Ronald Ryan, CEO, CFA

William F. Sharpe
Lifetime Achievement Award

Money Management Letter
Lifetime Achievement Award

Capital Link
Most Innovative ETF Award

IMN
ETF of the Year Award

Bernstein Fabozzi/Jacobs Levy
Research Paper of the Year Award

The Ryan ALM Pension Letter™

December 31, 2018

Index	Returns YTD 2018	Weights
Pension Liabilities:		
Market (Tsy STRIPS)	-1.26%	100 %
ASC 715 (FAS 158)	-4.17	
PPA (MAP 21 = 3 Segments)	8.99	
PPA (Spot Rates)	-6.51	
GASB /ASOP (7.50% ROA)	7.50	
Pension Assets:		
Ryan Cash	2.05 %	5 %
Bloomberg Barclay Aggregate	0.01	30
S&P 500	-4.39	60
MSCI EAFE Int'l	-13.32	5
Asset Allocation Model	-2.96 %	100 %
Pension Assets – Liabilities:		
Market	-1.70	
ASC 715 (FAS 158)	1.21	
PPA (MAP 21 = 3 Segments)	-11.95	
PPA (Spot Rates)	3.55	
GASB/ASOP (7.50% ROA)	-10.46	

Using the Asset Allocation return above, the difference in pension asset growth vs. liabilities in 2018 was: **-1.70%** (market valuation STRIPS), **1.21%** (ASC 715), **-11.95%** (PPA 3-segment rates), **3.55%** (PPA-Spot Rates) and **-10.46%** (GASB/ ASOP). Such valuations show the significant difference in not using *market* valuations. Most pension funds enjoyed a funded ratio surplus in 1999 but **pension asset growth has *underperformed* liability growth since by an estimated -162.68%** on a compounded index basis starting at 100 on 12/31/99!

	Total Returns									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Assets	-2.50	-5.40	-11.41	20.04	8.92	4.43	12.25	6.82	-24.47	19.43
Liabilities	25.96	3.08	19.47	1.96	9.35	8.87	0.81	11.76	33.93	-19.52
Difference:										
Annual	-28.46	-8.48	-30.89	18.08	-0.43	-4.44	11.44	-4.94	-58.40	38.95
Cumulative		-37.60	-73.40	-60.08	-66.13	-76.75	-64.60	-77.50	-181.53	-106.9
	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Assets	11.89	3.27	11.79	19.04	9.74	1.22	8.12	15.15	-2.96	
Liabilities	10.13	33.77	4.46	-12.59	24.35	-0.49	1.92	7.94	-1.26	
Difference:										
Annual	1.76	-30.50	7.33	31.63	- 14.61	1.71	6.20	7.21	-1.70	
Cumulative	-115.67	-195.73	-194.30	-120.74	-177.14	-172.78	-163.36	-160.34	-162.68	

2018 Good Year or Bad Year for Pensions?

Well it all depends on the discount rate used for liabilities. In this jabberwocky accounting and actuarial world of confusion, 2019 was a:

Good year for assets vs ASC 715 (FAS 158) = **1.21%** value added
Good year for assets vs PPA spot rates = **3.55%** value added

Bad year for assets vs. Treasury STRIPS = **-1.70%** value lost
Bad year for assets vs. PPA 3-segments = **-11.95%** value lost

Credit Fears Overblown

A December 10 research report by Credit Suisse suggests that recent credit fears resulting in widening credit spreads are overblown. They believe that the current consensus of rapidly increasing corporate debt that will lead to an earnings recession and continued rising rates is without merit and fact. They present data that refutes these assertions:

Rollover Risk: Balance sheets are flush with cash and the use of short-term debt is near historic lows, mitigating the risk from rising rates.

Debt Burden: Net Debt to Equity and Net Debt to EBITDA are elevated for the median company, but are below historical averages in aggregate.

Interest Coverage: Historically low rates have resulted in attractive ratios.

Social Insecurity?

The Penn Wharton Budget Model (PWBM) projects that Social Security's (SS) financial condition is substantially worse than official Social Security Trustees estimates because they don't factor in how the future growth of debt reduces the future growth of the payroll tax base. PWBM estimates that the SS trust fund is depleted by 2032 based on cash flow shortfall estimated to be 36% larger than the SS Trustees estimate. If SS shortfalls continue to contribute to the federal government's unified deficits PWBM projects that the federal debt-to-GDP ratio will exceed 200% by 2048… a path that is not sustainable.

