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™

September 30, 2017

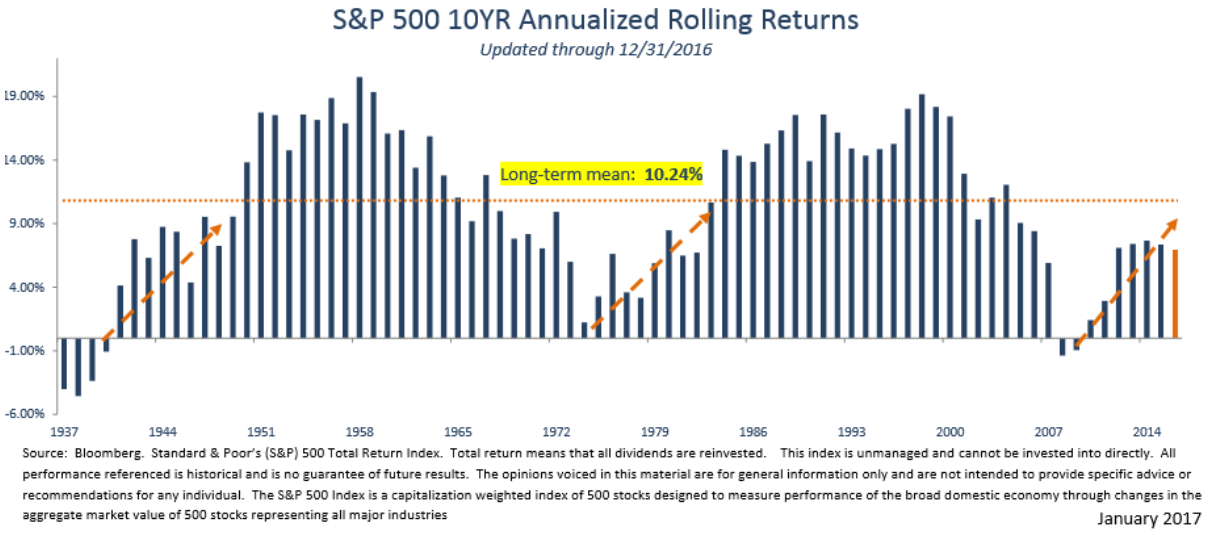
Index	Returns YTD 2017	Weights
Pension Liabilities:		
Market (Tsy STRIPS)	6.01%	100 %
ASC 715 (FAS 158)	17.54	
PPA (MAP 21 = 3 Segments)	10.75	
PPA (Spot Rates)	8.05	
GASB /ASOP (7.50% ROA)	5.92	
Pension Assets:		
Ryan Cash	0.53 %	5 %
Bloomberg Barclay Aggregate	3.14	30
S&P 500	14.23	60
MSCI EAFE Int'l	20.45	5
Asset Allocation Model	10.40 %	100 %
Pension Assets – Liabilities:		
Market	4.39	
ASC 715 (FAS 158)	-7.14	
PPA (MAP 21 = 3 Segments)	-0.35	
PPA (Spot Rates)	2.35	
GASB/ASOP (7.50% ROA)	4.48	

Using the Asset Allocation return above, the difference in pension asset growth vs. liabilities in 2017 was: **4.39%** (market valuation STRIPS), **-7.14%** (ASC 715), **-0.35%** (PPA 3 segment rates), **2.35%** (PPA-Spot Rates) and **4.48%** (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 -163.46%** 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	10.40		
Liabilities	10.13	33.77	4.46	-12.59	24.35	-0.49	1.92	6.01		
Difference:										
Annual	1.76	-30.50	7.33	31.63	- 14.61	1.71	6.20	4.39		
Cumulative	-115.67	-195.73	-194.30	-120.74	-177.14	-172.78	-163.36	-163.46		

S&P 500 Rolling 10-year Annual return = 10.24%... Should Pensions be 100% Equities?

