INCOME RESEARCH + MANAGEMENT

LDI MONITOR

December 31, 2022

2022 LDI Environment Review

Our Average Plan funded status decreased by 1.5% to 100.4% during 2022 – Plan assets fell on negative returns from both bonds and equities, but this was offset by higher rates reducing liabilities.

Discount rates increased over the course of the year driven by higher Treasury yields – Our Average Plan discount rate rose 227bps, to 4.89%.

- Long corporate yields began 2022 at 3.10%, peaked at 6.38% in October on heightened inflation concerns, and ultimately closed the year at 5.60%.

Long corporate spreads widened by 28bps, from 130bps to 158bps – Long corporate spreads began the year inside their long-term average, anchored by supportive technicals.

- Despite flattening Treasury curves, credit curves also flattened and closed 19bps wider year-over-year.

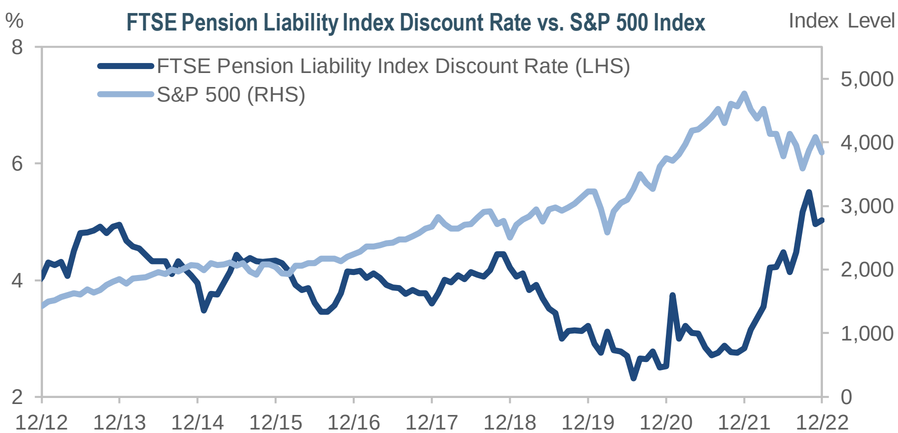
2022 saw the third-highest annual total of long corporate bond issuance on record – Long-duration supply totaled over $323 billion; however, this was still well-behind 2019's record total of nearly $560 billion.

- Issuance was front-loaded this year – nearly $200 billion priced during the first half of the year – as issuers rushed to issue debt with rates reaching new year-to-date highs.

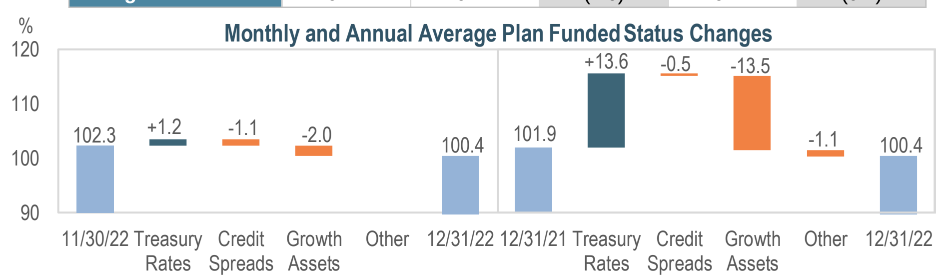
Negative equity returns were a headwind for funded statuses – The S&P 500 suffered extreme volatility and closed the year down almost 20%, its worst performance since 2008 after three consecutive positive returning years.

- Equity markets struggled to digest persistent supply chain bottle-necks, tighter monetary policy, geopolitical conflicts and the prospect of an ensuing recession.

