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The Ryan ALM Pension Letter™

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Index	Returns YTD 2018	Weights
Pension Liabilities:		
Market (Tsy STRIPS)	-2.89%	100 %
ASC 715 (FAS 158)	-6.63	
PPA (MAP 21 = 3 Segments)	3.10	
PPA (Spot Rates)	-4.76	
GASB /ASOP (7.50% ROA)	3.75	
Pension Assets:		
Ryan Cash	0.88 %	5 %
Bloomberg Barclay Aggregate	-1.62	30
S&P 500	2.65	60
MSCI EAFE Int'l	-2.40	5
Asset Allocation Model	1.09 %	100 %
Pension Assets – Liabilities:		
Market	3.98	
ASC 715 (FAS 158)	7.72	
PPA (MAP 21 = 3 Segments)	-2.01	
PPA (Spot Rates)	5.85	
GASB/ASOP (7.50% ROA)	-2.66	

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: **3.98%** (market valuation STRIPS), **7.72%** (ASC 715), **-2.01%** (PPA 3 segment rates), **5.85%** (PPA-Spot Rates) and **-2.66%** (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 -145.54%** 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	1.09		
Liabilities	10.13	33.77	4.46	-12.59	24.35	-0.49	1.92	7.94	-2.89		
Difference:											
Annual	1.76	-30.50	7.33	31.63	-14.61	1.71	6.20	7.21	3.98		
Cumulative	-115.67	-195.73	-194.30	-120.74	-177.14	-172.78	-163.36	-160.34	-145.54		

State Pension Funding Gap: PEW Study

The PEW Charitable Trusts released in April their study of the pension funding gap for states as of fiscal 2016, the most recent year of data. The 50 states reported:

Assets = \$2.6 trillion Liabilities = \$4.0 trillion Deficit = \$1.4 trillion

This was the 15th annual increase in pension debt since 2000 and a \$295 billion (27%) increase in the deficit over 2015. PEW cites poor investment returns as a major cause of the jump in the funding gap with a median return of about 1% in 2016 vs. a median ROA of 7.50% accounting for about \$146 billion of deficit. Lowering the discount rate assumption accounted for another \$138 billion in increased liabilities. PEW applied a 6.50% discount rate ROA instead of 7.50% and found it would increase liabilities by \$382 billion and the funding gap by \$300 billion to \$1.7 trillion. In addition, states fell short by \$13 billion of making their minimum contributions. Funded ratios ranged from a low of 31% (New Jersey) to a high of 91% (Wisconsin). Five states (CO, CT, IL, KY and NJ) were less than 50% funded with another 17 less than 66% funded. Remember this is based on GASB accounting of allowing the ROA to be the discount rate instead of economic market rates (i.e. U.S. Treasury yield curve) which would lower funded ratios significantly.

U.S. States Pension Reform Not Enough – Fitch

On June 21, Fitch Ratings released a report saying that recent pension reforms by U.S. states to reduce their pension burdens do not do enough. Three reasons were cited by Fitch: 1) funding discount rates remain higher than the 6% Fitch finds reasonable; 2) more retirees than ever are drawing on their plans and 3) recent economic expansion has not given state revenues a big enough boost. Illinois, the lowest rated state, is struggling with an unfunded pension liability of \$129 billion after years of skipped or inadequate state contributions. As a result, state contributions are projected to soar over the next five years.

