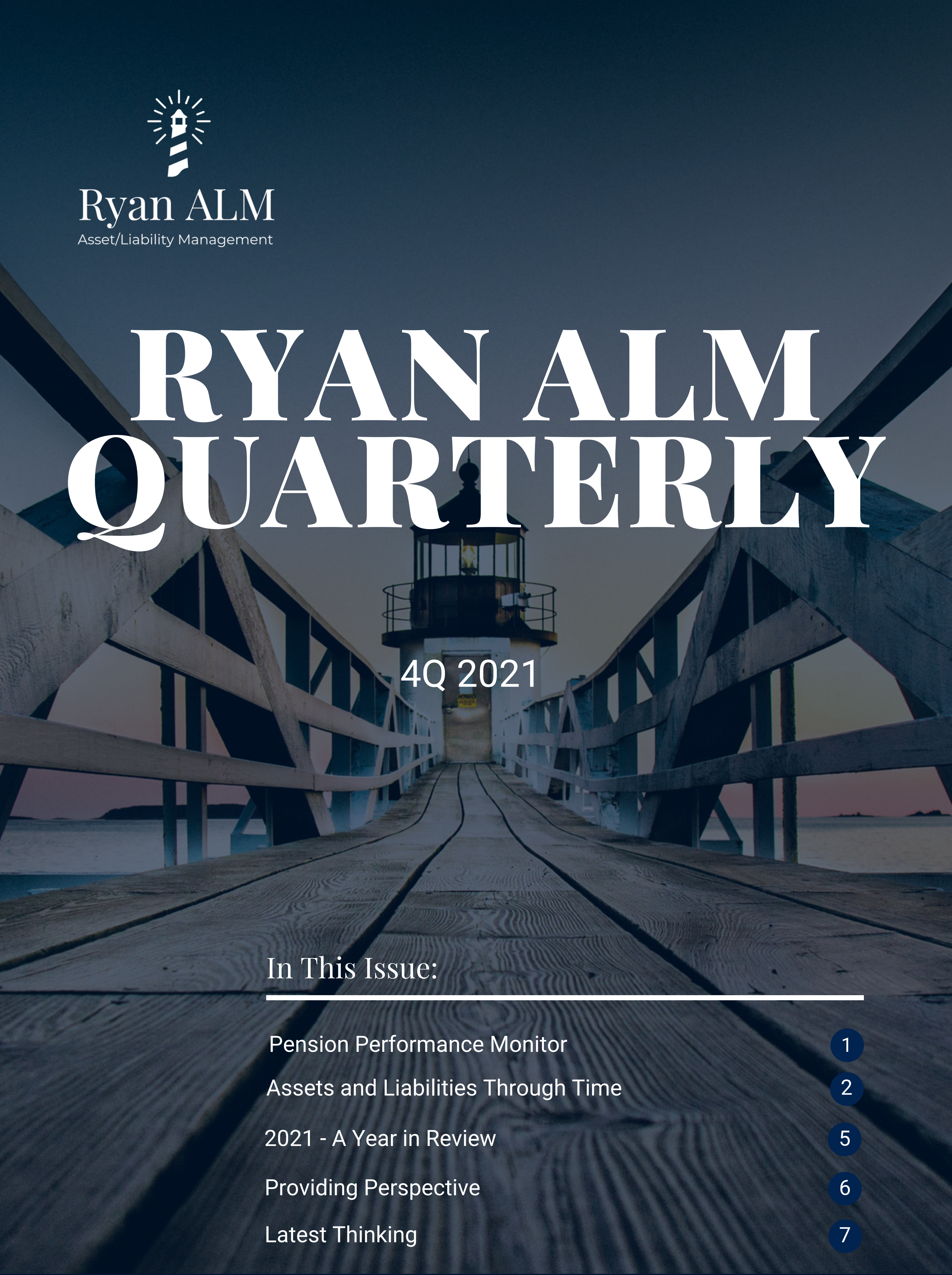


Ryan ALM
Asset/Liability Management

RYAN ALM QUARTERLY

4Q 2021

In This Issue:

Pension Performance Monitor

Pension Liabilities	2021 (%)
Market (Treasury STRIPS)	-4.2
ASC 715 (FAS 158)	-2.9
PPA (MAP 21 = 3 Segments)	5.5
PPA (Spot Rates)	0.4
GASB /ASOP (7.50% ROA)	7.5

Pension Assets	
Cash (Ryan Cash Index)	0.1
Bloomberg Barclay Aggregate	-1.5
S&P 500	28.7
MSCI EAFE International	11.9
Asset Allocation Model[1]	17.4

