IR+M INCOME RESEARCH + MANAGEMENT

LDI MONITOR

December 31, 2021

2021 LDI Environment Review

Our Average Plan funded status increased by 14.3% to 106.1% during 2021 – Plan assets benefitted as equities experienced double digit growth, and liabilities fell as higher yields boosted discount rates.

Discount rates increased over the course of the year driven by higher Treasury yields – Our Average Plan discount rate rose 40bps, to 2.62%.

- Long corporate yields began 2021 at 2.78%, peaked at 3.58% in March on heightened inflation concerns, and ultimately closed the year at 3.10%.

Long corporate spreads narrowed by 10bps, from 140bps to 130bps – Long corporate spreads spent the year inside their long-term average, buoyed by supportive technicals and continued economic recovery.

- Credit curves closed 10bps tighter year-over-year, driven by demand for long bonds.

2021 saw the second-highest annual total of long corporate bond issuance on record – Long-duration supply totaled $390 billion; however, this was still well-behind 2019's total of nearly $560 billion.

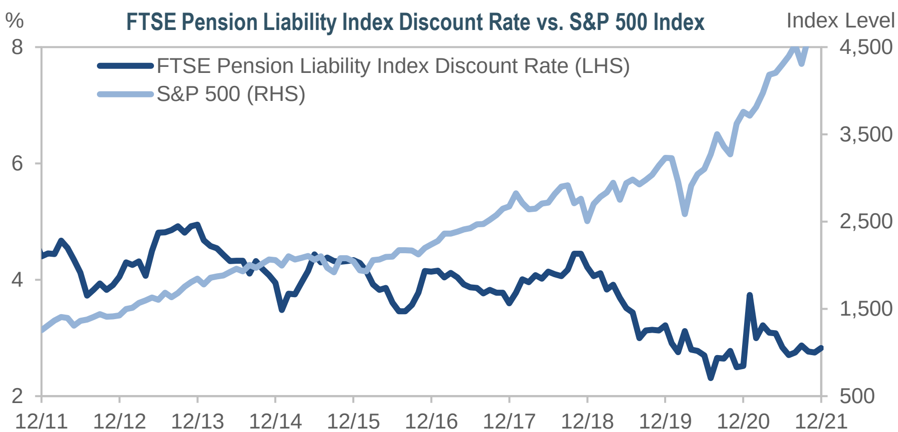
- Issuers focused on liability management by tendering higher-coupon legacy debt in exchange for new, lower-coupon longer-duration bonds. The average coupon of the Bloomberg Long Corporate Index fell from 4.50% to 4.32%.

Strong equity returns were a tailwind to funded status improvement – The S&P 500 continued its ascent higher, with only three negative-returning months and 70 new all-time highs in 2021, closing the year up almost 27%.

- Investors brushed off surging inflation and the emergence of several new COVID variants, and instead focused on the new Biden Administration's stimulus package, a mostly accommodative Fed, and positive economic data.

Rates Monitor	12/21	11/21	MoM Change	12/20	YTD Change
IR+M Average Plan Discount Rate (%)	2.62	2.55	0.07	2.22	0.40
Bloomberg Long Corp Yield (%)	3.10	3.06	0.04	2.78	0.32
Bloomberg Long Corp A+ Yield (%)	2.87	2.81	0.06	2.49	0.38
Bloomberg Long Corp BBB Yield (%)	3.32	3.30	0.02	3.07	0.25
Long Corp Spreads (bps)	130	135	(5)	140	(10)
Curve (Long Corp - Int Corp) (bps)	61	59	2	72	(11)

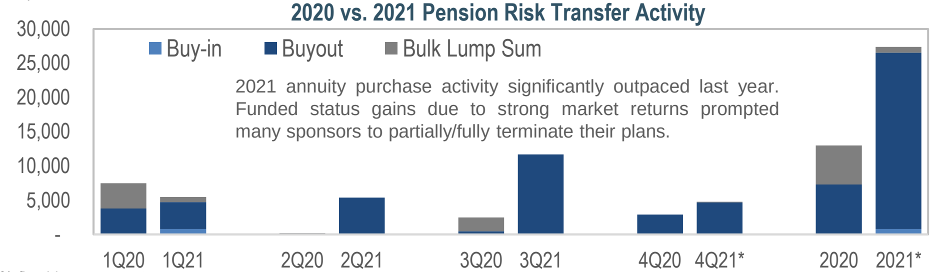
FTSE Pension Liability Index Discount Rate vs. S&P 500 Index