Most public and multiemployer pension plans are focused on the ROA (Return On Asset) forecast as their asset allocation hurdle rate. This is due mainly to FASB and GASB accounting rules plus ASOP actuarial practices that allow the ROA to be used as the discount rate for pricing liabilities. Actuaries need a forecast of both asset growth and liability growth to calculate projected contributions. Someone decided long ago to use the same growth rate for both. If assets grow at the ROA and if the pension plan sponsor makes the actuarially determined contribution (ADC), supposedly, the plan will be fully funded in 30 years. How a forecast of asset returns can be used as a discount rate for liabilities is a mystery to me but that has plaqued these pensions for several decades. What is missing in this thinking is that the **S&P 500 returns are quite volatile (see below) and that contributions are calculated annually**. When asset growth underperforms liability growth, the funded status is injured and results in a higher contribution for the next year. Whenever asset liability growth outperforms liability growth, contributions are reduced for the next year… but you don't get back the extra contributions paid in the previous year(s). This volatility of contributions and funded status is what drives pension plans (and budgets) crazy. As a result, de-risking strategies have become in vogue to reduce and, hopefully, eliminate this contribution volatility. So the answer to the question above is… **NO, pensions should not want 100% equities or any asset allocation strategy that creates great volatility of returns and funded status.**



Source: Hefty Wealth Partners

S&P 500 Ten-year Average Returns by Decade

1950s = 19.3%
1960s = 7.8%
1970s = 5.8%
1980s = 17.3%
1990s = 18.1%
2000s = -1.0%
2010 – 2016 = 7.9%

Source: Ryan ALM

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

		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 bp 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%**

(without Contributions)

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 10.40% for the 1st nine months of 2017 (13.9% annualized)… suggesting a fine year of asset growth. Based on the discount rate chosen, liability growth ranges from 5.92% (ROA) to 17.54% (ASC 715). This suggests that corporations funded status went down **-7.14%** while public plans funded status went up **4.48%**. Such discount rate variations have confused the pension industry for decades.

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

Cliffwater Study Shows State Pensions Median Return = 5.9% Last 10 Years

Pension consulting firm, Cliffwater LLC, has released a study on state pension plans that calculates the median return at 5.9% annually for the 10 years ending June 30, 2016. Pension and Investments study shows that that the top performing state pension was Oklahoma Teachers who was the only state to have a return above 7.0%. The range of returns went from 3.7% to 7.1%. This is in sharp contrast to the average ROA of 7.50% that most public plans have chosen as their hurdle rate.

Kentucky State Budget Director Sees State Pension Plans In Crisis

In a recent letter by State Budget Director, John Chilton, he suggests that if public pensions used FASB accounting rules for corporate single employer pensions, the underfunding level would double and federal law would require frozen benefits or even plan termination. He says that the current $33 billion funding deficit would climb to $64 billion under corporate bonds discount rates and up to $84 billion using the 30-year Treasury rate. The governor is expected to call a special session of the legislature to address this funding dilemma. The options are limited. Ryan ALM recommends a process that starts with a Custom Liability Index (CLI) to understand and monitor the true economics of the plan(s). Without a CLI, Kentucky is dealing with actuarial and accounting valuations instead of market and economic valuations… a big difference. After that we recommend an Asset Exhaustion Test to measure the true ROA needed to fully fund the plan(s). Once that is assessed then asset allocation begins. A core portfolio of bonds that matches and funds liabilities is recommended to gradually de-risk the plan(s).