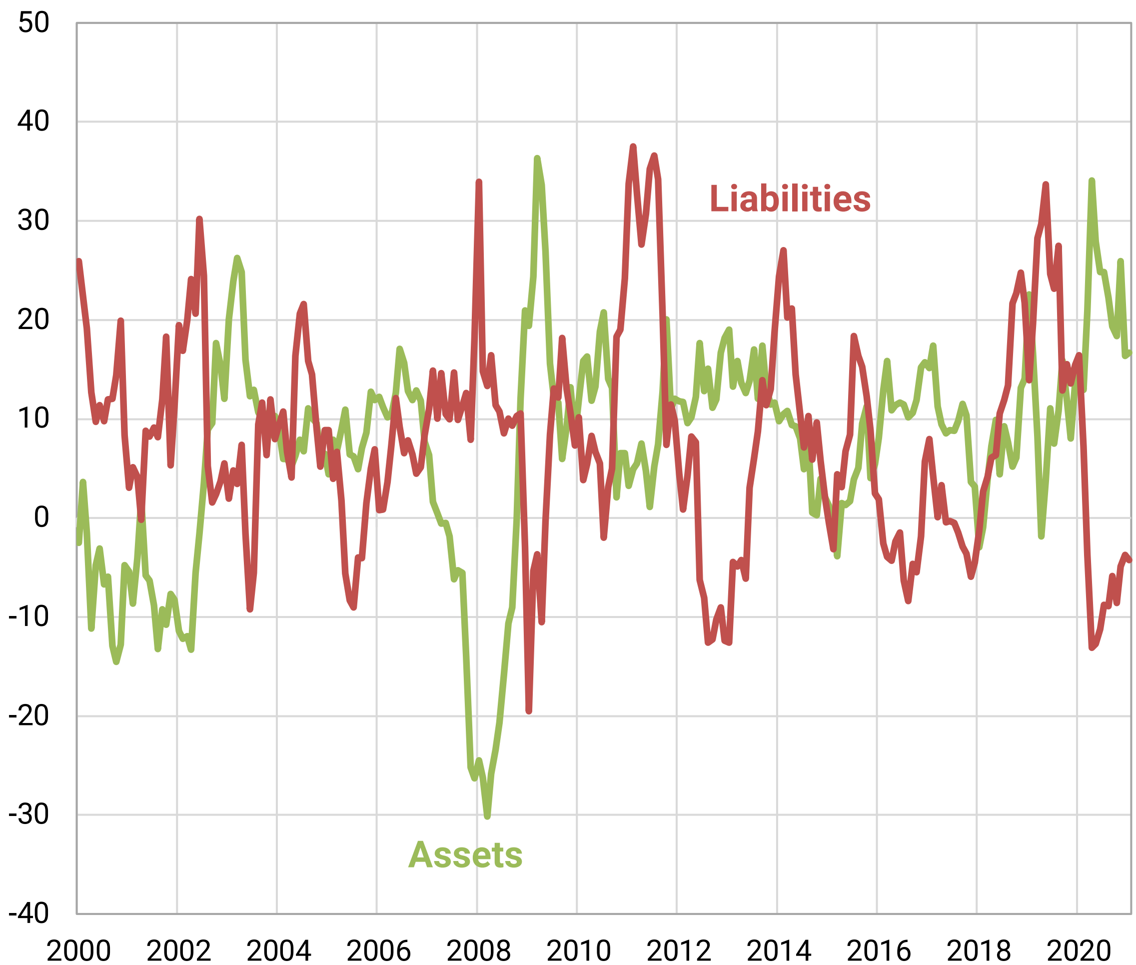
Pension Assets Minus Liabilities	
Market (Treasury STRIPS)	21.6
ASC 715 (FAS 158)	20.3
PPA (MAP 21 = 3 Segments)	11.9
PPA (Spot Rates)	17.0
GASB/ASOP (7.50% ROA)	9.9

Based on the weights of the Ryan ALM Asset Allocation Model[1], the difference in pension asset versus liability growth for 2021 is dramatically improved from that which we witnessed in 2020 and for many years before. Corporate, Public, and Multiemployer plans showed significant outperformance versus their liability benchmarks. Rising interest rates had a positive impact on liabilities (discount rates), while assets returns were strongly positive for equity markets leading to improved funded status/funded ratios for most pension plans during this period.

