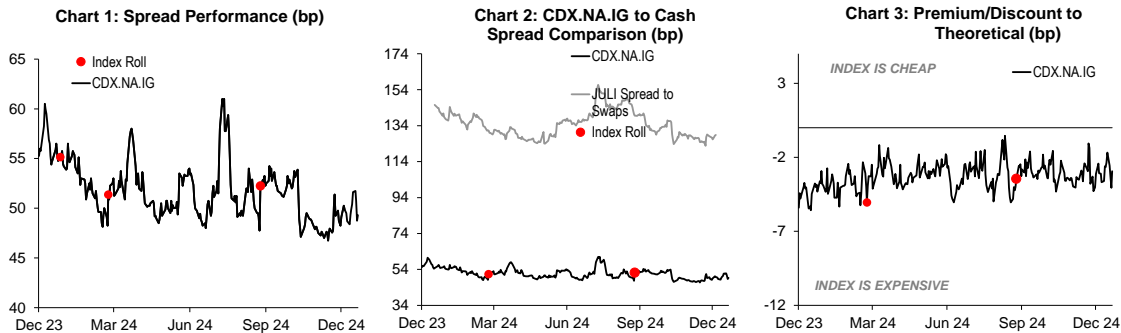


High Grade CDX Daily Analytics - Jan 16, 2025



1. Spreads - (Onrun) Series 43

	1y	2y	3y	4y	5y	7y	10y
CDX.NA.IG.43							
Maturity:	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-31	Dec-34
Coupon (bp):	100	100	100	100	100	100	100
Trader Quoted or Theoretical Spread ¹	Theo	Theo	Quoted	Theo	Quoted	Quoted	Quoted
Current Spread	15.3	23.0	29.2	41.7	49.3	69.3	90.1
1-day Spread Change	-0.2	-0.2	0.5	-0.5	0.5	0.5	0.5
1-week Spread Change	-0.2	-0.2	-1.0	-0.4	-1.1	-1.1	-0.9
1-month Spread Change	0.3	0.4	-1.1	0.6	-1.1	-1.1	-0.7
Index Issue (20-Sept-24) Spread Change	-1.0	-1.7	-2.8	-3.1	-3.0	-3.0	-2.0

2. (Premium)/Discount to Theoretical Value - (Onrun) Series 43

	3y	5y	7y	10y
CDX.NA.IG.43				
Current level	-2.9	-2.9	-1.7	3.8
1-day change	0.9	1.1	1.2	1.3
1-week change	-0.7	-0.6	-0.5	-0.2
1-month change	-1.6	-1.9	-2.0	-1.7
Index Issue (20-Sept-24) Spread Change	-0.4	0.5	0.1	0.7

1. "Quoted" indicates a trader quoted spread. "Theo" indicates a theoretical spread based on underlying CDS curves.

2. In spread terms, positive number indicates index is cheap (wide) to underlying CDS, negative number indicates index is expensive (tight).

3. Credit Event History

IG Index 5Y Maturity	Credit	Date	Recovery Rate
Jul-19	Weatherford International Ltd	7/24/2019	44.50%
Apr-18	Dynegy Inc (Succession)	4/9/2018	-
Dec-17	Energy Transfer, LP (Succession)	12/1/2017	-
Jun-17	Sara Lee (Succession)	6/28/2012	-
Jun-12, Dec-11	Residential Capital	5/14/2012	17.63%
Jun-10, Mar-10	Eastman Kodak	1/19/2012	23.88%
Jun-14, Dec-13, Jun-13, Dec-12, Jun-12, Dec-11, Jun-11, Dec-10, Jun-10, Mar-10	CIT Corp	11/1/2009	68.13%
Jun-10	Lear Corp	7/6/2009	38.50%
Dec-11, Jun-11, Dec-10, Jun-10, Mar-10	Idearc	3/31/2009	1.75%
Jun-11	Tribune Company	12/8/2008	1.50%
Jun-13, Dec-12, Jun-12, Dec-11, Jun-11, Dec-10, Jun-10, Mar-10	Washington Mutual, Inc.	9/29/2008	57.00%
	Federal National Mortgage Association	9/8/2008	91.51%
	Federal Home Loan Mortgage Corp	9/8/2008	94%

Source for all charts and tables in this report: J.P. Morgan

The certifying analyst(s) is indicated by a superscript AC. See last page of the report for analyst certification and important legal and regulatory

Series 42 and Series 41 - Spreads and Basis to CDS

4. Spreads

	1y	2y	3y	4y	5y	7y	10y
CDX.NA.IG.42							
Maturity:	Jun-25	Jun-26	Jun-27	Jun-28	Jun-29	Jun-31	Jun-34
Coupon (bp):	100	100	100	100	100	100	100
Trader Quoted or Theoretical Spread ³	Theo	Theo	Quoted	Theo	Quoted	Quoted	Quoted
Current Spread	12.2	18.7	24.0	36.7	44.1	64.5	86.6
1-day Spread Change	-0.1	-0.2	0.5	-0.4	0.5	0.5	0.5
1-week Spread Change	-0.1	-0.2	-1.3	-0.3	-1.1	-1.1	-0.9
1-month Spread Change	0.2	0.3	-1.1	0.6	-1.2	-1.2	-0.9
Index Issue (20-Mar-24) Spread Change	-5.4	-7.3	-5.0	-9.4	-7.3	-7.7	-5.1

CDX.NA.IG.41							
Maturity:	Dec-25	Dec-26	Dec-27	Dec-28	Dec-30	Dec-33	
Coupon (bp):	100	100	100	100	100	100	
Trader Quoted or Theoretical Spread ³	Theo	Quoted	Theo	Quoted	Quoted	Quoted	
Current Spread	14.8	18.7	31.3	37.9	57.7	81.9	
1-day Spread Change	-0.1	0.5	-0.3	0.5	0.5	0.5	
1-week Spread Change	-0.1	-1.0	-0.3	-1.3	-1.1	-0.8	
1-month Spread Change	0.2	-0.8	0.4	-1.2	-1.1	-0.8	
Index Issue (20-Sept-23) Spread Change	-21.4	-28.0	-30.3	-32.4	-33.6	-28.3	

5. (Premium)/Discount to Theoretical Value⁴

	1y	2y	3y	4y	5y	7y	10y
CDX.NA.IG.42							
Current level			-3.4		-2.4	-2.5	2.4
1-day change			0.8		1.0	1.1	1.2
1-week change			-1.0		-0.7	-0.7	-0.4
1-month change			-1.5		-1.9	-2.1	-1.9
Index Issue (20-Mar-24) Spread Change			3.9		2.6	0.9	1.5

CDX.NA.IG.41							
Current level			-3.6		-2.6	-3.7	1.6
1-day change			0.7		1.0	1.1	1.2
1-week change			-0.8		-1.0	-0.6	-0.3
1-month change			-1.1		-1.8	-1.9	-1.7
Index Issue (20-Sept-23) Spread Change			-1.4		1.8	1.4	4.3

3. "Quoted" indicates a trader quoted spread. "Theo" indicates a theoretical spread based on underlying CDS curves.