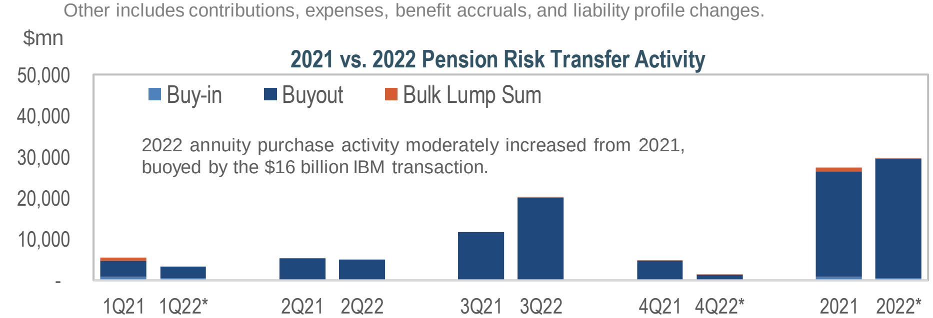
Rates Monitor	12/22	11/22	MoM Change	12/21	YTD Change
IR+M Average Plan Discount Rate (%)	4.89	4.81	0.08	2.62	2.27
Bloomberg Long Corp Yield (%)	5.60	5.48	0.12	3.10	2.50
Bloomberg Long Corp A+ Yield (%)	5.26	5.14	0.12	2.87	2.39
Bloomberg Long Corp BBB Yield (%)	5.95	5.82	0.13	3.32	2.63
Long Corp Spreads (bps)	158	160	(2)	130	28
Curve (Long Corp - Int Corp) (bps)	42	41	1	61	(19)



Funded Status (%)	12/22	11/22	MoM Change	12/21	YTD Change
Average Plan	100.4	102.3	(1.9)	101.9	(1.5)
End Stage Plan	105.2	105.9	(0.7)	106.8	(1.6)
Young Plan	92.1	94.7	(2.6)	92.2	(0.1)



Other includes contributions, expenses, benefit accruals, and liability profile changes.



*Preliminary as of 12/31/2022

The single effective discount rate shown is for the IR+M Average Sample Plan, calculated from the FTSE Pension Discount Curve. Totals may not sum due to rounding.

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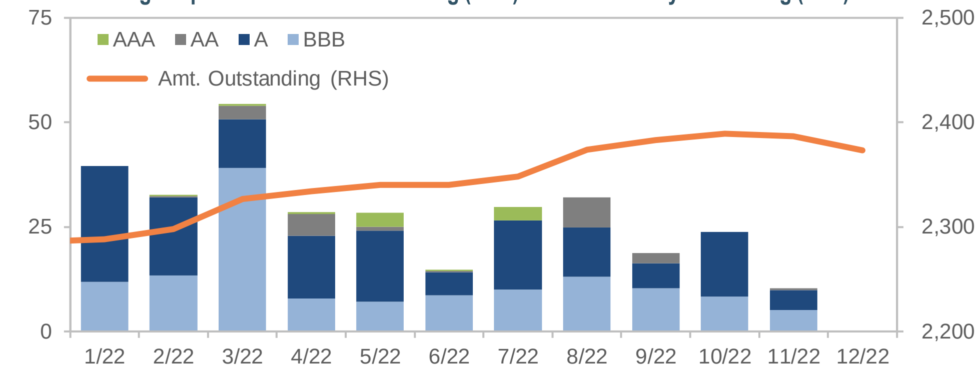
Fourth Quarter 2022 Corporate Issuance

- Long issuance was relatively light in the fourth quarter with no new deals being priced during the month of December.
    - Long supply totaled roughly $42 billion, compared to over $87 billion issued in 4Q 2021 and $64 billion in 4Q 2020.
- Year-to-date issuance of $323 billion was well-behind last year's total of $390 billion, but still ranked the third-highest annual total on record.
- New issue concessions across corporate deals were 13bps in 2022, much higher than 2021's average of 2bps.
- The lack of supply was met with unwavering demand for long-duration debt and spreads tightened from 198bps to 158bps as a result.