Funded Status (%)	12/21	11/21	MoM Change	12/20	YTD Change
Average Plan	106.1	103.2	2.9	91.8	14.3
End Stage Plan	114.7	113.1	1.6	102.8	11.9
Young Plan	97.4	93.5	3.9	80.0	17.4

Monthly and Annual Average Plan Funded Status Changes

2020 vs. 2021 Pension Risk Transfer Activity



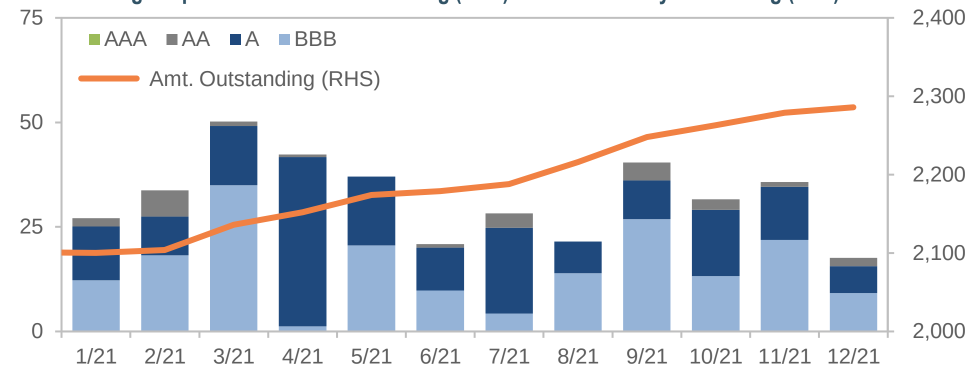
*Preliminary as of 12/31/2021

The single effective discount rate shown is for the IR+M Average Sample Plan, calculated from the FTSE Pension Discount Curve.
The Average Plan is soft frozen with a target liability duration of 12 to 14 years, and a target asset allocation of 50% growth assets and 50% fixed income assets.
The End Stage Plan is hard frozen with a target liability duration of 8 to 10 years, and a target asset allocation of 15% growth assets and 85% fixed income assets.
The Young Plan is open and accruing benefits with a target liability duration of 15 to 17 years, and a target asset allocation of 70% growth assets and 30% fixed income assets.

Fourth Quarter 2021 Corporate Issuance: Largest Long-Dated USD Investment Grade Deals

- Long corporate issuance continued at an above-average pace, with another $87 billion issued in 4Q to bring the year-to-date total to almost $390 billion.
    - The fourth quarter was the highest all-time total for a 4Q, with each month within the quarter surpassing previous monthly records.
    - Overseas demand picked-up amid depressed global yields, as the Bloomberg Long Corporate Index yield remained above 3% for much of the quarter.
- Just over half of supply came from BBB-rated issuers, as lower-quality issuers came to market prior to rates likely going higher in 2022.
    - Valuations also enticed BBB-rated issuers to price new bonds; the basis between higher-rated and lower-rated long corporates tightened to roughly 50bps versus 60bps at the start of the year.

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



Trailing 12 Month Long Corporate New Issuance (bn)

AAA	AA	A	BBB	*Total*
$0.0	$24.3	$175.8	$186.4	$386.5

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)
MRK	Merck & Co Inc	30	12/7/2021	A+	2.0	2.76	95	5	7.6	3.8
		40	12/7/2021	A+	1.5	2.91	110	5	5.7	3.8
AER	AerCap Ireland Capital DAC	12	10/21/2021	BBB-	1.5	3.44	175	-1	8.3	5.5
		20	10/21/2021	BBB-	1.5	3.87	175	1	11.4	7.6
DELL	Dell International LLC / EMC Corp	20	12/6/2021	BBB-	1.0	3.40	155	N/A	4.1	4.1
		30	12/6/2021	BBB	1.3	3.45	170	N/A	3.1	2.5
WSTP	Westpac Banking Corp	15	11/8/2021	BBB+	1.3	3.02	153	5	4.2	3.4
		20	11/8/2021	BBB+	1.0	3.13	123	3	3.8	3.8
ROSW	Roche Holdings Inc	30	12/6/2021	AA	2.0	2.61	85	0	5.1	2.6
PEP	PepsiCo Inc	20	10/6/2021	A+	0.8	2.64	62	2	2.0	2.7
		30	10/6/2021	A+	1.0	2.78	72	2	2.2	2.2
CB	Chubb INA Holdings Inc	30	11/15/2021	A	0.6	2.85	83	-2	3.9	6.5
		40	11/15/2021	A	1.0	3.07	105	5	3.3	3.3
APTV	Aptiv PLC	30	11/9/2021	BBB	1.5	3.21	140	25	2.5	1.7
RDSALN	Shell International Finance BV	20	11/22/2021	AA-	0.5	2.96	95	13	1.0	2.0
		30	11/22/2021	AA-	1.0	3.01	105	15	1.6	1.6