Class Action Pension Lawsuit vs. American Airlines (AA)

Bloomberg news reported that a class action lawsuit filed Dec. 11 in a Texas federal court, accuses AA of calculating spousal pension benefits by using old mortality tables that haven't been updated for more than 30 years. Met Life was accused of similar violations filed earlier in December. The lawsuit claims that AA knew its mortality tables were outdated but used them anyway to save money. The lawsuit includes of people who receive benefits.

Credit Spreads Widened Significantly in 2018

Yield spreads on the Barclays U.S. Corporate Aggregate widened significantly in the fourth quarter from 110 bps to 154 bps vs. the Treasury yield curve mainly due to the spread widening on BBB bonds. According to Credit Suisse, this episode of credit fears is overblown. In their Dec. 10 report, Credit Suisse explained "the consensus narrative holds that companies have gorged themselves on low interest rates, resulting in exposure to an earnings recession or rapidly rising rates. The data refutes this assertion in the following ways:

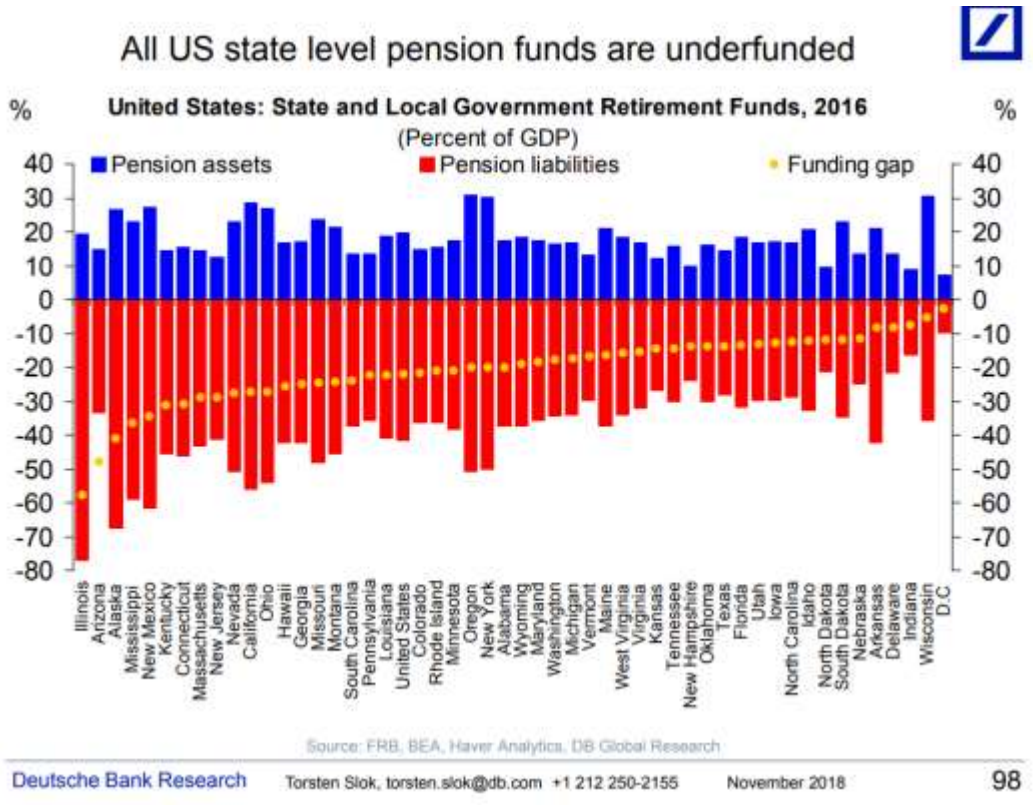
Rollover Risk: Balance sheets are flush with cash and the use of short-term debt is near historic lows, mitigating the risk from rising rates.

Debt Burden: Net Debt to Equity and Net Debt to EBITDA are elevated for the median company, but are below historical averages in aggregate.

Interest Coverage: Historically low rates have resulted in attractive coverage ratios.

All U.S. States Pension Funds are Underfunded

According to a Deutsche Bank research report released in November, all state pension funds were underfunded with Illinois being the worst followed by Arizona, Alaska, Mississippi and New Mexico. The best were Wisconsin, Indiana, Delaware, Arkansas and Nebraska.



