The Ryan ALM Pension Letter™
June 30, 2017
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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

Index	Returns YTD 2017	Weights
Pension Liabilities:		
Market (Tsy STRIPS)	5.33%	100 %
ASC 715 (FAS 158)	15.78	
PPA (MAP 21 = 3 Segments)	8.77	
PPA (Spot Rates)	3.27	
GASB /ASOP (7.50% ROA)	3.89	
Pension Assets:		
Ryan Cash	0.27 %	5 %
Bloomberg Barclay Aggregate	2.27	30
S&P 500	9.33	60
MSCI EAFE Int'l	14.20	5
Asset Allocation Model	6.96 %	100 %
Pension Assets – Liabilities:		
Market	1.63	
ASC 715 (FAS 158)	-8.82	
PPA (MAP 21 = 3 Segments)	-1.81	
PPA (Spot Rates)	3.69	
GASB/ASOP (7.50% ROA)	3.07	

Using the Asset Allocation return above, the difference in pension asset growth vs. liabilities in 2017 was: **1.63%** (market valuation STRIPS), **-8.82%** (ASC 715), **-1.81%** (PPA 3 segment rates), **3.69%** (PPA-Spot Rates) and **3.07%** (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 -168.44%** on a compounded index basis starting at 100 on 12/31/99!

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009		
	Total Returns				(Market Values)								
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	6.96					
Liabilities	10.13	33.77	4.46	-12.59	24.35	-0.49	1.92	5.33					
Difference: Annual	1.76	-30.50	7.33	31.63	- 14.61	1.71	6.20	1.63					
Cumulative	-115.67	-195.73	-194.30	-120.74	-177.14	-172.78	-163.36	-168.44					

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2017: What Discount Rate Do You Trust?

Pension funded status and performance for 2017 greatly depends on what discount rate you are using. Our asset allocation estimates pension asset growth of 6.96% for the 1st half of 2017 (over 14% annualized)… suggesting a fine year of asset growth. Based on the discount rate chosen, liability growth ranges from 3.27% (PPA spot rates) to 15.78% (ASC 715). This suggests that corporations funded status went down **-8.82%** while public plans funded status went up **3.07%**. Such discount rate variations have confused the pension industry for decades.

GE: Pension Problems

Bloomberg News reported that GE's pension was underfunded by $31.1 billion at the end of 2016… the biggest deficit of any S&P 500 company. GE blamed their shortfall on the fallout from the 2008 financial crisis. Before 2008, GE's pension was overfunded from 1999 to 2007 with a surplus of $15.2 billion at the end of 2007. By the end of 2008, the GE pension funded status dropped to a deficit of $6.8 billion. That's when GE made a series of poor asset allocation decisions: First, it sold its risky assets when they should have waited for a recovery. GE had an 80% allocation to risky assets at that time which they reduced to 66%. GE them moved into alternative investments from a zero allocation before 2008 to a 14% allocation by 2009. Since March 2009 thru May 2017, the S&P 500 is up 18% annualized to 6.2% for the HFRI alternative investment index. However, the biggest decision was the ROA assumption GE used. In 1999, GE used a 9.5% ROA mainly based on the historical bull market in stocks for the 15 years before. Pension accounting (FASB) for corporations allows pension expense to be offset by the forecasted return on assets (ROA). Then FASB requires that you compare the actual return vs. the forecasted ROA. This difference minus 10% goes into a complicated calculation (using a corridor) and comes out as a line item called actuarial gain/loss which is a direct hit to the bottom line (earnings). Moreover, the higher the ROA the lower pension expense… namely, contributions. So, GE lowered its contributions which also affected its pension funded status. Instead of shoring up the pension, GE spent more than $45 billion on share buybacks which enhanced their stock value. In the last two years, GE only spent around $2 billion on pension contributions while reducing capital investments. At the end of 2016, GE's pension had $94 billion in assets and $63 billion in assets for a funding ratio of 67%. The question now is how can GE afford to continue paying a 3%+ dividend?

Public Pension Liability Growth Outpacing Contributions

The Society of Actuaries (SOA) recently released a study showing public pension employer contributions increased 75% (from $48 billion to $88 billion) and employee contributions increased 30% (from $28 billion to 37 billion) from 2006 to 2014. Over the same period, total unfunded liabilities increased 150% to $1 trillion in 2014 from $400 billion in 2006. The SOA analysis used public data for 160 state and large city public plans. In every year of the study, the 160 plans received insufficient employer contributions to resolve their unfunded liabilities… known as negative amortization. In 2014, 72% of these plans experienced negative amortization up from 65% in 2006 with only 3% of plans showing a surplus.