4. In spread terms, positive number indicates index is cheap (wide) to underlying CDS, negative number indicates index is expensive(tight).

Cash Analysis

6. Composition by Sector

	CDX.NA.IG.43			JPM JULI (Cash Index)		
	No. of Credits	Weight	Avg 5Y CDS Spread	Index Weight	Avg Spread vs Swaps	YTD Total Return
Automotive	3	2%	110	3%	115	0%
Banks	1	1%	72	23%	121	0%
Basic Industries	15	12%	54	4%	149	0%
Capital Goods	9	7%	39	5%	122	0%
Consumer	12	10%	54	7%	125	0%
Energy	14	11%	62	7%	144	0%
Finance Companies	2	2%	85	3%	139	0%
Healthcare Pharmaceuticals	12	10%	43	9%	127	0%
Insurance	8	6%	57	5%	144	0%
Media Entertainment	5	4%	57	3%	183	0%
Property Real Estate	1	1%	56	3%	151	0%
Retail	9	7%	35	3%	113	0%
Technology	14	11%	52	9%	113	0%
Telecoms	3	2%	58	4%	144	0%
Transportation	8	6%	48	3%	133	0%
Utilities	9	7%	46	9%	147	0%
Total	125	100%	53	99%	130	0%

7. Composition by Rating

CDX.NA.IG.43			
	No. of Credits	Weight	Avg 5Y CDS Spread
AAA	1	1%	22
AA	4	3%	21
A	23	18%	31
BBB	97	78%	58
Total	125	100%	53

JPM JULI (Cash Index)

Index Weight	Avg Spread vs Swaps	YTD Total Return
1%	81	-0.1%
8%	91	-0.1%
45%	113	-0.1%
46%	147	-0.1%
100%	127	-0.1%

8. Spread Correlations and Beta

	1m	3m	6m
CDX.NA.IG OnRun and J.P. Morgan JULI			
Correlation	0.12	0.76	0.75
Beta	0.15	1.32	1.19
CDX.NA.IG. OnRun and J.P. Morgan JULI BBB			
Correlation	0.09	0.75	0.74
Beta	0.11	1.37	1.25

9. Relative Spread levels of CDX.NA.IG. On Run to Cash Bonds

CDX.IG.OnRun 5Y Spread Less JPM JULI	
Current	(77)
1 Week	(78)
1 Month	(72)
Index Roll	(87)
YTD	(93)
1 Year	(88)

10. Durations

	1y	2y	3y	4y	5y	7y	10y
CDX.NA.IG.43							
Years to Maturity	0.93	1.93	2.93	3.93	4.93	6.93	9.93
CDX.NA.IG.43	0.92		2.81		4.50	5.95	7.72
CDX.NA.IG.42							
Years to Maturity	0.42	1.42	2.42	3.43	4.43	6.43	9.43
CDX.NA.IG.42	0.43		2.35		4.10	5.61	7.47
CDX.NA.IG.41							
Years to Maturity		0.93	1.93	2.93	3.93	5.93	8.93
CDX.NA.IG.41	#N/A		1.89		3.69	5.27	7.21

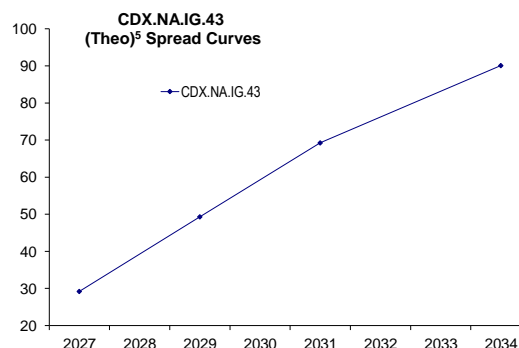
JULI (J.P. Morgan Cash Index)

	Duration	Average Life
Domestic JULI	6.72	10.06
Domestic JULI A	6.57	9.69

CDX Forward Spreads

11. Current Spread and Duration

CDX.NA.IG.43			
Maturity Date	Spread	Duration	
Dec-27	29.2	2.81	
Dec-29	49.3	4.50	
Dec-31	69.3	5.95	
Dec-34	90.1	7.72	



5.*Theo* indicates a theoretical spread based on underlying CDS curves.

12. Spot and Implied Spreads

CDX.NA.IG.43

		End of Forward Period			
		Dec-27	Dec-29	Dec-31	Dec-34
Spot Spread:		29	49	69	90
Start of Forward Period	Dec-27		83	105	125
	Dec-29			131	147
	Dec-31				0

If one sells 5yr CDS and buys 3yr CDS the forward spread is 83bp. This is a 3yr forward 2yr position. If 2yr rates are below 83 in 3yrs time the position will be profitable

13. Duration-Neutral Ratios (Curve Flattening Trades)

CDX.NA.IG.43

		Dec-27	Dec-29	Dec-31	Dec-34
Duration:		2.8	4.5	6.0	7.7
Start of Forward Period	Dec-27		1.6	2.1	2.8
	Dec-29			1.3	1.7
	Dec-31				1.3

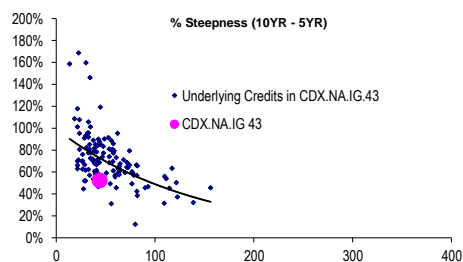
The ratio of the 5yr CDS duration (4.5) to the 3yr CDS duration (2.8) is 1.6. Therefore, if one sells 5yr CDS protection on 1.0 notional, the correct duration-neutral hedge would be to buy 3yr CDS protection on 1.6 notional, or 1.0×1.6 .