Public

Pension Discount Rate is Deeply Flawed

According to Richard Keevey, former budget director and comptroller for New Jersey, feels that the ROA (Return On Asset assumption) used as the discount rate for pension liabilities is a deeply flawed approach. It violates finance theory, which posits that a proper discount rate should reflect the riskiness of the liability and not the riskiness of the asset. It also contrasts significantly with how private firms and other countries value pensions. He continues to say that because pensions are generally protected by law and are likely to be paid even if poorly funded, the discount rate should reflect bond-market rates for low-risk assets, such as Treasury Bills. All state and local governments should be required to use a risk-free discount rate to determine liabilities. We applaud Mr. Keevey keen insights and add that the proper discount rate(s) should be the risk-free rate that settles liabilities. It must be a rate(s) that you can buy to defease liabilities. If you cannot buy the discount rate it is of no use or a financial lie. By definition, the **only appropriate discount rate that settles liabilities is the U.S. Treasury STRIPS yield curve.**

Problem: ROA and Contributions Calculation Confusion

Actuarial practices (ASOP 27) use the ROA to calculate projected contributions. In essence, the projected contributions + the growth of current assets at the ROA should fully fund the pension plan over an amortization period (30-years). The problem becomes when there is a significant funded status deficit as most plans have. If you grow the current assets market value by the annual ROA and then grow the actuarial valuation of liabilities (based on the ROA as the discount rate) by the same ROA growth rate… the funded status deficit also grows at the ROA. The difference in the dollar growth of assets vs. liabilities results in a higher contribution to fund this new deficit. The example below shows $60 of assets and $100 of liabilities both

growing at the ROA of 8%. This creates a funded ratio of 60% and a funded status of ($40). In just five years, the dollar deficit grows 46.9%... and so does projected contributions? This **ASOP contribution procedure has no input for assets to ever outgrow liabilities**! Therein lies the problem.

Assets = $60
Liabilities = $100
Funded Ratio = 60%
Funded Status = ($40)
ROA = 8% Growth rate for Assets + Liabilities
Deficit = Can *only* be reduced thru Contributions

	Growth Rate = 8% ROA				Funded	
	Assets	$ Growth	Liabilities	$ Growth	Ratio	Status
Start	$60.00	$ 4.80	$100.00	$ 8.00	60%	$ 40.00
Year 1	64.80	5.18	108.00	8.64	60	43.20
Year 2	69.98	5.60	116.64	9.33	60	46.66
Year 3	75.58	6.05	125.97	10.07	60	50.39
Year 4	81.63	6.53	136.05	10.88	60	54.42
Year 5	88.16	7.05	146.93	11.72	60	58.77

At same growth rate (ROA) Funded Ratio stable… but deficit increases 46.9% !

Solution: Assets Outgrow Liabilities

If assets and liabilities were marked to market (economic books), each pension plan would understand the true economics of their plan. GASB accounting rules distort economic reality by allowing a discount rate based on the ROA. Pension liabilities are a term structure of benefit payments. No single discount rate could ever price liabilities accurately. The Society of Actuaries (SOA) recommended that pensions create a set of ***economic books*** to help assets understand and manage to these liabilities. If interest rates stay the same or rise as a secular trend over the next five years, liability growth would be very low to even negative growth.

Solution: If the market value of assets would outgrow the market value of liabilities… the funded status improves. If interest rates trend upward (+60 bps per year), liability growth on a market value basis would be around **-2.56%** per year (based on a 12-year duration for liabilities). Note: the market value of liabilities is priced at the risk-free Treasury discount rate (3% in example below). If assets could grow at just 5% per year on average, assets would outgrow liability growth (liability Alpha) by about 7.50% per year. In just five years, a 60% funded status grows to 88% with just a 5% asset growth rate… well below the ROA of 8.0%. A 70% funded ratio would grow to 108%... without help from contributions. The ROA, an absolute return target, is not the proper pension focus. Relative returns… asset growth vs. liability growth is the true pension growth target. This requires a Custom Liability Index (CLI) to calculate liability growth on a frequent and accurate market value basis.

Moral: you want assets to outgrow liabilities not the ROA!