Moody's: Public Pension Crisis Won't Be Reversed by High Returns

According to a Moody's Investors Service report even if public pensions had cumulative returns of 25% during the 2017-2019 period ahead, it would not offer a respite for chronically underfunded U.S. public pension plans. The growing underfunded gap (deficit) has risen to over $4 trillion nationwide.

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 (3%) to even negative growth. A 50 bps increase in market rates (Treasury yield curve) would translate into about -2.50% liability growth for most public plans on an economic basis (market value). If assets could grow at just 5%, assets would outgrow liability growth (liability Alpha) by about 7.50% per year. A 60% funded ratio would grow to 88% and a 70% funded ratio would grow to 104% in just five years. 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.

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!

BLACK SWAN Event: Banco Popular Tier I and II Bonds

Banco Popular Tier I and II bonds both just went to a zero valuation. At the time, Banco Popular (BP) had an equity valuation of $12.07 billion with $86.8 billion in deposits. Their capital was 53 bps above minimum requirements. Earnings were generating 17% annual returns. Non-performing loans were down 24% over last year… at least that was what was reported. Mark Grant from Hilltop Securities warned that, in his opinion, the European Central Bank (ECB) falsified documents by carefully using the word "subjective" and applying it to all covenants of the Tier I and II bond indentures to attract international investors.

Public Pension Watch List

S&P warns Illinois of Possible Junk Bond Status
S&P has warned IL that if they don't pass a spending plan by the start of next fiscal year on July 1, they will downgrade IL to below investment grade status. This would be the first state ever to be rated as junk. A budget proposal is in motion that will cut $5 billion in costs through lower spending plus pension changes as well as paying down $4 billion of the state's $15 billion bill backlog. Personal income tax rates will be increased by 40% as well.

NYC Five Pensions: a Great Budget Cost
NYC five pension funds are a combined $64.8 billion in debt with a ROA of 7.00%. If you use a market discount rate of 3.61%, this pension debt exceeds $142 billion. according to E.J. McMahon and Josh McGee of the Manhattan Institute. Annual pension contributions exceed 17% of NYC annual tax revenues which are crowding out other budget priorities… like infrastructure and services. Mayor Bill de Blasio's 2018 budget of $84.9 billion includes $9.6 billion in payments to the five pensions. In fiscal 2000, pension costs were below $2 billion. Most city employees are not required to make pension contributions.

PA State ERS and School Employees… Not A Pretty Sight
PA State ERS and School Employees pension plans had a compound annual growth rate (CAGR) in pension liabilities of about 5% from 2001-2015. Over that same period, the CAGR for annual required contributions (ARC) was 27% for PA ERS and 24% for PA Schools. How could that happen? Because of GASB accounting allowing for smoothing of assets over 5 years, the equity correction years of 2000-2002 did not affect the funded status as much as market value would have so funded ratios were erroneously too high and contributions were too low. Then using the ROA as the discount rate valued liabilities way too low vs. market (economic) values. In recent years, the ROA was lowered from 8.00% to 7.50% which increased liabilities by about 6% resulting in higher contributions… the opposite of what was intended.

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 $4.6 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%.

Chicago's Police Pension Fund… Broke by 2021
According to Local Government Information Services (LGIS) which owns the Chicago City Wire, Chicago's police pension fund won't have enough money to pay benefits to retirees in 2021 without a bailout. By the end of 2020, LGIS estimates that the Policeman's Annuity and Benefit Fund of Chicago will have less than $150 million of assets to pay $928 million in retirees' benefits. Fund assets will decline from $3.2 billion at the end of 2015 to $1.4 billion at the end of 2018, $751 million at the end of 2019 and $143 million at the end of 2020. Currently, Chicago taxpayers are paying for more retired police officers than they are active ones.

Ryan ALM Pension Scoreboard

The graphs below show asset vs. liability rolling 12 month and cumulative growth since 1999. Ryan ALM Benchmark Liability Index = **305.79%** growth while pension assets = **137.35%** growth for a difference of **–168.44% suggesting any pension Funded Ratio below 170.97% in 1999** has a deficit today on a *market weighted* basis.

The Ryan ALM Pension Funded Ratio = 58.49% (starting at 100.00 on 12/31/99)

Ryan ALM, Inc.
Assets vs. Liabilities
(12 month rolling returns)

(12/31/1999 - 06/30/2017)

Ryan ALM, Inc.
Assets vs. Liabilities
Cumulative returns starting 12/31/1999

(12/31/1999 - 06/30/2017)

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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.

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.