1. Model weights are: 5% Ryan Cash, 30% Bloomberg Barclay Aggregate, 60% S&P 500, and 5% MSCI EAFE International

Assets and Liabilities Through Time

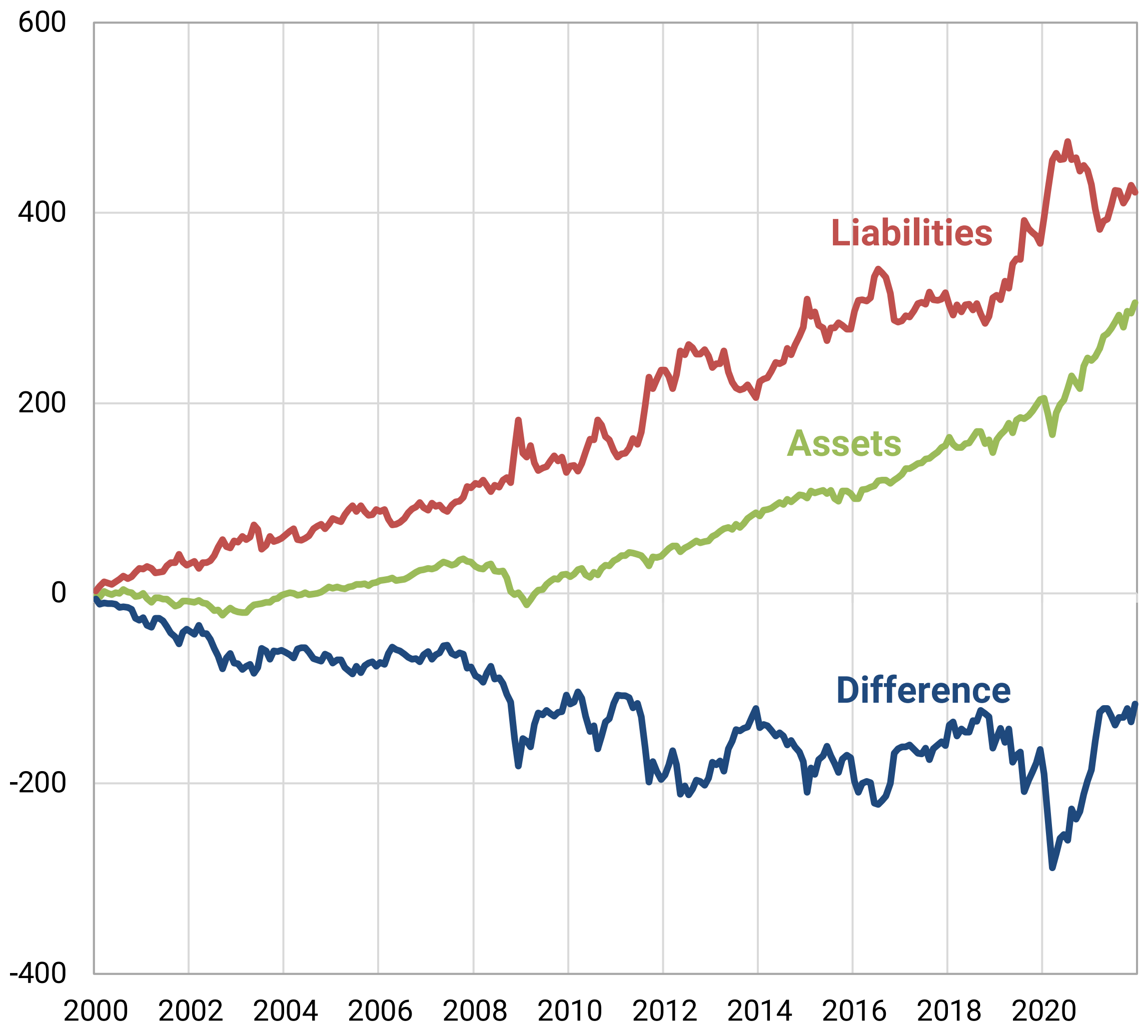
Rolling 12-month asset versus liability growth



Source: Ryan ALM, Inc.

The bull market rally for equities that lasted more than 13 years has helped to close the gap between assets and liabilities. While equities continued to rally, US fixed income (and plan liabilities) were coming under pressure as the longest bull-market run in history, which began in 1982, began to reverse. Failure to manage plan assets relative to plan liabilities lead to significant volatility in both contribution costs and the funded ratio. Given the improved funding that we've witnessed, it would be imprudent not to de-risk pension systems at this time.

Cumulative returns of assets versus liabilities



Source: Ryan ALM, Inc.