Assumptions: Interest Rates go up 60 bps per year
30-year Treasury = 3.00% >> 6.00%
Growth Rate = (2.56%) Annual
Liabilities duration = 12 years

	----- Annual Growth Rate -----			
Assets	**5.0%**	**6.0%**	**7.0%**	**8.0%**
Liabilities	**- 2.6%**	**-2.6%**	**- 2.6%**	**- 2.6%**
Alpha (Annual)	**7.6%**	**8.6%**	**9.6%**	**10.6%**
Funded Ratio 60%	**87.8%**	**92.1%**	**96.5%**	**101.1%**

Duration Matching = Hedging Strategy… NOT De-Risking Strategy

Duration matching is designed to match the growth rate of liabilities. Since the duration of most liabilities are not provided by the actuary, most duration matching strategies use *generic* bond indexes as a proxy for liabilities. This is not an accurate or effective way to match liabilities. Liabilities are like snowflakes… you will never find two alike. Only through a Custom Liability Index (CLI) could you ever know the duration profile of liabilities which is quite interest rate sensitive. Since coupon bonds durations peak out at around 16 years, any liabilities longer than 16 years must be duration matched with high cost Treasury STRIPS. Moreover, buying a 5-year duration bond to match a 5-year duration liability, a 10-year duration bond to match a 10-year duration liability, etc., is not cost effective. Bond math is clear that the longer the maturity the lower the cost (purchase price) given the same yield. Moreover, the yield curve is usually positive sloping such that the longer bonds have higher yields which results in more cost savings. Please read my research paper ***"How To De-Risk A Pension"*** located in the research section of our web site www.RyanALM.com. **Futures, derivatives and interest rate swaps are certainly not de-risking strategies** since there are no funds to match and pay the liability benefit payment schedule. The objective of a pension should not be return oriented (i.e. the ROA). The 1990s should be a constant reminder of what happens when your focus is on a target return instead of the funded ratio and funded status. Had pension's ***cash flow matched*** liabilities in the 1990s when they had surpluses, there would be no pension crisis today!

Public Pension Watch List

Illinois Pension Deficit Increases by 8%

The state of Illinois and many of their municipalities are drowning in unsustainable pension costs. If state pensions were fully funded Illinois would spend about $3.6 billion per year instead of $10 billion in pension obligations. This difference is equal to 30% of the revenue from the Illinois individual income tax. The Illinois Supreme Court has said emphatically in unanimous decisions that the IL state constitution guarantees pension obligations and cannot be cut.

Vermont's Underfunded Pension Battle

Thanks to steady deficits from the early 2000s Vermont faces a mountain of pension obligations. The cause was mainly a lack of proper contributions to fund the plan. The issue became contentious at the end of the 2018 legislative session during a fight over $34 million in unanticipated revenue. Gov. Phil Scott wanted to hold property taxes at last year's levels while Democrats wanted to contribute more to the state pension funds. A last-minute compromise split the money between the two issues. According to the administration there may be another $30 million coming in 2019 that was not projected.

Ryan ALM Pension Scoreboard

The graphs below show asset vs. liability rolling 12 month and cumulative growth since 1999. Ryan ALM Benchmark Liability Index = **310.640%** growth while pension assets = **147.9650%** growth for a difference of **–162.675%** **suggesting any pension Funded Ratio below 165.60% in 1999 has a deficit today on a *market weighted* basis.**

The Ryan ALM Pension Funded Ratio = 60.39% (starting at 100.00 on 12/31/99)

The World of Ryan Indexes

Custom Liability Indexes … (Patent Pending)

The best way to price (discount rate) and understand the interest rate sensitivity of liabilities is the **Ryan Treasury STRIPS yield curve indexes** as a **LIABILITY INDEX BENCHMARK.** In March 1985, when STRIPS were born, the Ryan Financial Strategy Group (RFSG) created the **1st STRIPS Index.** Based upon these Ryan STRIPS indexes we created the **1st Liability Index** as the proper Liability Benchmark for liability driven objectives. The Ryan team has developed hundreds of Custom Liability Indexes (CLI). Similar to snowflakes, no two pension funds are alike with unique benefit payment schedules due to different labor forces, mortality and plan amendments. Until a CLI is installed as the benchmark, the asset side is in jeopardy of managing vs. the wrong objective (market indexes). **If you outperform generic market indexes, but lose to the CLI … the plan loses!**

Ryan Treasury Yield Curve Indexes (*Constant Maturity / Duration* series)

In March 1983, the Ryan Financial Strategy Group (RFSG) created the **1st Daily bond Indexes (the Ryan Index)** as a *Treasury Yield Curve constant maturity* index series for each ***auction*** maturity series (from Bills to Bonds). In March 1985, the day after Treasury STRIPS were born RFSG created the **1st Treasury STRIPS indexes** as a *Treasury Yield Curve constant duration* series of 1-30 year maturities (30 distinct constant duration indexes + composite)**.** The best way to measure interest rate risk is to use the Ryan Treasury Yield Curve Index series**.**