14. Carry from a Duration-Neutral Hedged Position (Curve Flattening Trades)

CDX.NA.IG.43

		Dec-27	Dec-29	Dec-31	Dec-34
Duration:		2.8	4.5	6.0	7.7
Start of Forward Period	Dec-27		2	7	10
	Dec-29			4	5
	Dec-31				0

Given the correct duration-neutral ratio (Exhibit 3), the carry for the 3yr forward 2yr curve flattening trade is 2bp. This assumes the short protection position is on 1.0 notional while the long protection position is on a notional appropriately adjusted for duration.



CDX.NA.IG.43 Credits: Mid-Market Levels

High Volatility	Current 5Y CDS Spread	Current 10Y CDS Spread	1d Spread Change	1w Spread Change	High Volatility	Current 5Y CDS Spread	Current 10Y CDS Spread	1d Spread Change	1w Spread Change
Reference Entity					Reference Entity				
Advanced Micro Devices, Inc.	39	65	0	1	Johnson Controls International Public Limited Company	37	63	0	1
x Ally Financial Inc.	139	184	0	-3	Kinder Morgan, Inc.	56	100	-1	-2
Altria Group, Inc.	42	71	-1	-1	Kraft Heinz Foods Company	49	93	0	1
Amazon.com, Inc.	22	47	-1	-1	x Lennar Corporation	82	128	0	-1
American Electric Power Company, Inc.	33	58	0	0	x Lincoln National Corporation	123	168	-2	0
American Express Company	31	56	-1	-1	Lockheed Martin Corporation	23	61	-1	0
American International Group, Inc.	54	97	-1	1	Loews Corporation	24	49	0	0
Amgen Inc.	44	67	0	0	Lowe'S Companies, Inc.	34	53	-1	-2
x Apache Corporation	77	123	-2	-6	M.D.C. Holdings, Inc.	30	78	-2	-2
x Arrow Electronics, Inc.	70	111	-1	0	Marathon Petroleum Corporation	68	117	0	-2
x At&T Inc.	65	108	0	1	Mcdonald'S Corporation	28	40	-1	0
Autozone, Inc.	33	63	-1	-1	Mckesson Corporation	39	70	0	0
x Avnet, Inc.	74	133	-1	1	Metlife, Inc.	64	100	-1	1
Barrick Gold Corporation	44	74	-2	-2	Mondelez International, Inc.	39	62	-1	1
Baxter International Inc.	61	89	-1	-3	Motorola Solutions, Inc.	32	62	0	1
Berkshire Hathaway Inc.	14	35	0	0	National Rural Utilities Cooperative Finance Corporation	19	39	0	0
Best Buy Co., Inc.	48	87	-1	-1	Netflix, Inc.	30	57	-1	0
Block Financial Llc	62	121	-1	0	Newmont Corporation	45	98	-1	-1
x Borgwarner Inc.	65	104	0	0	x Nextera Energy Capital Holdings, Inc.	60	94	-2	-1
Boston Scientific Corporation	27	43	0	0	Norfolk Southern Corporation	24	43	0	0
Bristol-Myers Squibb Company	35	62	0	0	Northrop Grumman Corporation	22	44	-1	-1
Broadcom Inc.	35	70	0	1	x Occidental Petroleum Corporation	82	114	0	-3
Campbell Soup Company	44	82	0	1	Omnicom Group Inc.	42	72	0	5
Canadian Natural Resources Limited	58	107	0	0	Oracle Corporation	42	77	0	3
x Capital One Financial Corporation	72	121	-1	-1	x Ovintiv Inc.	82	136	-1	-4
Cardinal Health, Inc.	41	73	0	-1	Packaging Corporation Of America	22	36	-1	-2
Cisco Systems, Inc.	27	47	0	0	x Paramount Global	111	172	-1	0
Comcast Corporation	55	82	0	0	Pfizer Inc.	38	68	0	-2
Conagra Brands, Inc.	58	93	1	1	Prudential Financial, Inc.	63	100	-1	2
Cox Communications, Inc.	41	66	0	1	x Pultegroup, Inc.	79	124	0	-4
Csx Corporation	24	46	0	0	Quest Diagnostics Incorporated	30	48	0	0
Cvs Health Corporation	73	119	0	-10	x Radian Group, Inc.	90	131	0	3
D.R. Horton, Inc.	51	81	0	-2	Rtx Corporation	37	63	0	0
Danaher Corporation	29	48	0	0	Ryder System, Inc.	57	97	0	0
Darden Restaurants, Inc.	41	68	0	1	Sempra	40	74	0	2
Deere & Company	34	62	0	-1	Simon Property Group, L.P.	56	73	0	2
Dell Inc.	61	105	0	2	x Southwest Airlines Co.	82	116	1	0
x Delta Air Lines, Inc.	93	136	-1	-7	Target Corporation	38	71	-1	-2
x Devon Energy Corporation	81	135	-2	-6	x Teck Resources Limited	71	118	0	-1
Dominion Energy, Inc.	44	67	-1	-1	x The Aes Corporation	115	166	-2	4
x Dxc Technology Company	122	183	-2	0	The Allstate Corporation	27	45	0	2
Eastman Chemical Company	64	105	-1	-1	x The Boeing Company	109	144	0	0
Enbridge Inc.	60	93	-1	-3	The Dow Chemical Company	64	104	0	-1
x Energy Transfer, L.P.	59	105	0	0	The Home Depot, Inc.	29	55	-1	-1
Exelon Corporation	34	61	-1	-2	The Kroger Co.	38	58	0	0
x Expedia Group, Inc.	56	105	-1	0	The Procter & Gamble Company	23	39	-1	-1
Fedex Corporation	53	101	0	1	The Sherwin-Williams Company	43	81	-1	-1
Firstenergy Corp.	43	63	0	0	The Southern Company	33	64	0	0
x Ford Motor Company	156	228	0	3	The Walt Disney Company	35	60	0	1
x Freeport-Mcmoran Inc.	77	115	-1	-1	The Williams Companies, Inc.	54	91	-2	-2
General Electric Company	33	67	-1	0	T-Mobile Usa, Inc.	45	84	0	1
General Mills, Inc.	41	69	0	1	x Toll Brothers, Inc.	78	124	-1	-4
x General Motors Company	110	171	-1	-2	Transcanada Pipelines Limited	48	85	0	1
Halliburton Company	54	94	-2	-3	Tyson Foods, Inc.	47	81	-1	0
Hca Inc.	63	103	0	0	Union Pacific Corporation	22	37	-1	-1
Hess Corporation	34	84	-2	-2	United Parcel Service, Inc.	33	53	0	0
Honeywell International Inc.	27	45	0	0	Unitedhealth Group Incorporated	42	66	1	0
x Host Hotels & Resorts, L.P.	74	124	-3	0	Valero Energy Corporation	57	103	0	-2
Hp Inc.	58	102	0	0	Verizon Communications Inc.	63	102	0	1
Intel Corporation	80	90	-3	-4	Walmart Inc.	29	44	-1	0
International Business Machines Corporation	39	66	-1	1	Weyerhaeuser Company	30	45	-1	-1
International Paper Company	40	63	-1	-2	x Whirlpool Corporation	117	192	0	2
Johnson & Johnson	22	35	0	-1					

6. Spread levels and CDX.NA.IG calculations are based on the NR (No Restructuring) CDS curves.
Positive Spread change indicates widening and negative spread change indicates tightening.

