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The Ryan ALM Pension Letter™

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Index	Returns YTD 2017	Weights
Pension Liabilities:		
Market (Tsy STRIPS)	-2.97%	100 %
ASC 715 (FAS 158)	-4.92	
PPA (MAP 21 = 3 Segments)	1.75	
PPA (Spot Rates)	-2.56	
GASB /ASOP (7.50% ROA)	1.92	
Pension Assets:		
Ryan Cash	0.39 %	5 %
Bloomberg Barclay Aggregate	-1.47	30
S&P 500	-0.76	60
MSCI EAFE Int'l	-1.41	5
Asset Allocation Model	-0.88 %	100 %
Pension Assets – Liabilities:		
Market	2.09	
ASC 715 (FAS 158)	4.04	
PPA (MAP 21 = 3 Segments)	-2.63	
PPA (Spot Rates)	1.68	
GASB/ASOP (7.50% ROA)	-2.80	

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



Using the Asset Allocation return above, the difference in pension asset growth vs. liabilities in 2017 was: **2.09%** (market valuation STRIPS), **4.04%** (ASC 715), **-2.63%** (PPA 3 segment rates), **1.68%** (PPA-Spot Rates) and **-2.80%** (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 -150.23%** 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	-0.88		
Liabilities	10.13	33.77	4.46	-12.59	24.35	-0.49	1.92	7.94	-2.97		
Difference:											
Annual	1.76	-30.50	7.33	31.63	-14.61	1.71	6.20	7.21	2.09		
Cumulative	-115.67	-195.73	-194.30	-120.74	-177.14	-172.78	-163.36	-160.34	-150.23		

2018 Starts Off with All Negatives

The major assets classes started the year 2018 with negative returns but then so did liabilities. Based on pricing liabilities as Treasury STRIPS, liabilities grew at **-2.97%**. Based on pricing liabilities as AA corporates (ASC 715), liabilities grew at **-4.92%**. As a result, pension funded status should have improved by 2.09% or 4.04% as shown on our first page recap for the first quarter of 2018. Most pensions are still suffering from the asset allocation disaster (heavily skewed to equities) and equity corrections of 2000-02 and 2008

Actuarial Gain/Loss Amortization Cut Back by CalPERS

As reported by Pensions & Investments... the CalPERS board voted Feb. 14 to shorten the amortization period for actuarial gains and losses from 30 years to 20 years effective June 30, 2019. Reducing the amortization period for sources of unfunded liability is expected to increase average funding ratios and provide faster recovery of funded status in any market downturn. The downside of this shorter amortization period is that it could increase contributions of the participating cities in the CA fund. CalPERS was 68% funded as of June 30, 2017 based on using the 7.00% ROA as the discount rate. Can someone show me where I can buy 7% investment grade bonds... as a yield curve?

Corporations Increased Pension Contributions to Avoid PBGC Premium Hike in 2018

NEPC's annual survey of corporate defined benefit plans concluded that funded ratios have improved partly due to increased plan contributions. NEPC's survey shows that only 2% of private plans are less than 70% funded while 19% are less than 70% funded. More than 22% are overfunded (up from 9% last year). The PBGC variable premiums for underfunded plans was an obvious reason for such contribution increase. For 2017, the PBGC charged a variable rate of \$34 per \$1,000 in unfunded benefits plus a participant fee of \$69. In 2018, the variable rate rises to \$38 (11.76% increase) and the flat fee to \$74 (7.2% increase).

PBGC Paid \$5.6 billion to Retirees of Failed Plans in 2017

The Pension Benefit Guaranty Corporation (PBGC) reported that it paid 868,000 retirees more than \$5.6 billion in 2017 in failed single-employer plans. This amount has been stable for the last three fiscal years while the number of retirees receiving benefits has risen from 840,000 in 2015. Retirees in Florida, Ohio and Pennsylvania accounted for over 25% of all benefits paid. The PBGC predicts that the single-employer program will turn into a surplus over the next 10 years. The program's deficit shrank from \$20.6 billion in 2016 to \$10.9 billion in 2017.

Illegal Immigrants Pay Estimated \$13 billion per year in SS Taxes

Stephen Goss, chief actuary, of the Social Security Administration (SSA) estimates that seven million people are working illegally in America of which 3.1 million are using fake social security numbers. Goss suggests that these workers pay an annual contribution of \$13 billion to the Social Security Trust Fund but get only about \$1 billion back in benefits. The SSA estimates that unauthorized workers have now paid over \$100 billion into the SSA Trust Fund over the past decade.

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 grows by 8%. 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

	<u>Growth Rate = 8% ROA</u>				<u>Funded</u>	
	<u>Assets</u>	<u>\$ Growth</u>	<u>Liabilities</u>	<u>\$ Growth</u>	<u>Ratio</u>	<u>Status</u>
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 -----			
	5.0%	6.0%	7.0%	8.0%
Assets				
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%
	(without Contributions)			

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

New Jersey Pension Funded Ratio... Worst in America

According to S&P Global Ratings, the funded ratio for state of New Jersey employees pension is at 31%. The police and fire pension is much better at around 65%. On Monday, March 25, the New Jersey legislature passed a bill allowing police and firefighters to create a pension board that replaces the state Treasury Department's Division of Pensions & Benefits. This new board will be able to control their levels of contributions and benefits. This may allow the board to reinstate cost of living adjustments and to alter benefits.

