,000	0.2131%		1.79%	4,886,529	0.4493		0.4	2.4	2-7 days	HL
USF11494AA36	BPCE SA	4,000,000	0.1897%		0.58%	2,187,064	0.4500		1.5	3.5	2-7 days	HL
FR0011606169	CASINO GUICHARD PERRACHO	3,900,000	0.1849%		1.58%	3,238,257	0.3806		0.9	2.9	2-7 days	HL
FR0010814434	CREDIT AGRICOLE SA	2,050,000	0.1444%		0.39%	1,215,420	0.3306		2.0	4	2-7 days	HL
USF22797FK97	CREDIT AGRICOLE SA	5,000,000	0.1737%		2.23%	4,512,247	0.3841		0.7	2.7	2-7 days	HL
XS1139494493	GAS NATURAL FENOSA FINAN	7,800,000	0.1532%		2.05%	6,196,163	0.3319		1.2	3.2	2-7 days	HL
XS1140860534	GENERALI FINANCE BV	4,450,000	0.2143%		3.30%	5,380,701	0.4602		0.3	2.3	2-7 days	HL
XS1191320297	GRAND CITY PROPERTIES SA	1,500,000	0.2200%		0.90%	1,825,287	0.4731		0.3	2.3	2-7 days	HL
FR0011896513	GROUPAMA SA	6,200,000	0.2055%		2.77%	6,874,861	0.4911		0.4	2.4	2-7 days	HL

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Bloomberg LQA – Asset Class Coverage

- Wide range of asset classes globally

- Consistent output across asset classes

- Clients can use proxies for securities not covered by LQA

3.7M Total Coverage

175k
GSAC
Governments, Supra-
nationals, Agencies, and
Corporates

950k
U.S. Municipals
Tax exempt, Taxable, High
Yield, Distressed and
Defaulted

1.3m
Structured Products
Mortgages including ABS,
MBS and CMBS

4,000
Syndicated Loans

60k
Global Equity & ETFs

4,500
Preferred Stock

1.2m
Listed Derivatives
Equity Options, Equity
Index Futures

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Questions?

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