Average: CDX.NA.IG.43 53 87 -1 -1
High Volatility 89 137 -1 -1
Median: CDX.NA.IG.43 44 81 0 0

Page 5

Guide to High Grade CDX Daily Analytics

The High Grade CDX Daily Analytics provides important information regarding the pricing, performance, and valuation of CDX.NA.IG indices. It also compares the structure and return performance of CDX.NA.IG to JPMorgan's high grade corporate cash index. A final section illustrates the current pricing and positioning opportunities of the TRAC-X NA tranches. Note that all figures and calculations are based on mid-market levels.

Table 1 and Charts 1 & 2: Price and Spread

CDX.NA.IG swaps trade on spread. If the market spread is below the coupon an upfront price will be paid which is the present value of this difference.

Chart 2 compares the spread on CDX.NA.IG to the spread on JULI, JP Morgan's US Liquid Index of investment grade bonds. Juli inclusion criteria are included at the bottom of this page

Table 2 and Chart 3: (Premium)/Discount to Theoretical Value (CDX.NA.IG vs. Underlying NO RESTRUCTURING CDS Levels)

A comparison of the weighted average spread on the underlying CDS levels to the actual pricing of CDX.NA.IG. A negative figure in spread (bp) terms indicates that CDX.NA.IG is expensive to the component CDS levels. This is a similar concept to the premium/discount to NAV of a closed-end mutual fund. The weighted average of the underlying CDS levels is the NAV while CDX.NA.IG will usually trade at a premium or discount to this NAV. As in the historical return calculations, CDX.NA.IG and CDX.NA.IG High Volatility are treated as continuations of their predecessor indices.

Chart 3 illustrates the history of this figure for CDX.NA.IG September 2009. The underlying CDS levels used are those for the No Restructuring default curves, as this is the documentation for CDX.NA.IG products. Generally the No Restructuring curve has a spread 4-6% tighter than the Modified Restructuring curve of the same credit.

Table 3 & 4: (Premium)/Discount to Cash (CDX.NA.IG vs. Cash Bonds)

A comparison of CDX.NA.IG to a basket of cash bonds. The calculation is a weighted average of the basis between a representative bond for each credit and the CDS curve for that credit. In order to do this calculation perfectly one would need a liquid bond for each credit with the exact maturity date of each CDX.NA.IG product. As such bonds do not exist we have chosen the most liquid bond for each credit which is nearest to the maturity date of CDX.NA.IG. If no such bond exists we have excluded that credit from the calculation. The result is therefore an approximation of the relative expensiveness or cheapness of CDX.NA.IG to the cash bond market for a similar list of names, but not an exact calculation.

Note that this calculation includes the results of the Premium/Discount to Theoretical Value (Table 2). This is because, if the basis between each bond and its CDS curve averaged to zero but CDX.NA.IG was trading 5 bps expensive to the CDS market (i.e. expensive to theoretical), then CDX.NA.IG would also be trading 5 bps expensive to cash bonds.

Table 5 & 6: Composition by Sector, Composition by Rating

The first part of table 5 illustrates the breakout of CDX.NA.IG by sector. Note that while each credit represents 1/125 of the index (for the CDX.NA.IG.3) the index behaves as a market weighted index in that credits with a market spread greater than the index spread have a lower weight, and vice versa. This is similar to a cash bond index where the weighting is based on market value (rather than face value) of each asset. Specifically, market weightings are calculated by averaging the (dollar price of the underlying CDS)*(1/125).

The average 5 year CDS spread is shown for illustrative purposes, but the weighted average of the 5yr CDS spread shown is not exactly the same as the NAV of CDX.NA.IG calculated for Table 2. This is because Table 2 is using the CDS spreads matching the CDX.NA.IG maturity while this table shows the 5 year levels. The second part of this table illustrates the sector breakdown and spread over swaps for JULI.

Table 6 shows this analysis grouped by Rating.

Table 7: Spread Correlation and Beta

Correlation and beta data are calculated comparing 1 week spread changes for the two indices.

Table 8: Relative Spread Performance of CDX.NA.IG to Bonds

Illustrates the outperformance or underperformance of CDX.NA.IG to the JULI index. The data reflects differences in current or historical spread levels, not changes in levels.

Table 15: Tranched TRAC-X NA Series 2

Tranches of TRAC-X represent exposure to levels of loss in the TRAC-X portfolio. The Lower Attachment represents the subordination, or the percentage of losses in the portfolio that the tranche can withstand before the notional of the tranche is reduced. The tranche will be exposed to each additional unit of loss between the Lower Attachment and the Upper Attachment. The transaction will terminate when losses exceed the Upper Attachment.

For example, a seller of protection against the 3 - 7% tranche of a \$1 billion portfolio will receive a regular coupon equal to the bid side of the market for that tranche times the size of the tranche (i.e. 7% - 3% = 4% of notional), or \$40 million. The seller would not make any cash payment (i.e. suffer any losses) until losses in the TRAC-X portfolio exceeded \$30 million (= 3% x \$1 billion). If losses in the TRAC-X portfolio totaled \$50 million, the protection seller would pay \$20 million (= \$50 million - \$30 million). The protection seller's loss exposure would be capped at \$40 million (= (7% - 3%) x \$1 billion), should losses in the TRAC-X portfolio exceed \$70 million.

The 0 - 3% tranche of TRAC-X is quoted as an upfront payment, plus a spread of 500 basis points running. All other tranches are quoted as running spreads

Cash Bond Market: JPMorgan US Liquid Index (JULI)

Cash bond market data used in comparisons to CDX.NA.IG based on JULI (JPMorgan US Liquid Index). The index contains bonds that meet the following criteria:

- U.S. dollar denominated bonds; primarily fixed rate bullets; also US\$ bonds with step-up (by rating) coupons.
- Minimum individual issue size of \$300 million and a minimum fixed-rate total outstanding of \$1 billion per issuer.
- Maturities from 13 months to 31 years and 1 month.
- Markets include U.S. domestic, non-U.S., medium-term note, global and Yankee.
- Minimum credit rating of Baa3 from Moody's and BBB- from S&P.