Long Corporate: Amount Outstanding (RHS) and Issuance by S&P Rating (LHS)



Trailing 12 Month Long Corporate New Issuance (bn)

AAA	AA	A	BBB	*Total*
$8.3	$20.2	$149.7	$135.1	$313.2

Ticker	Issuer Name	Maturity	Issue Date	Average Rating	Amount Issued ($bn)	Yield at Issue (%)	Spread at Issue (bps)	Concession to Outstanding (bps)	Order Book ($bn)	Oversubscription Level (times)
UNH	UnitedHealth Group Inc	30	10/25/2022	A2	2.0	5.93	165	0	8.7	4.4
		40	10/25/2022	A2	1.5	6.13	185	0	7.5	5.0
ORCL	Oracle Corp	30	11/7/2022	BAA2	2.5	6.91	255	-10	9.2	3.7
LMT	Lockheed Martin Corp	32	10/19/2022	A3	1.0	5.76	160	10	5.5	5.5
		41	10/19/2022	A3	0.8	5.96	180	10	4.8	6.4
BRKHEC	PacifiCorp	31	11/29/2022	A1	1.1	5.37	153	8	2.4	2.2
	Nevada Power Co	31	10/17/2022	A2	0.4	5.94	190	10	2.1	5.3
QCOM	QUALCOMM Inc	31	11/7/2022	A2	1.2	6.05	170	5	3.5	2.9
ENELIM	Enel Finance International NV	30	10/6/2022	BAA1	1.0	7.75	440	65	3.4	3.4
GEHC	GE HealthCare Technologies Inc	30	11/9/2022	BAA2	1.0	6.38	210	Debut	6.0	6.0
DOW	Dow Chemical Co/The	31	10/24/2022	BAA1	0.9	6.91	250	20	3.2	3.6
ELV	Elevance Health Inc	30	10/26/2022	BAA2	0.8	6.10	190	10	6.5	8.7
ED	Consolidated Edison Co of New York Inc	30	11/9/2022	A3	0.7	6.20	185	15	3.1	4.4
FANG	Diamondback Energy Inc	30	11/29/2022	BAA2	0.7	6.25	240	15	1.2	1.8

2022 long corporate issuance sourced from Bloomberg, all prior months sourced from JP Morgan. Totals may not sum due to rounding.

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LDI Environment from 2022 into 2023

After a very challenging year, the funded statuses for our sample plans ended the year slightly lower. In 2022, the S&P 500 experienced a -19% annual return, the worst performance since 2008. Fed action pushed rates higher, and bonds were unusually correlated with equity performance. The Bloomberg Long Corporate Index had a –26% return in 2022. Plans who embraced liability driven investing (LDI) were better insulated from 2022's marked volatility. This was evident by the year-to-date funded status range across plans; our Young Plan's daily funded status ranged from 88% to 99%, while our End Stage Plan's funded status ranged from 103% to 107%.

With funded statuses returning to pre-Great Financial Crisis levels and interest rates finally approaching "normal" levels, we anticipate the de-risking trend will remain especially strong in 2023. Fixed income at higher yields will look more attractive for corporate defined benefit sponsors who have been patiently waiting on the sidelines to buy into LDI. Higher rates will also bring increased pension demand from public and multiemployer plans (especially recipients of Special Financial Assistance). Equity volatility and the compelling possibility of a recession in 2023 should further fuel the desire to de-risk in order to protect funded statuses and reach plan goals, such as plan termination within a near-term timeline. We look forward to partnering closely with our clients and prospects by making progress on their LDI journeys and finding attractive fixed income opportunities.

Technical Factors

- Corporate pension plans increased asset allocations to fixed income in 2022, continuing the de-risking trend from 2021. Demand for long-duration bonds should remain strong in 2023 with funded statuses at historic highs.
- The Bloomberg Investment-Grade Corporate Bond Index yield briefly eclipsed the S&P 500 forward earnings yield for the first time in 14 years. The combination of high yields and low dollar prices makes fixed income assets relatively attractive.
- STRIPs creation surged through November, continuing the rise from 2021.

Gross and net IG supply in 2023 are expected to fall short of 2022; conditions supporting demand likely remain.

Regulatory Environment

- Total estimated Special Financial Assistance (SFA) for distressed multiemployer plans is expected to total up to $100 billion, which will be distributed over the next few years. At least 67% of SFA funds must be invested in investment-grade bonds which should be a tailwind for fixed income.
- The DOL rule gave discretion to managers to consider ESG factors in investment decisions for ERISA plans. However, widespread adoption is not anticipated because the rule reiterated pension sponsors' fiduciary obligations.

