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The Ryan ALM Pension Letter™

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Index	Returns YTD 2017	Weights
Pension Liabilities:		
Market (Tsy STRIPS)	1.40%	100 %
ASC 715 (FAS 158)	0.78	
PPA (MAP 21 = 3 Segments)	1.85	
PPA (Spot Rates)	0.55	
GASB /ASOP (7.50% ROA)	1.88	
Pension Assets:		
Ryan Cash	0.11 %	5 %
Bloomberg Barclay Aggregate	0.82	30
S&P 500	6.06	60
MSCI EAFE Int'l	7.39	5
Asset Allocation Model	4.24 %	100 %
Pension Assets – Liabilities:		
Market	2.84	
ASC 715 (FAS 158)	3.46	
PPA (MAP 21 = 3 Segments)	2.39	
PPA (Spot Rates)	3.69	
GASB/ASOP (7.50% ROA)	2.36	

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: **2.84%** (market valuation STRIPS), **3.46%** (ASC 715), **2.39%** (PPA 3 segment rates), **3.69%** (PPA-Spot Rates) and **2.36%** (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 -159.36%** on a compounded index basis starting at 100 on 12/31/99!

	Total Returns (Market Values)										
	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			
Assets	11.89	3.27	11.79	19.04	9.74	1.22	8.12	4.24			
Liabilities	10.13	33.77	4.46	-12.59	24.35	-0.49	1.92	1.40			
Difference:											
Annual	1.76	-30.50	7.33	31.63	-14.61	1.71	6.20	2.84			
Cumulative	-115.67	-195.73	-194.30	-120.74	-177.14	-172.78	-163.36	-159.36			

2017 Off to a Good Start

According to Ryan ALM calculations on the first page, pensions should see assets outgrowing liabilities based on any liability discount rate methodology:

Pension asset growth = 4.24%	vs. Tsy. STRIPS = 1.40%	Alpha = 2.84%
	vs. ASC 715 = 0.78%	Alpha = 3.46%
	vs. PPA (3 segments)	Alpha = 2.39%
	vs. PPA (spot rates)	Alpha = 3.69%
	vs. GASB (8.00%)	Alpha = 2.36%

WARNING: Public Pension Trend to Lower ROA Assumptions

Most public pensions have lowered their return on asset (ROA) assumption or in the planning stage. Under GASB 67/68 and ASOP 27 actuarial practices, the ROA is the discount rate used for public plans in contrast to “market rates” required ASC 715 for private pension plans. This reduction in the ROA will increase the present value of liabilities and the unfunded deficit. This deficit increase causes an increase in contribution costs to fund this new deficit. A good formula to use to determine this increase is:

$$\text{Change in ROA} \times \text{Duration of Liabilities (as a negative number)}$$
$$-50 \text{ bps} \times -12 = 6\% \text{ increase in present value of liabilities}$$

In the example above, if the ROA is reduced by 50 bps then most public pension liabilities will go up by 6% in present value. At a time when interest rates are trending upward, GASB and ASOP rules are *reducing* discount rates. But it gets worst... **projected contribution costs**.

DILEMMA: Projected Contribution Costs

In order to calculate projected contribution costs, the actuary needs to input a growth rate assumption for assets and a discount rate for liabilities... which is a growth rate for liabilities. The dollar difference in assets vs. liabilities present value is the unfunded liability that is financed by projected contributions. Since GASB and ASOP rules allow for the ROA to be both the growth rate for assets and the discount rate for liabilities creates the following problem... **increased contribution costs**. If there is a deficit, then growing assets and liabilities at the same growth rate... **increases the deficit dramatically**. In the example below a 60% Funded Ratio shows that the deficit (Funded Status) increases by **58.68%** in just 6 years while the Funded Ratio stays at 60%. Imagine what this calculation looks like over 30 years. Since the actuarial exercise has asset growth = liability growth, then only thru increased contributions can the plan reach full funding. This actuarial exercise is prevalent everywhere among Public pensions:

	Growth Rate = 8% ROA					
	<u>Assets</u>	<u>\$ Growth</u>	<u>Liabilities</u>	<u>\$ Growth</u>	<u>\$ Deficit</u>	<u>% Increase</u>
Start	\$60.00		\$100.00		\$40.00	
Year 1	64.80	\$ 4.80	108.00	\$ 8.00	43.20	8.13%
Year 2	69.98	5.18	116.64	8.64	47.66	19.15
Year 3	75.58	5.60	125.97	9.33	50.39	25.98
Year 4	81.63	6.05	136.05	10.07	54.44	36.10
Year 5	88.16	6.53	146.93	10.88	58.77	46.93
Year 6	95.21	7.05	158.69	11.72	63.47	58.68

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 pension create a set of **economic books** to help assets understand and manage to these liabilities.