The index is rebalanced on the last weekday of each month. Source of pricing data for the 1648 component bonds as of September 30, 2003 is JP Morgan.

Analyst Certification: The Research Analyst(s) denoted by an “AC” on the cover of this report certifies (or, where multiple Research Analysts are primarily responsible for this report, the Research Analyst denoted by an “AC” on the cover or within the document individually certifies, with respect to each security or issuer that the Research Analyst covers in this research) that: (1) all of the views expressed in this report accurately reflect the Research Analyst’s personal views about any and all of the subject securities or issuers; and (2) no part of any of the Research Analyst’s compensation was, is, or will be directly or indirectly related to the specific recommendations or views expressed by the Research Analyst(s) in this report. For all Korea-based Research Analysts listed on the front cover, if applicable, they also certify, as per KOFIA requirements, that the Research Analyst’s analysis was made in good faith and that the views reflect the Research Analyst’s own opinion, without undue influence or intervention.

All authors named within this report are Research Analysts who produce independent research unless otherwise specified. In Europe, Sector Specialists (Sales and Trading) may be shown on this report as contacts but are not authors of the report or part of the Research Department.

Important Disclosures

Company-Specific Disclosures: Important disclosures, including price charts and credit opinion history tables, are available for compendium reports and all J.P. Morgan–covered companies, and certain non-covered companies, by visiting <https://www.jpmm.com/research/disclosures>, calling 1-800-477-0406, or e-mailing research.disclosure.inquiries@jpmorgan.com with your request.

A history of J.P. Morgan investment recommendations disseminated during the preceding 12 months can be accessed on the Research & Commentary page of <http://www.jpmorganmarkets.com> where you can also search by analyst name, sector or financial instrument.

Explanation of Credit Research Valuation Methodology, Ratings and Risk to Ratings:

J.P. Morgan uses a bond-level rating system that incorporates valuations (relative value) and our fundamental view on the security. Our fundamental credit view of an issuer is based on the company's underlying credit trends, overall creditworthiness and our opinion on whether the issuer will be able to service its debt obligations when they become due and payable. We analyze, among other things, the company's cash flow capacity and trends and standard credit ratios, such as gross and net leverage, interest coverage and liquidity ratios. We also analyze profitability, capitalization and asset quality, among other variables, when assessing financials. Analysts also rate the issuer, based on the rating of the benchmark or representative security. Unless we specify a different recommendation for the company’s individual securities, an issuer recommendation applies to all of the bonds at the same level of the issuer’s capital structure. We may also rate certain loans and preferred securities, as applicable. This report also sets out within it the material underlying assumptions used.

We use the following ratings for bonds (issues), issuers, loans, and preferred securities: Overweight (over the next three months, the recommended risk position is expected to outperform the relevant index, sector, or benchmark); Neutral (over the next three months, the recommended risk position is expected to perform in line with the relevant index, sector, or benchmark); and Underweight (over the next three months, the recommended risk position is expected to underperform the relevant index, sector, or benchmark). J.P. Morgan Emerging Markets Sovereign Research uses Marketweight, which is equivalent to Neutral. NR is Not Rated. In this case, J.P. Morgan has removed the rating for this particular security or issuer because of either a lack of a sufficient fundamental basis or for legal, regulatory or policy reasons. The previous rating no longer should be relied upon. An NR designation is not a recommendation or a rating. NC is Not Covered. An NC designation is not a rating or a recommendation.

For CDS, we use the following rating system: Long Risk (over the next three months, the credit return on the recommended position is expected to exceed the relevant index, sector or benchmark); Neutral (over the next three months, the credit return on the recommended position is expected to match the relevant index, sector or benchmark); and Short Risk (over the next three months, the credit return on the recommended position is expected to underperform the relevant index, sector or benchmark).

J.P. Morgan Credit Research Ratings Distribution, as of October 05, 2024

	Overweight (buy)	Neutral (hold)	Underweight (sell)
Global Credit Research Universe*	27%	57%	16%
IB clients**	64%	61%	64%

*Please note that the percentages may not add to 100% because of rounding.

**Percentage of subject companies within each of the "Overweight," "Neutral" and "Underweight" categories for which J.P. Morgan has provided investment banking services within the previous 12 months.

For purposes of FINRA ratings distribution rules only, our Overweight rating falls into a buy rating category; our Neutral rating falls into a hold rating category; and our Underweight rating falls into a sell rating category. The Credit Research Rating Distribution is at the issuer level. Issuers with an NR or an NC designation are not included in the table above. This information is current as of the end of the most recent calendar quarter.

Analysts' Compensation: The research analysts responsible for the preparation of this report receive compensation based upon various factors, including the quality and accuracy of research, client feedback, competitive factors, and overall firm revenues.

Other Disclosures

J.P. Morgan is a marketing name for investment banking businesses of JPMorgan Chase & Co. and its subsidiaries and affiliates worldwide.

UK MIFID FICC research unbundling exemption: UK clients should refer to [UK MIFID Research Unbundling exemption](#) for details of J.P. Morgan's implementation of the FICC research exemption and guidance on relevant FICC research categorisation.

Any long form nomenclature for references to China; Hong Kong; Taiwan; and Macau within this research material are Mainland China; Hong Kong SAR (China); Taiwan (China); and Macau SAR (China).

J.P. Morgan Research may, from time to time, write on issuers or securities targeted by economic or financial sanctions imposed or administered by the governmental authorities of the U.S., EU, UK or other relevant jurisdictions (Sanctioned Securities). Nothing in this report is intended to be read or construed as encouraging, facilitating, promoting or otherwise approving investment or dealing in such Sanctioned Securities. Clients should be aware of their own legal and compliance obligations when making investment decisions.

Any digital or crypto assets discussed in this research report are subject to a rapidly changing regulatory landscape. For relevant regulatory advisories on crypto assets, including bitcoin and ether, please see <https://www.jpmorgan.com/disclosures/cryptoasset-disclosure>.

The author(s) of this research report may not be licensed to carry on regulated activities in your jurisdiction and, if not licensed, do not hold themselves out as being able to do so.