SECURE 2.0 included provisions that may affect pension risk transfer activity and marginally stabilize pension contributions and costs.

Fundamental Factors

- Inflation is expected to moderate, but geopolitical tensions remain a headwind to the possibility that the Fed can execute a soft landing.
- General consensus remains that a recession will begin in 2023, but the strong consumer may delay it and soften its severity.
  - A recession may spur a "flight to quality" with higher demand for Treasuries and more resilient sectors of investment grade credit.
  - China's re-opening is expected in 2023 and would further support global growth and easing of supply chain pressures.

Weakening corporate earnings and selective M&A activity may elevate leverage.

Portfolio Positioning For 2022

- Long corporate spreads began the year at 130bps before widening to over 200bps through the first three quarters.
  - We incrementally added risk as spreads widened by sourcing our favored issuers in both the primary and secondary markets.
- Spreads reversed course and tightened through the fourth quarter and closed the quarter at 158bps.
  - We rotated out of outperformers while selectively swapping into more attractively priced issues for fundamentally solid credits.

We continue to favor spread product over Treasuries but retain ample dry powder to take advantage of any market weakness.

Heightened volatility in interest rates and broader markets is expected to continue in 2023. We will continue to help our clients hedge their plan liabilities and manage funded status risk through our practical approach to LDI.

IR+M DISCLOSURE STATEMENT

Disclosures:

Sources: Moody's PFaroe, Milliman, FTSE Russell (formerly Citigroup), Bloomberg, JPMorgan and Pension & Investments. All data in the above commentary is as of 12/31/22. Yields are represented as of the aforementioned date and are subject to change. The views contained in this report are those of IR+M and are based on information obtained by IR+M from sources that are believed to be reliable but IR+M makes no guarantee as to the accuracy or completeness of the underlying third-party data used to form IR+M's views and opinions. This report is for informational purposes only and is not intended to provide specific advice, recommendations, or projected returns for any particular IR+M product. No part of this material may be reproduced in any form, or referred to in any other publication, without express written permission from Income Research + Management. "Bloomberg®" and Bloomberg Indices are service marks of Bloomberg Finance L.P. and its affiliates, including Bloomberg Index Services Limited ("BISL"), the administrator of the index (collectively, "Bloomberg") and have been licensed for use for certain purposes by IR+M. Bloomberg is not affiliated with IR+M, and Bloomberg does not approve, endorse, review, or recommend the products described herein. Bloomberg does not guarantee the timeliness, accurateness, or completeness of any data or information relating to any IR+M product. Moody's Analytics PFaroe® product used by IR+M includes market data and other information sourced from third parties under license. Certain licensors require Moody's Analytics to make disclosures to, or to obtain acknowledgements or agreements from, IR+M and parties receiving the information from IR+M, which is effected by the disclosures and disclaimers available at https://static.pfaroe.com/DisclosuresAndDisclaimers/index.html.

IR+M Funded Status Monitor Assumptions:

Detailed methodology and assumptions for the IR+M Funded Status Monitor can be found at: https://www.incomeresearch.com/wp-content/uploads/2022/02/IRM-Funded-Status-Monitor-Whitepaper-2022.pdf.

	End Stage	Average	Young
Target Liability Duration (Years)	8-10	12-14	15-17
Funded Ratio at Inception (i.e., 12/31/2019)	100.0%	89.8%	80.0%

Asset Allocations	End Stage	Average	Young
US All Cap Equity	8%	27%	38%
International Equity	2%	17%	22%
US REITS	0%	2%	5%
Private Equity	0%	4%	5%
Growth Assets Allocation	10%	50%	70%
Long Government Fixed Income	5%	10%	10%
Long Credit Fixed Income	30%	25%	10%
Intermediate Government Fixed Income	5%	5%	5%
Intermediate Credit Fixed Income	50%	10%	5%
Fixed Income Allocation	90%	50%	30%