Public Pension Watch List

CalSTRS lowers ROA to 7.005 from 7.50%

CalSTRS voted in February to lower its ROA 7.50% to 7.00% effective for 2018 fiscal year. CalPERS made the same decision in December. This will increase the present value of liabilities and unfunded accrued liability by about 6.00%.

Ohio State Teachers Retirement System (STRS) Cuts ROA to 7.45%

The Ohio STRS Board of Trustees agreed to change the ROA assumption as recommended by Segal Consulting to 7.45%. This will increase pension liabilities by \$6.5 billion.

Iowa Public Employees Retirement System (IPERS) Cuts ROA to 7.00%

IPERS lowered its ROA from 7.50% to 7.00% in March. This discount rate change increases liabilities and the unfunded pension deficit by \$1.3 billion (from \$5.6 billion to \$5.9 billion) This change also drops the funded ratio from 84% to 80%. This increased deficit will require an increase in contribution costs from 14.88% of payroll to 15.88%.

Houston Moves Pension Reform thru Legislature

In the proposed Houston's pension reform legislation, police, firefighters and muni workers agreed to reduce benefits by 30% or \$2.5 billion. In return, the city agreed to repay the \$750 million it borrowed from the pension plans.

Jacksonville's Pension Bailout

Jacksonville's city council will take a final vote on a complex pension reform structure designed to pay down \$2.85 billion in debt. Voters approved a half-cent sales tax for pension costs last August starting in 2031. The plan would put in place an unprecedented and generous 401(k) style plan for future employees plus millions of dollars in raises and retirement benefits to current employees. There is also an untested accounting process that could reduce pension costs in the short-term.

Chicago's Massive Shortfall

In 2015, Chicago's two pension plans for employees paid out \$999 million in retirement benefits to 29,286 retirees while collecting only \$90 million in investment income. Investment income is one of three sources of funding pensions. The other two is contributions from employees and taxpayers. Gov. Bruce Rauner vetoed a bill that have allowed Chicago to contribute less to the city six pension plans for a few years with a promise that higher contributions in later years... good going, Governor!

Duration Matching = Hedging Strategies... NOT De-Risking Strategies

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 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 (especially 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!

Insurance Buyout Annuities (IBA)... Most Costly Way to De-risk

IBA have won over \$500 billion of business in recent years. The big attraction here is the transfer of the pension to the insurance company and the removal of this liability from the balance sheet and the pension + PBGC expense from the income statement. Such IBA come at great cost with most using a U.S. Treasury discount rate – 20 bps. (@ 2.80% as of 12/31/16) as the discount rate cost of assets to be transferred. This is in sharp contrast to the ASC 715 discount rates of 3.71% and our LBP average YTM of 4.69% (as of 12/31/16). This translates into our LBP product is 26% to 30% less costly than IBA!

Plan Sponsors Overpaid PBGC Premiums

According to October Three Consulting, DB plan sponsors overpaid their PBGC premiums by \$700 million in the past six years. The firm analyzed form 5500 for 25,000 single-employer plans. PBGC premiums have tripled in the last five years rising to \$6.4 billion vs. \$2.1 billion in 2011. October Three cites that many plans failed to adopt best practices such as recording and timing plan contributions. Due to this major pension expense and rising, more attention is needed to managing PBGC premiums.

\$10 Trillion Missing from Pentagon... No Ones Knows Where?

Claire Bernish, a free-lance writer, reported that over the last two decades, the Pentagon has lost track of \$10 trillion. Although audits of every federal agency are mandatory, the Pentagon has made itself an exception because of the time and cost of such an exercise Reuters initially reported on this bogus books situation 15 years ago, Excessive spending on surplus inventory is a prime example. Troubling is the fact that many American weapons and supplies lost by the DoD and CIA became the property of terrorists.

Ryan ALM Pension Scoreboard

The graphs below show asset vs. liability rolling 12 month and cumulative growth since 1999. Ryan ALM Benchmark Liability Index = **290.69%** growth while pension assets = **131.33%** growth for a difference of **-159.36%** suggesting any pension **Funded Ratio below 168.89%** in 1999 has a deficit today on a *market weighted* basis.

The Ryan ALM Pension Funded Ratio = 59.21% (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 (Patent Pending) – The value added in bonds is small as every performance ranking study proves (1st quartile vs. median difference). **The best value in bonds is 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 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 Beta portfolio is the lowest cost portfolio since we will always out yield liabilities by more than our low fee thereby guarantying each client **No Net Fee** to maturity (liability benefit payment dates). Moreover, the Beta portfolio is a matching liability portfolio that fully funds liabilities thereby reducing the cost and volatility of contributions.