Most pension funds enjoyed a funded ratio surplus in 1999, but pension asset growth has underperformed liability growth (based on the Ryan ALM Treasury STRIPS discount rate) fairly consistently for much of the past two decades. The current level of underperformance is -128.6% on a compound index basis starting at 100 on 12/31/99. Starting at a funded ratio of 100 on 12/31/99, the estimated funded ratio today would be **77.8%, but that is improved from last quarter's 74%.** Plan sponsors and their advisors should pay greater attention on the plan's specific liabilities as an important strategy to reduce the volatility of the funded status and contribution expenses

Cumulative returns of assets versus liabilities (%)

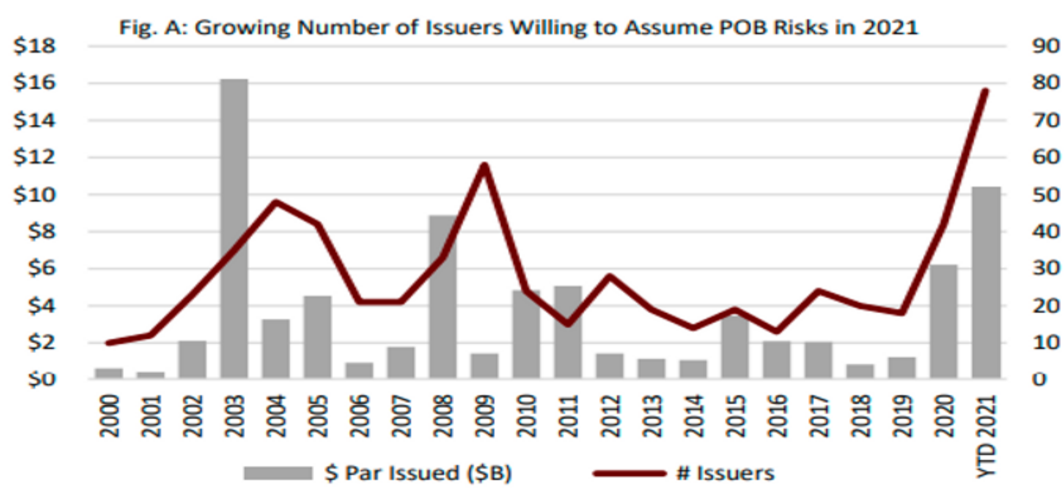
	Assets	Liabilities	Difference	Cumulative Difference	Funded Ratio
2000	-2.5	26.0	-28.5	-28.5	77.4
2001	-5.4	3.1	-8.5	-37.6	71.0
2002	-11.4	19.5	-30.9	-73.4	52.7
2003	20.0	2.0	18.1	-60.1	62.0
2004	8.9	9.4	-0.4	-66.1	61.8
2005	4.4	8.9	-4.4	-76.8	59.2
2006	12.3	0.8	11.4	-64.6	66.0
2007	6.4	11.0	-4.6	-77.5	63.2
2008	-24.5	33.9	-58.4	-181.6	35.7
2009	15.7	-19.5	35.3	-106.9	52.9
2010	11.9	10.1	1.8	-115.7	53.8
2011	3.3	33.8	-30.5	-195.7	41.5
2012	11.8	4.5	7.3	-194.3	44.4
2013	19.0	-12.6	31.6	-120.7	60.5
2014	9.7	24.4	-14.6	-177.1	53.4
2015	1.2	-0.5	1.7	-172.8	54.3
2016	8.1	1.9	6.2	-163.4	57.6
2017	15.2	7.9	7.2	-160.3	60.9
2018	-3.0	-1.3	-1.7	-162.7	60.4
2019	22.8	13.9	8.9	-163.9	65.0
2020	14.4	16.5	-2.1	-197.1	63.8
2021	17.4	-4.2	21.6	-116.1	77.8

Source: Ryan ALM, Inc.

2021 – A Year in Review

	2020	2021
U.S. GDP	$20.9 T	
US Debt	$27.8 T	$29.6 T
CPI - U	1.23	6.81
Unemployment Rate	8.3	3.9
30-Year Treasury Yield	1.66	1.90
10-Year Treasury Yield	0.93	1.52
2-Year Treasury Yield	0.11	0.73
3 Mo. T-Bills Yield	0.90	0.60
S&P 500	3,793.75	4,796.56
Nasdaq	12,698.45	15,832.80
R2000	10,122.27	11,638.77
Gold	1,187.60	1,794.25
Oil	$48.52	$75.21
Existing Single Family Sales	5.64 M	6.12 M

Growing Number of Issuers Willing to Assume POB Risks in 2021



Source: MarketWatch

Providing Perspective

Credit Ratings Migration Downward

Most participants in the US pension industry know that the credit rating downgrade trend has been occurring for quite some time, but they may not necessarily appreciate the magnitude. The US bond market has shifted heavily toward BBB. Read Here

Massive shift to Risk Assets – Are DB Plans Better Off?