Exchange-Traded Funds (ETFs): J.P. Morgan Securities LLC ("JPMS") acts as authorized participant for substantially all U.S.-listed ETFs. To the extent that any ETFs are mentioned in this report, JPMS may earn commissions and transaction-based compensation in connection with the distribution of those ETF shares and may earn fees for performing other trade-related services, such as securities lending to short sellers of the ETF shares. JPMS may also perform services for the ETFs themselves, including acting as a broker or dealer to the ETFs. In addition, affiliates of JPMS may perform services for the ETFs, including trust, custodial, administration, lending, index calculation and/or maintenance and other services.

Options and Futures related research: If the information contained herein regards options- or futures-related research, such information is available only to persons who have received the proper options or futures risk disclosure documents. Please contact your J.P. Morgan Representative or visit <https://www.theocc.com/components/docs/riskstoc.pdf> for a copy of the Option Clearing Corporation's Characteristics and Risks of Standardized Options or http://www.finra.org/sites/default/files/Security_Futures_Risk_Disclosure_Statement_2018.pdf for a copy of the Security Futures Risk Disclosure Statement.

Changes to Interbank Offered Rates (IBORs) and other benchmark rates: Certain interest rate benchmarks are, or may in the future become, subject to ongoing international, national and other regulatory guidance, reform and proposals for reform. For more information, please consult: https://www.jpmorgan.com/global/disclosures/interbank_offered_rates

Private Bank Clients: Where you are receiving research as a client of the private banking businesses offered by JPMorgan Chase & Co. and its subsidiaries ("J.P. Morgan Private Bank"), research is provided to you by J.P. Morgan Private Bank and not by any other division of J.P. Morgan, including, but not limited to, the J.P. Morgan Corporate and Investment Bank and its Global Research division.

Legal entity responsible for the production and distribution of research: The legal entity identified below the name of the Reg AC Research Analyst who authored this material is the legal entity responsible for the production of this research. Where multiple Reg AC Research Analysts authored this material with different legal entities identified below their names, these legal entities are jointly responsible for the production of this research. Research Analysts from various J.P. Morgan affiliates may have contributed to the production of this material but may not be licensed to carry out regulated activities in your jurisdiction (and do not hold themselves out as being able to do so). Unless otherwise stated below, this material has been distributed by the legal entity responsible for production. If you have any queries, please contact the relevant Research Analyst in your jurisdiction or the entity in your jurisdiction that has distributed this research material.

Legal Entities Disclosures and Country-/Region-Specific Disclosures:

Argentina: JPMorgan Chase Bank N.A Sucursal Buenos Aires is regulated by Banco Central de la República Argentina ("BCRA"- Central Bank of Argentina) and Comisión Nacional de Valores ("CNV"- Argentinian Securities Commission - ALYC y AN Integral N°51). **Australia:** J.P. Morgan Securities Australia Limited ("JPMSAL") (ABN 61 003 245 234/AFS Licence No:

238066) is regulated by the Australian Securities and Investments Commission and is a Market Participant of ASX Limited, a Clearing and Settlement Participant of ASX Clear Pty Limited and a Clearing Participant of ASX Clear (Futures) Pty Limited. This material is issued and distributed in Australia by or on behalf of JPMSAL only to "wholesale clients" (as defined in section 761G of the Corporations Act 2001). A list of all financial products covered can be found by visiting <https://www.jpmm.com/research/disclosures>. J.P. Morgan seeks to cover companies of relevance to the domestic and international investor base across all Global Industry Classification Standard (GICS) sectors, as well as across a range of market capitalisation sizes. If applicable, in the course of conducting public side due diligence on the subject company(ies), the Research Analyst team may at times perform such diligence through corporate engagements such as site visits, discussions with company representatives, management presentations, etc. Research issued by JPMSAL has been prepared in accordance with J.P. Morgan Australia's Research Independence Policy which can be found at the following link: [J.P. Morgan Australia - Research Independence Policy](#). **Brazil:** Banco J.P. Morgan S.A. is regulated by the Comissão de Valores Mobiliários (CVM) and by the Central Bank of Brazil. Ombudsman J.P. Morgan: 0800-7700847 / 0800-7700810 (For Hearing Impaired) / ouvidoria.jp.morgan@jpmorgan.com. **Canada:** J.P. Morgan Securities Canada Inc. is a registered investment dealer, regulated by the Canadian Investment Regulatory Organization and the Ontario Securities Commission and is the participating member on Canadian exchanges. This material is distributed in Canada by or on behalf of J.P.Morgan Securities Canada Inc. **Chile:** Inversiones J.P. Morgan Limitada is an unregulated entity incorporated in Chile. **China:** J.P. Morgan Securities (China) Company Limited has been approved by CSRC to conduct the securities investment consultancy business. **Dubai International Financial Centre (DIFC):** JPMorgan Chase Bank, N.A., Dubai Branch is regulated by the Dubai Financial Services Authority (DFSA) and its registered address is Dubai International Financial Centre - The Gate, West Wing, Level 3 and 9 PO Box 506551, Dubai, UAE. This material has been distributed by JP Morgan Chase Bank, N.A., Dubai Branch to persons regarded as professional clients or market counterparties as defined under the DFSA rules. **European Economic Area (EEA):** Unless specified to the contrary, research is distributed in the EEA by J.P. Morgan SE ("JPM SE"), which is authorised as a credit institution by the Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin) and jointly supervised by the BaFin, the German Central Bank (Deutsche Bundesbank) and the European Central Bank (ECB). JPM SE is a company headquartered in Frankfurt with registered address at TaunusTurm, Taunustor 1, Frankfurt am Main, 60310, Germany. The material has been distributed in the EEA to persons regarded as professional investors (or equivalent) pursuant to Art. 4 para. 1 no. 10 and Annex II of MiFID II and its respective implementation in their home jurisdictions ("EEA professional investors"). This material must not be acted on or relied on by persons who are not EEA professional investors. Any investment or investment activity to which this material relates is only available to EEA relevant persons and will be engaged in only with EEA relevant persons. **Hong Kong:** J.P. Morgan Securities (Asia Pacific) Limited (CE number AAJ321) is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission in Hong Kong, and J.P. Morgan Broking (Hong Kong) Limited (CE number AAB027) is regulated by the Securities and Futures Commission in Hong Kong. JP Morgan Chase Bank, N.A., Hong Kong Branch (CE Number AAL996) is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission, is organized under the laws of the United States with limited liability. Where the distribution of this material is a regulated activity in Hong Kong, the material is distributed in Hong Kong by or through J.P. Morgan Securities (Asia Pacific) Limited and/or J.P. Morgan Broking (Hong Kong) Limited. **India:** J.P. Morgan India Private Limited (Corporate Identity Number - U67120MH1992FTC068724), having its registered office at J.P. Morgan Tower, Off. C.S.T. Road, Kalina, Santacruz - East, Mumbai - 400098, is registered with the Securities and Exchange Board of India (SEBI) as a 'Research Analyst' having registration number INH000001873. J.P. Morgan India Private Limited is also registered with SEBI as a member of the National Stock Exchange of India Limited and the Bombay Stock Exchange Limited (SEBI Registration Number - INZ000239730) and as a Merchant Banker (SEBI Registration Number - MB/INM000002970). Telephone: 91-22-6157 3000, Facsimile: 91-22-6157 3990 and Website: <http://www.jpmypl.com>. JPMorgan Chase Bank, N.A. - Mumbai Branch is licensed by the Reserve Bank of India (RBI) (Licence No. 53/ Licence No. BY.4/94; SEBI - IN/CUS/014/ CDSL : IN-DP-CDSL-444-2008/ IN-DP-NSDL-285-2008/ INBI00000984/ INE231311239) as a Scheduled Commercial Bank in India, which is its primary license allowing it to carry on Banking business in India and other activities, which a Bank branch in India are permitted to undertake. For non-local research material, this material is not distributed in India by J.P. Morgan India Private Limited. Compliance Officer: Spurthi Gadamsetty; spurthi.gadamsetty@jpmchase.com; +912261573225. Grievance Officer: Ramprasadh K, jpmipl.research.feedback@jpmorgan.com; +912261573000.