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LDI Environment from 2021 into 2022

The pandemic persisted longer than expected and continued to drive market volatility throughout 2021. Funded statuses benefitted from both rising interest rates and record-high equities. Our Average Plan funded status ended the year up 14%. Plans with higher allocations to growth assets saw even greater gains, and the funded status of our Young Plan increased by 17%. While plans that embraced LDI did not participate as much in the upside, they still saw significant improvement. Our End Stage Plan funded status was up 12% and experienced less overall funded status volatility. Many of our clients sought to protect their funded status gains by increasing allocations to LDI assets. We dynamically adjusted LDI strategies in light of these changes, and we partnered with several clients to successfully partially or fully terminate their plans.

In 2021, it was widely predicted that market uncertainty would continue, and we anticipate this volatility lingering in 2022. Can risk assets continue to break records? When will interest rates ”normalize”? The Fed is tapering asset purchases and preparing the market for rate hikes, but it may need to pivot as more economic data is released. Market sentiment could also be challenged based on COVID cases. With this, we continue to believe pension plans should take an active approach with their LDI strategy. Clear plan objectives allow LDI managers to quickly take advantage of changing market dynamics, while also maintaining duration exposure and target hedge ratios.

Technical Factors

- Corporate pension plans transferred as much as 10% of their assets into bonds in 2021 amidst steadily improving funded statuses, and this de-risking trend may continue into 2022.
- Demand for US Treasury STRIPS in the long-end increased sharply, with $41 billion of new supply through November versus a $19 billion decline in 2020.
- Foreign buying is expected to remain strong against a backdrop of negative global yields.

Gross IG supply in 2022 is expected to be in-line with 2021, with net issuance falling ~15%; conditions supporting demand likely remain.

Regulatory Environment

- Pension funding relief was extended under the American Rescue Plan Act (ARPA) for single-employer pensions. With the strong gains in funded status during 2021, ARPA likely benefits fewer sponsors. We also expect many sponsors to remain committed to contributions to progress on LDI journeys.
- ARPA also provided Special Financial Assistance for qualifying distressed multiemployer plans. Clarity on whether proceeds can be invested in assets besides investment-grade credit is expected in January 2022.

Legal changes, including the Department of Labor’s proposal allowing use of ESG factors, will influence asset allocations of retirement plans.

Fundamental Factors

- Elevated inflation levels are projected to gradually subside, although this may be delayed by ongoing supply chain pressures and a COVID resurgence.
- The Federal Reserve will remain accommodative, but its asset purchase taper should end in 1Q, and three rate hikes are expected by year-end.
- The US economy likely stays healthy but tightening monetary policy and diminished chances of further fiscal stimulus may weigh on growth prospects.
- Corporate fundamentals may see continued improvement, although M&A-related debt may increase on the heels of elevated activity in 2021.

Leverage may fall on strong earnings, but the trend of debt reduction could reverse on higher capex and shareholder friendly activities.

Portfolio Positioning For 2021

- Long corporate spreads closed tighter year-over-year, despite widening in the second half of the year.
    - We incrementally reduced risk as spreads tightened by trimming lower-quality issuers, outperformers and large idiosyncratic exposures.
    - Spread widening and heavy long issuance allowed us to reposition into favored issuers before ultimately increasing dry powder into year-end.
- We remain underweight credit given relatively tight spread levels and are taking a measured approach to adding risk in select issuers and securitized bonds.

With long corporate spreads at historically tight levels, active management and bottom-up security selection is prudent.

Market unpredictability and heightened interest rate volatility is expected in 2022. 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: Milliman, FTSE Russell (formerly Citigroup), Bloomberg, JPMorgan, Treasury Direct and Pensions & Investments. All data in the above commentary is as of 12/31/21. 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. This report is for informational purposes only and is not intended to provide specific advice, recommendations for, or projected returns of 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.

IR+M Funded Status Monitor Assumptions:

Detailed methodology and assumptions for the IR+M Funded Status Monitor can be found at:
http://www.incomeresearch.com/wp-content/uploads/2021/01/IRM-Funded-Status-Monitor-2021.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 Equity	12%	27%	38%
International Equity	3%	17%	22%
US REITS	0%	2%	5%
Private Equity	0%	4%	5%
Growth Assets Allocation	15%	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	45%	10%	5%
Fixed Income Allocation	85%	50%	30%