As the chart below depicts, there has been a massive shift in the asset allocation of DB plans since the mid-50s from mostly fixed income allocations to significant exposure to risk assets. I suspect that most of the motivation has been driven by the plan sponsors desire/need to achieve a target return or hurdle rate (ROA). Read Here

Leverage – A Double-edged Sword

There have been many investment strategies over the years that have incorporated some aspect of leverage, but it is rare to see a public pension system decide to use leverage as an overlay on its plan's asset allocation. The CalPERS Board of Directors recently adopted a new policy in a 7-4 vote permitting the use of leverage at 5% of the plan's total assets. Read Here

This is No Time to be Greedy

The WSJ's Heather Gillers has published an article today highlighting the potential risk of a liquidity crunch due to asset allocation decisions that have significantly reduced both fixed income and cash, as more aggressive exposure to alternatives – private equity and debt, real estate, infrastructure, etc. – are pursued. Read Here

It's Okay to Peek!

Private pension plans operate under different accounting standards than those in the public sector (FASB versus GASB). As a consequence, private plans are "forced" to use market discount rates (ASC 715 = AA corporate yield curve), as opposed to a static discount rate (the ROA) permitted under GASB. Why is this important? Read Here

Latest Thinking

Ryan ALM is engaged in a number of exciting conversations with major public pension systems regarding the appropriateness of using a Pension Obligation Bond (POB) to help close the funding gap, improve liquidity to meet near-term benefit payments and expenses, while also reducing the stress on state and municipal budgets that have been impacted by the disruptive Covid-19 virus. The use of POBs can dramatically improve the plan's economics longer-term, while significantly reducing the volatility of the funded status and contribution expenses. The success of this strategy is predicated on how the bond's proceeds are invested. We believe that a successful outcome begins by using the proceeds to defease the current Retired Lives Liability as far out into the future as the allocation will fund.

We are thrilled that the American Rescue Plan Act (ARPA) was passed as part of the $1.9 trillion stimulus package. This legislation has some of the elements of the Butch Lewis Act. Importantly, any Special Financial Assistance (SFA) received must be kept separate and managed conservatively to ensure that the funds necessary to pay the promised benefits (through 2051) are actually available. The PBGC has recently approved three of the plans that filed for the SFA. Local 138 Pension Trust Fund, Baldwin, NY, has received their funding ($112 million). We are still waiting on the PBGC to provide us with the "Final, Final Rules" related to the implementation of this legislation.

We have recently been retained by a corporate pension plan sponsor to use our cash flow matching skills to do a vertical cut of the plan's liabilities. We have historically used our cash flow matching capabilities to fund and match liabilities from the most current month as far out as the allocation permits. This provides 100% of the cash flow necessary to meet benefits and expenses. In this latest implementation, we are being asked to manage both cash flow and duration (about 12% of projected liabilities over 80 years). By using this approach, we can give our client an incredible 30%+ funding cost savings on the plan's liabilities.

Lastly, we are excited to announce that we were just retained by a large East coast public plan to manage a cash flow matching portfolio. It is wonderful to see public pension systems putting greater focus on their specific liabilities.

Ryan ALM's mission is to solve liability driven problems through low cost, low risk solutions.

About Ryan ALM, Inc.

Ryan ALM was founded by Ronald J. Ryan, CFA on July 12, 2004 as an Asset/Liability Management firm. The firm builds a turnkey system of proprietary synergistic products designed to measure liabilities as a Custom Liability Index (CLI) and manage assets to the CLI as Liability Beta Portfolios.

Ryan ALM is unique in having its own proprietary Index company named ALM Research Solutions, LLC. This company builds both custom and generic bond indexes. Such indexes range from Custom Liability Indexes to ETF Indexes.

Our Liability Beta Portfolio™ is our proprietary cost optimization model that "cash flow matches" clients projected liability benefit payment schedules at the least cost using investment grade bonds. It is back-tested since 2009 showing a consistent cost savings of 8% to 15%. Our LBP best represents the core portfolio of a pension plan.

FASB requires corporations and nonprofit organizations to price their liabilities at certain discount rates. Ryan ALM provides these discount rates in conformity to ASC 842: Lease Accounting and ASC 715: Pensions. For more info: Read here

Our team has been recognized for our expertise and results including Ron Ryan having won the William F. Sharpe Index Lifetime Achievement Award.

Ryan ALM
Asset/Liability Management

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