Investment in securities market are subject to market risks. Read all the related documents carefully before investing. Registration granted by SEBI and certification from NISM in no way guarantee performance of the intermediary or provide any assurance of returns to investors.

Indonesia: PT J.P. Morgan Sekuritas Indonesia is a member of the Indonesia Stock Exchange and is registered and supervised by the Otoritas Jasa Keuangan (OJK). **Korea:** J.P. Morgan Securities (Far East) Limited, Seoul Branch, is a member of the Korea Exchange (KRX). JPMorgan Chase Bank, N.A., Seoul Branch, is licensed as a branch office of foreign bank (JPMorgan Chase Bank, N.A.) in Korea. Both entities are regulated by the Financial Services Commission (FSC) and the Financial Supervisory Service (FSS). For non-macro research material, the material is distributed in Korea by or through J.P. Morgan Securities (Far East) Limited, Seoul Branch. **Japan:** JPMorgan Securities Japan Co., Ltd. and JPMorgan Chase Bank, N.A., Tokyo Branch are regulated by the Financial Services Agency in Japan. **Malaysia:** This material is issued and distributed in Malaysia by JPMorgan Securities (Malaysia) Sdn Bhd (18146-X), which is a Participating Organization of Bursa Malaysia Berhad and holds a Capital Markets Services License issued by the Securities Commission in Malaysia. **Mexico:** J.P. Morgan Casa de Bolsa, S.A. de C.V. and J.P. Morgan Grupo Financiero are members of the Mexican Stock Exchange and are authorized to act as a broker dealer by the National Banking and Securities Exchange Commission. **New Zealand:** This material is issued and distributed by JPMSAL

in New Zealand only to "wholesale clients" (as defined in the Financial Markets Conduct Act 2013). JPMSAL is registered as a Financial Service Provider under the Financial Service providers (Registration and Dispute Resolution) Act of 2008. **Philippines:** J.P. Morgan Securities Philippines Inc. is a Trading Participant of the Philippine Stock Exchange and a member of the Securities Clearing Corporation of the Philippines and the Securities Investor Protection Fund. It is regulated by the Securities and Exchange Commission. **Singapore:** This material is issued and distributed in Singapore by or through J.P. Morgan Securities Singapore Private Limited (JPMSS) [MDDI (P) 068/08/2024 and Co. Reg. No.: 199405335R], which is a member of the Singapore Exchange Securities Trading Limited, and/or JPMorgan Chase Bank, N.A., Singapore branch (JPMCB Singapore), both of which are regulated by the Monetary Authority of Singapore. This material is issued and distributed in Singapore only to accredited investors, expert investors and institutional investors, as defined in Section 4A of the Securities and Futures Act, Cap. 289 (SFA). This material is not intended to be issued or distributed to any retail investors or any other investors that do not fall into the classes of "accredited investors," "expert investors" or "institutional investors," as defined under Section 4A of the SFA. Recipients of this material in Singapore are to contact JPMSS or JPMCB Singapore in respect of any matters arising from, or in connection with, the material. **South Africa:** J.P. Morgan Equities South Africa Proprietary Limited and JPMorgan Chase Bank, N.A., Johannesburg Branch are members of the Johannesburg Securities Exchange and are regulated by the Financial Services Conduct Authority (FSCA). **Taiwan:** J.P. Morgan Securities (Taiwan) Limited is a participant of the Taiwan Stock Exchange (company-type) and regulated by the Taiwan Securities and Futures Bureau. Material relating to equity securities is issued and distributed in Taiwan by J.P. Morgan Securities (Taiwan) Limited, subject to the license scope and the applicable laws and the regulations in Taiwan. According to Paragraph 2, Article 7-1 of Operational Regulations Governing Securities Firms Recommending Trades in Securities to Customers (as amended or supplemented) and/or other applicable laws or regulations, please note that the recipient of this material is not permitted to engage in any activities in connection with the material that may give rise to conflicts of interests, unless otherwise disclosed in the "Important Disclosures" in this material. **Thailand:** This material is issued and distributed in Thailand by JPMorgan Securities (Thailand) Ltd., which is a member of the Stock Exchange of Thailand and is regulated by the Ministry of Finance and the Securities and Exchange Commission, and its registered address is 3rd Floor, 20 North Sathorn Road, Silom, Bangkok, Bangkok 10500. **UK:** Unless specified to the contrary, research is distributed in the UK by J.P. Morgan Securities plc ("JPMS plc") which is a member of the London Stock Exchange and is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. JPMS plc is registered in England & Wales No. 2711006, Registered Office 25 Bank Street, London, E14 5JP. This material is directed in the UK only to: (a) persons having professional experience in matters relating to investments falling within article 19(5) of the Financial Services and Markets Act 2000 (Financial Promotion) (Order) 2005 ("the FPO"); (b) persons outlined in article 49 of the FPO (high net worth companies, unincorporated associations or partnerships, the trustees of high value trusts, etc.); or (c) any persons to whom this communication may otherwise lawfully be made; all such persons being referred to as "UK relevant persons". This material must not be acted on or relied on by persons who are not UK relevant persons. Any investment or investment activity to which this material relates is only available to UK relevant persons and will be engaged in only with UK relevant persons. Research issued by JPMS plc has been prepared in accordance with JPMS plc's policy for prevention and avoidance of conflicts of interest related to the production of Research which can be found at the following link: [J.P. Morgan EMEA - Research Independence Policy](#). **U.S.:** J.P. Morgan Securities LLC ("JPMS") is a member of the NYSE, FINRA, SIPC, and the NFA. JPMorgan Chase Bank, N.A. is a member of the FDIC. Material published by non-U.S. affiliates is distributed in the U.S. by JPMS who accepts responsibility for its content.