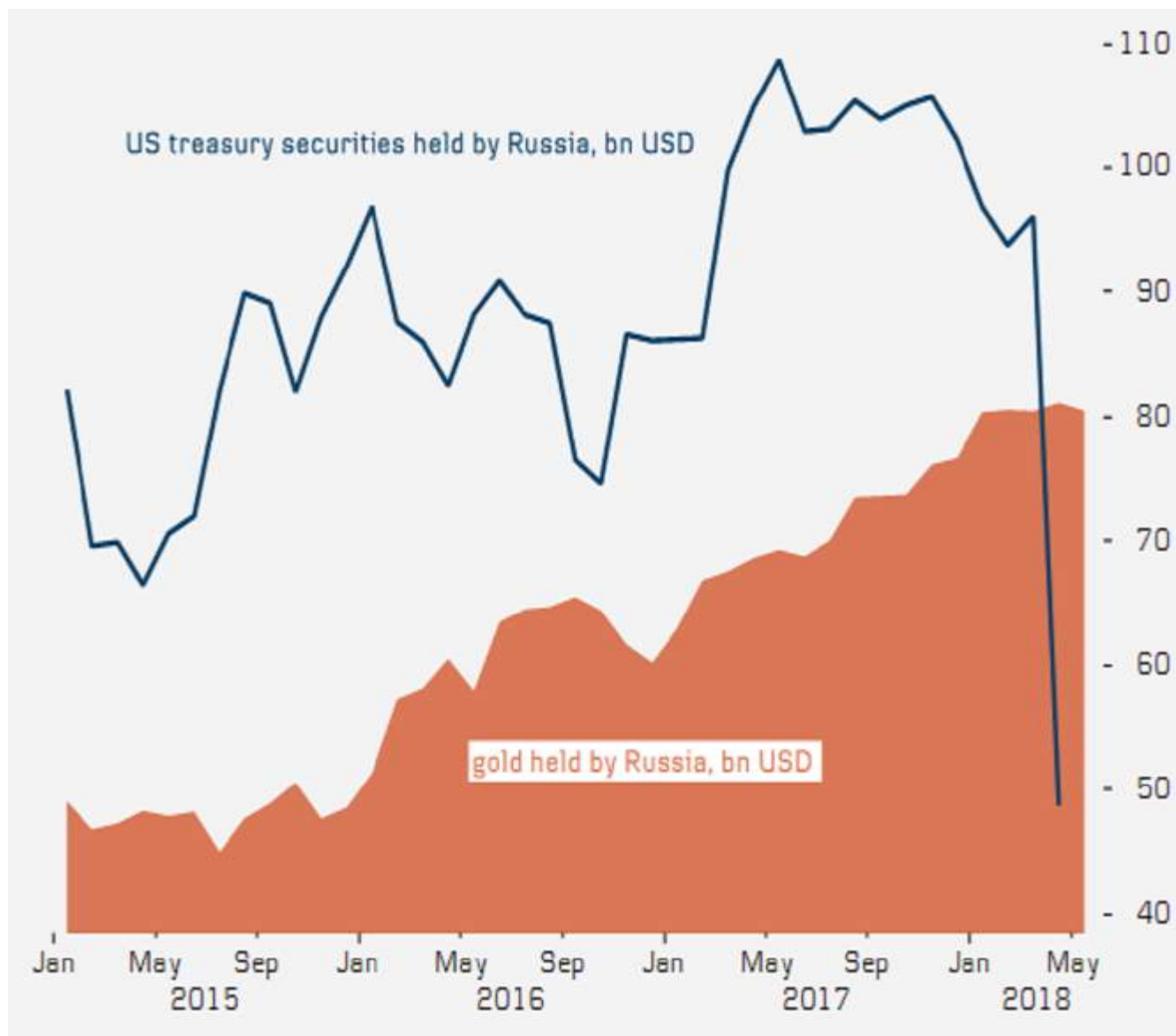
Social Security and Medicare Financial Hole

The trustees for SS and Medicare released their annual reports in early June. Despite the strong U.S. economy, both programs have large and growing financial deficits. Such deficits may grow due to unrealistic cuts in medical care payment rates and the persistently low birth rates. The SS report estimates that the program will run out of reserves in 2034 after which benefits would have to be reduced by about 25%. Over the next 75 years, SS is projected to have an unfunded liability of \$13.2 trillion. To restore permanent solvency would require raising the payroll tax rate from 12.4% today to 15.2%. Moreover, SS benefits would need to be cut by about 17%. The Medicare hole is even deeper. The Medicare hospital insurance trust fund will run out of reserves in 2026. The Medicare physician and outpatient and prescription drugs trust fund is permanently solvent because it has an unlimited tap on the general fund of the Treasury. Medicare's overall unfunded liability over 75 years is more than \$37 trillion.

Central Bank of Russia (CBR) – Net seller of U.S. Securities

According to Business Week, the CBR has been a major seller of U.S. securities recently with as much as \$47.4 billion sold in April alone, more than any other major foreign holder. The CBR policy is usually to reveal information about their investments with a six-month lag. This selloff started in 2011 and has intensified in recent years due to numerous rounds of sanctions imposed by the U.S. government. All told, Russia has reduced its U.S. securities holdings by more than two-thirds from \$176 billion in 2010 to \$48.7 billion today (see graph below). Other

countries have followed suit as Turkey reduced its U.S. Treasury holdings from \$62 billion in November to \$38 billion in April. Norway reduced its U.S. Treasury holdings by 40% from \$64 billion in September to \$39 billion in April. By contrast Russia keeps adding to its gold reserves. The Bank of Russia said that its holdings of gold rose by 1 percent in May to 62 million troy ounces, valuing them at \$80.5 billion.