Connecticut has \$36 billion Deficit in Unfunded OPEB Liabilities

According to a study by American Legislative Exchange Council, Connecticut's retirement healthcare fund has a deficit of \$36 billion. The other post-employment benefits (OPEB) trust fund is only 1% funded... an improvement since 2016! Until 2009, the OPEB trust fund was not funded at all. Then state employees started to pay a 3% of payroll contribution toward retiree healthcare. CT only pays 36% of the annually required contribution (ARC).

Minnesota Senate Approves Pension Reform Bill

The Minnesota state senate unanimously approved a pension overhaul bill that will be the largest pension reform in state history. The bill proposes mandatory contribution increases, reduced COLAs and a lower ROA (investment rate of return). Proponents of this bill suggest it would save the state \$6.1 billion over a 30-year period of which \$3.4 billion would be immediate savings. The ROA would be reduced from 8.00% to 7.50% except for state teachers which stays at 8.50%. The bill reduces or suspends the cost-of-living increases automatically applied to retiree pension benefits. All of the state pension plans have a contribution deficiency.

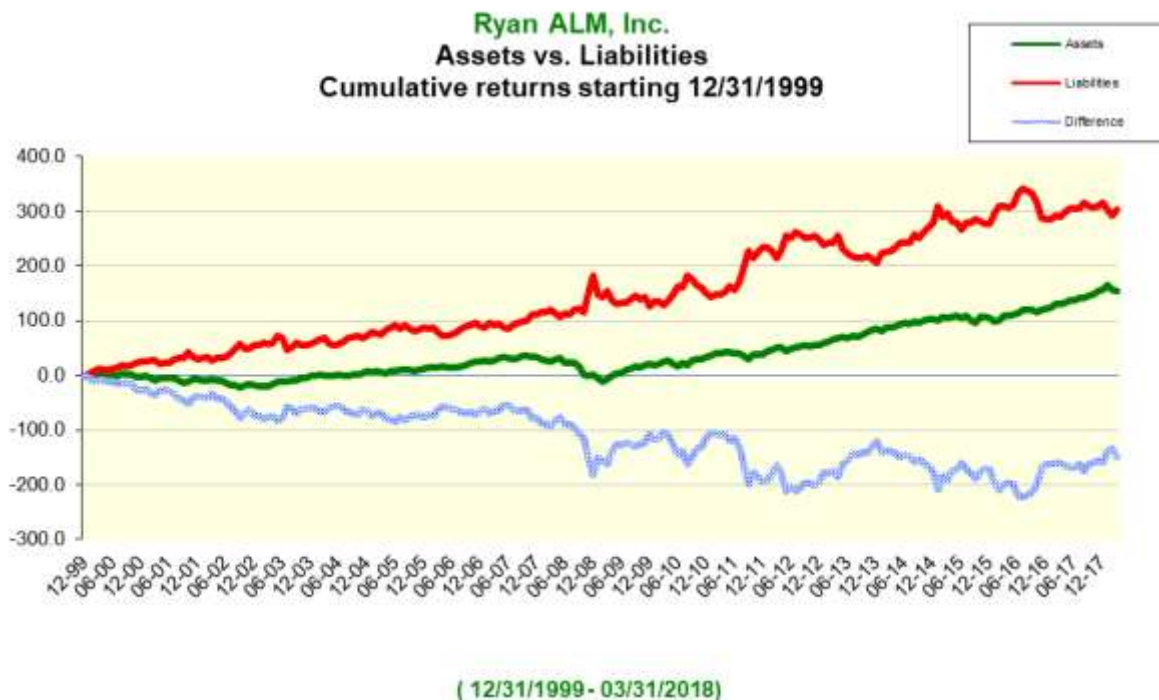
Kentucky State Legislature Approves Controversial Pension Reform Bill

Kentucky legislatures approved Senate Bill 151 in opposition to the Kentucky Education Association. Kentucky teachers opposed Senate Bill 1 which became attached inside Senate Bill 151 regarding sewerage services. A summary of the bill includes: no changes to COLA of 1.5%; new hires have to enter a cash balance plan; limits number of sick days applied to retirement.

Ryan ALM Pension Scoreboard

The graphs below show asset vs. liability rolling 12 month and cumulative growth since 1999. Ryan ALM Benchmark Liability Index = **303.50%** growth while pension assets = **153.27%** growth for a difference of **-150.23%** suggesting any pension **Funded Ratio below 159.32%** in 1999 has a deficit today on a *market weighted* basis.

The Ryan ALM Pension Funded Ratio = 62.77% (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

Ryan Index is a Registered Trademark of Ryan ALM, Inc.

In October 2005, Ron Ryan terminated his license agreement with Ryan Labs to distribute and calculate the Ryan Indexes and Ryan STRIPS Indexes. Ron Ryan and Ryan ALM have no affiliation with Ryan Labs. Any use of the formulas, methodologies and data of any of the Ryan Indexes without Ron Ryan's written permission is prohibited.

Pension Solutions:
Custom Liability Index and Liability Beta Portfolio™
(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.