General: Additional information is available upon request. The information in this material has been obtained from sources believed to be reliable. While all reasonable care has been taken to ensure that the facts stated in this material are accurate and that the forecasts, opinions and expectations contained herein are fair and reasonable, JPMorgan Chase & Co. or its affiliates and/or subsidiaries (collectively J.P. Morgan) make no representations or warranties whatsoever to the completeness or accuracy of the material provided, except with respect to any disclosures relative to J.P. Morgan and the Research Analyst's involvement with the issuer that is the subject of the material. Accordingly, no reliance should be placed on the accuracy, fairness or completeness of the information contained in this material. There may be certain discrepancies with data and/or limited content in this material as a result of calculations, adjustments, translations to different languages, and/or local regulatory restrictions, as applicable. These discrepancies should not impact the overall investment analysis, views and/or recommendations of the subject company(ies) that may be discussed in the material. J.P. Morgan accepts no liability whatsoever for any loss arising from any use of this material or its contents, and neither J.P. Morgan nor any of its respective directors, officers or employees, shall be in any way responsible for the contents hereof, apart from the liabilities and responsibilities that may be imposed on them by the relevant regulatory authority in the jurisdiction in question, or the regulatory regime thereunder. Opinions, forecasts or projections contained in this material represent J.P. Morgan's current opinions or judgment as of the date of the material only and are therefore subject to change without notice. Periodic updates may be provided on companies/industries based on company-specific developments or announcements, market conditions or any other publicly available information. There can be no assurance that future results or events will be consistent with any such opinions, forecasts or projections, which represent only one possible outcome. Furthermore, such opinions, forecasts or projections are subject to certain risks, uncertainties and assumptions that have not been verified, and future actual results or events could differ materially. The value of, or income from, any investments referred to in this material may fluctuate and/or be affected by changes in exchange rates. All pricing is indicative as of the close of market for the securities discussed, unless otherwise stated. Past performance is not indicative of future results. Accordingly, investors may receive back less than originally invested. This material is not intended as an offer or solicitation for the purchase or sale of any financial instrument. The opinions and recommendations herein do not take into account individual client circumstances, objectives, or needs and are not intended as recommendations of particular securities,

financial instruments or strategies to particular clients. This material may include views on structured securities, options, futures and other derivatives. These are complex instruments, may involve a high degree of risk and may be appropriate investments only for sophisticated investors who are capable of understanding and assuming the risks involved. The recipients of this material must make their own independent decisions regarding any securities or financial instruments mentioned herein and should seek advice from such independent financial, legal, tax or other adviser as they deem necessary. J.P. Morgan may trade as a principal on the basis of the Research Analysts' views and research, and it may also engage in transactions for its own account or for its clients' accounts in a manner inconsistent with the views taken in this material, and J.P. Morgan is under no obligation to ensure that such other communication is brought to the attention of any recipient of this material. Others within J.P. Morgan, including Strategists, Sales staff and other Research Analysts, may take views that are inconsistent with those taken in this material. Employees of J.P. Morgan not involved in the preparation of this material may have investments in the securities (or derivatives of such securities) mentioned in this material and may trade them in ways different from those discussed in this material. This material is not an advertisement for or marketing of any issuer, its products or services, or its securities in any jurisdiction.

Confidentiality and Security Notice: This transmission may contain information that is privileged, confidential, legally privileged, and/or exempt from disclosure under applicable law. If you are not the intended recipient, you are hereby notified that any disclosure, copying, distribution, or use of the information contained herein (including any reliance thereon) is **STRICTLY PROHIBITED**. Although this transmission and any attachments are believed to be free of any virus or other defect that might affect any computer system into which it is received and opened, it is the responsibility of the recipient to ensure that it is virus free and no responsibility is accepted by JPMorgan Chase & Co., its subsidiaries and affiliates, as applicable, for any loss or damage arising in any way from its use. If you received this transmission in error, please immediately contact the sender and destroy the material in its entirety, whether in electronic or hard copy format. This message is subject to electronic monitoring: <https://www.jpmorgan.com/disclosures/email>

MSCI: Certain information herein ("Information") is reproduced by permission of MSCI Inc., its affiliates and information providers ("MSCI") ©2024. No reproduction or dissemination of the Information is permitted without an appropriate license. MSCI MAKES NO EXPRESS OR IMPLIED WARRANTIES (INCLUDING MERCHANTABILITY OR FITNESS) AS TO THE INFORMATION AND DISCLAIMS ALL LIABILITY TO THE EXTENT PERMITTED BY LAW. No Information constitutes investment advice, except for any applicable Information from MSCI ESG Research. Subject also to [msci.com/disclaimer](https://www.msci.com/disclaimer)

Sustainalytics: Certain information, data, analyses and opinions contained herein are reproduced by permission of Sustainalytics and: (1) includes the proprietary information of Sustainalytics; (2) may not be copied or redistributed except as specifically authorized; (3) do not constitute investment advice nor an endorsement of any product or project; (4) are provided solely for informational purposes; and (5) are not warranted to be complete, accurate or timely. Sustainalytics is not responsible for any trading decisions, damages or other losses related to it or its use. The use of the data is subject to conditions available at <https://www.sustainalytics.com/legal-disclaimers>. ©2024 Sustainalytics. All Rights Reserved.

"Other Disclosures" last revised October 05, 2024.

Copyright 2024 JPMorgan Chase & Co. All rights reserved. This material or any portion hereof may not be reprinted, sold or redistributed without the written consent of J.P. Morgan. It is strictly prohibited to use or share without prior written consent from J.P. Morgan any research material received from J.P. Morgan or an authorized third-party ("J.P. Morgan Data") in any third-party artificial intelligence ("AI") systems or models when such J.P. Morgan Data is accessible by a third-party. It is permissible to use J.P. Morgan Data for internal business purposes only in an AI system or model that protects the confidentiality of J.P. Morgan Data so as to prevent any and all access to or use of such J.P. Morgan Data by any third-party.