Secured Overnight Financing Rate (SOFR)... the Replacement for LIBOR

A white paper from Longfellow investment management presented a comprehensive view on the “The Elimination of LIBOR”. Since its origination in 1986, the London Interbank Offered Rate (LIBOR) has been the benchmark for short term- rates. LIBOR is based on submissions from a collection of banks as to the rate for short-term loans rather than actual transactions. In the summer of 2017, Andrew Bailey, CEO of the Financial Conduct Authority in London, announced plans to phase out LIBOR by the end of 2021. The Alternative Reference Rates Commission (ARRC), a group of banks convened by the Federal Reserve, was given the task of

finding a LIBOR alternative. ARRC recommended the Secured Overnight Financing Rates (SOFR). It is a transactions-based rate, calculated by sorting all overnight repo transactions collateralized by U.S. Treasuries in order from lowest to highest on a volume-weighted basis with the median as the published rate. Being secured by U.S. Treasuries, SOFR represents a risk-free rate vs. LIBOR which reflects banking sector risk. SOFR rates began to be published on April 3, 2018. LIBOR rates stretch from overnight to 12 months while SOFR is calculated only on an overnight basis. LIBOR's primary exposure is in investment grade floating rate notes with a universe of about \$400 billion. Approximately 20% of asset backed securities (ABS) has been indexed to LIBOR.

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

	<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 -----			
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

North Carolina Creates Solvency Fund

According to P&I, North Carolina has a new trust fund to help pay down unfunded liabilities for both pensions and health-care costs thanks to a new law signed on June 25 called the Unfunded Liability Solvency Reserve Act. This act creates a reserve funded through several sources including General Assembly appropriations, overflows from the state's rainy-day fund and savings from refinancing of general obligation bonds. Between pension and health care, the state has \$50 billion in unfunded liabilities with \$35 billion in health care alone. This solvency fund is believed to be the only one of its kind in the nation.

Illinois Pension Solution?

The Federal Reserve Bank of Chicago released a May 7 report that claims to have found a prudent solution to funding the Illinois pension deficit which is estimated to be between \$130 to \$250 billion. Their solution is for the average homeowner to pay an additional property tax of \$1,948 annually for the next 30 years. This would amount to about a 44% property tax increase. Opponents of the Fed recommendation suggest that this additional tax would hurt the housing market recovery which is still showing home prices below 2008 recession levels. Employment growth and housing price growth are strongly correlated. A report by the Illinois Commission on Government Forecasting and Accountability offers a grim forecast of Illinois economic condition. Illinois was 42ns in the nation for employment growth in 2017.

Ohio Teachers lose Pension COLAs

As reported by the Columbus Bureau, the State Teachers Retirement System (STRS) of Ohio trustees voted back in April 2017 to suspend the cost of living allowance (COLA) as a way to enhance the funding status of the STRS \$75 billion pension plan. STRS members used to receive a 3 percent COLA which was reduced to 2% on the fifth anniversary of retirement. Retired teachers are planning a protest at a STRS trustees meeting soon. Trustees agreed to review their decision again in 2022. STRS is the second largest public pension plan in Ohio.

State of California given an "F" Grade by Truth in Accounting (TIA)

Truth in Accounting, which analyzes government financial reports gave CA an "F" grade for claiming surpluses instead of a \$269.9 billion deficit. TIA reviews audited financial statements for America's fifty states since 2002. The group's mission is to educate and empower citizens with understandable and reliable government financial information. CA has a pension burden of \$461.3 billion in benefits which are \$102.5 billion underfunded with another \$107 billion in unfunded retiree health care benefits. These deficits are based on GASB accounting which prices liabilities at the ROA discount rate. If marked to market using Treasury STRIPS, the CA pension + healthcare deficits could be several times higher. TIA warns that CA is a giant "sinkhole state". CA has only \$100.1 billion in assets to pay \$369.9 billion in bills this 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 = **303.85%** growth while pension assets = **158.31%** growth for a difference of **-145.54%** suggesting any pension **Funded Ratio below 156.35%** in 1999 has a deficit today on a *market weighted* basis.

The Ryan ALM Pension Funded Ratio = 63.96% (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.

Disclaimer

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