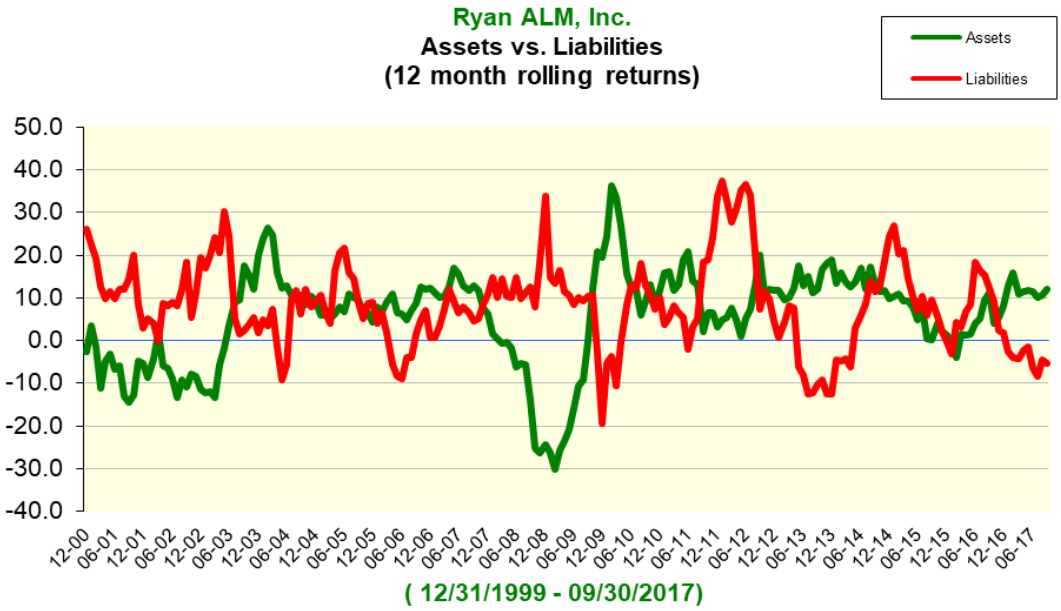
California State Debt

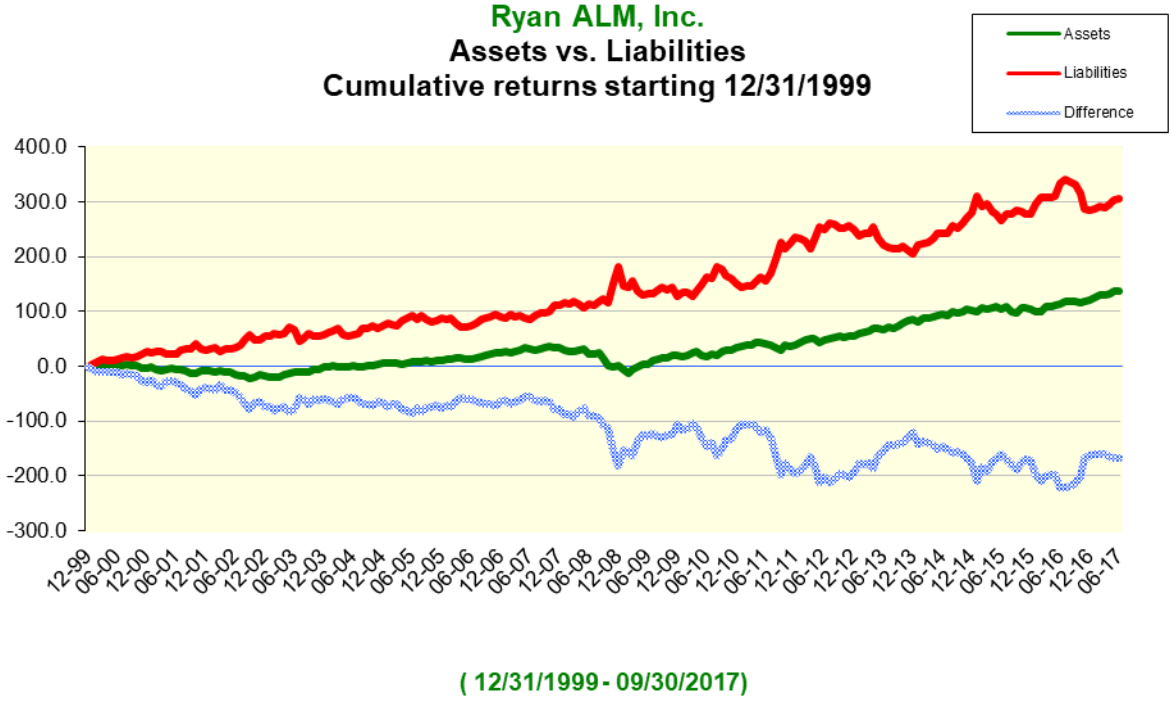
CA State debt currently stands at $255.1 billion which ranks 43rd in terms of debt per taxpayer or about $21,600 for each CA taxpayer. Despite new rules to increase fiscal transparency, many argue that this is a very conservative estimate which might be more realistic at approaching $1 trillion or $100,000 per taxpayer. An example is the Comprehensive Annual Financial Report (CAFR) which was released after a delinquency of 265 days after the end of the fiscal year.

Ryan ALM Pension Scoreboard

The graphs below show asset vs. liability rolling 12 month and cumulative growth since 1999. Ryan ALM Benchmark Liability Index = **308.45%** growth while pension assets = **144.99%** growth for a difference of **–163.46%** **suggesting any pension Funded Ratio below 166.72% in 1999 has a deficit today on a *market weighted* basis.**

The Ryan ALM Pension Funded Ratio = 59.98% (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™
(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.