RAFI Fundamental Weighted High Yield Index Series + RAFI Investment Grade Index Series

(PowerShares ETFs = PHB + PFIG)

In January 2010, Research Affiliates announced the creation of a series of bond indexes based on the RAFI fundamental weights. These include a short, intermediate long and composite Investment grade series and a short and intermediate High Yield series. Ryan ALM was honored and chosen as the index designer and calculation agent. In August 2010 the RAFI 1-10 year High Yield Index was launched as a **PowerShares ETF (PHB)**. There is also a Canadian hedged version **(PFH_CN)**. In September 2011 the RAFI 1-10 year Investment Grade index was launched as a PowerShares ETF **(PFIG)**. For more info on these ETFs and index, please go to:

www.Powershares.com (click on fixed income portfolios)

Ryan/Nasdaq 1-30 year Treasury Maturity Ladder (PowerShares ETF = PLW)

On October 11, 2007 PowerShares launched a fixed income ETF **(PLW)** based upon the Ryan/Nasdaq 1-30 year Treasury Maturity Ladder index. This index is an equal-weighted diversified portfolio of 30 distinct maturities. For more info on this ETF and index, please go to:

www.Powershares.com (click on fixed income portfolios)

Ryan ASC 715 (formerly FAS 158) Discount Rates

In 2006, Ryan ALM designed the FAS 158 yield curve index that prices any private pension liabilities in conformity to FAS 158 standards. We provide four distinct yield curves of AA corporate zero-coupon bonds in conformity to ASC 715.

Given the Wrong Index … you will get the Wrong Risk/Reward!

To view all Ryan Indexes data go to: www.RyanIndex.com

Pension Solutions:
Custom Liability Index and Liability Beta Portfolio™

Ryan ALM, Inc. - The Solutions Company
www.ryanalm.com

(Patent Pending)

Ryan ALM offers a turnkey system of CLI + Liability Beta portfolio as a pension solution:

Custom Liability Index (Patent pending) - The first step in prudent pension management is to measure and monitor the liability objective frequently and accurately. Until liabilities are packaged as a **Custom Liability Index (CLI)** the asset side is in jeopardy of managing to the wrong objectives (i.e. market indexes). Only a CLI best represents the unique liability schedule of pensions. Just like snowflakes, no two pension liability schedules are alike due to different labor forces, salaries, mortality and plan amendments. How could a *generic market index* ever properly represent such a diverse array of pension liabilities? Once the CLI is installed the pension will now know the true **economic Funded Ratio** which should dictate the appropriate Asset Allocation, Asset Management and Performance Measurement. Ryan ALM is a leader in CLI as Ron Ryan was the inventor of the *first Liability Index* in 1991. In 2006, Ron won the *William F. Sharpe Index Lifetime Achievement Award*!

Liability Beta Portfolio (LBP) – The value added in bonds is small as every performance ranking study proves (1st quartile vs. median difference). **The best value in bonds is its cash flow to match and fund liabilities** as Dedication, Immunization and Defeasance have proven for decades. Since liabilities are dynamic calculations they need a CLI to monitor their risk/reward behavior. The *core* or Beta portfolio for a pension should be in high quality bonds that match and fund liabilities. A Beta portfolio is defined as the portfolio that matches the objective. If the true objective is liability driven then, by definition, the proper beta portfolio for any liability objective must be … a **Liability Index Fund or Liability Beta Portfolio**. This requires a Custom Liability Index in order to be executed.

The Ryan ALM Liability Beta portfolio system will invest only in high quality securities that match the CLI. This provides our clients with the ***lowest cost and lowest risk portfolio***. It is the lowest risk portfolio since it has:

No Interest Rate Risk (matches CLI)
No Liquidity Risk
No Credit Risk
No Event Risk
No Prepay Risk

The Ryan ALM Liability Beta portfolio is the lowest cost portfolio since we will always out yield liabilities by more than our very low fee thereby guarantying each client **No *Net* Fee**. Moreover, the Liability Beta portfolio is a cash flow matching liability portfolio that fully funds liabilities thereby reducing the cost and volatility of contributions.

Disclaimer

The material herewith is for informational purposes only, and does not contend to address the financial objectives, situation, or specific needs of any individual investor. Any information is for illustrative and educational purposes only and is not intended to serve as investment advice since the availability and effectiveness of any strategy is dependent upon your individual facts and circumstances. Results will vary, and no suggestion is made here about how any specific solution or strategy will perform in reality.