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Long Duration Indexes (Caveat Emptor)

As the former Director of Research at Lehman, I designed the Lehman Govt. /Corporate, Lehman Aggregate and about 60 other popular bond indexes (now Barclay Capital). In the late 1970s, I went to visit the Consultant industry to get our indexes widely accepted as the appropriate benchmarks for fixed income. I think I did too good of a job. In a short time, the Lehman indexes were the bond benchmarks throughout America. Many asset managers have been hired and fired based on their relative performance to these Lehman bond indexes.

In 1985 my index team and I at my initial firm (the Ryan Financial Strategy Group) created the 1st Treasury STRIPS Indexes the day STRIPS were born as a yield curve of 30 constant maturity/duration indexes plus an equal-weighted composite. This allowed us to produce the **Ryan Liability Index as the proper benchmark concept for liability driven objectives**. My logic was that no generic index could replicate the unique cash flows of any pension or liability objective (i.e. Insurance, Lotteries, OPEB, etc.). I emphasized that interest rate risk (systematic risk) dominates any bond portfolio (or liability portfolio) accounting for over 95% of the risk/reward behavior. As a result, it was critical that the client was using an index that best represents the interest rate sensitivity of the liability objective. Most pensions have long average durations of 10 to 15 years (OPEB liabilities are even longer at 15 to 25 years). I thought this was an obvious fact that would dismiss generic bond indexes such as the Lehman Aggregate as the proper benchmark for liability driven objectives. The risk/reward mismatch of the Lehman Aggregate vs. any liability objective is significant and costly. A historical comparison vs. the Ryan Liability Benchmark is striking evidence over the life of STRIPS:

12/31/85 – 06/30/10

	Lehman Aggregate	Ryan Liability
Annualized Return	7.57%	10.26%
STD	4.14%	13.73%
Beta	0.27	
R2	80.23	
Tracking Deviation	217 bps	

In time many pensions and consultants have now realized this interest rate risk disparity and are replacing their traditional fixed income benchmark (i.e. Lehman Aggregate) with a longer duration index (i.e. long Lehman Govt. /Corporate). Although a longer duration, the Lehman long Govt. /Corporate index and any generic bond index have structural flaws that should dismiss it as qualifying as a liability benchmark, such as:

Coupon Bonds vs. Zero-coupon bonds

Generic bond indexes *only* use coupon bonds as the portfolio composition. **Mathematically, it is basically impossible for coupon bonds to have durations longer than 17 years.** As a result, they could never price or match any liabilities greater than 17 years. For most pensions, this represents 30% to 50% of their liabilities. Coupon bonds also have reinvestment risk which creates uncertain cash flows. For this reason, liability matching strategies (i.e. defeasance, dedication, immunization) tend not to favor coupon bonds.

Market Weighted vs. Liability Weighted

Generic bond market indexes are all *market weighted*. In order to market weight a bond index you must know the amount outstanding. As simple as it sounds it is most difficult, if not impossible, to know the amount outstanding on bonds. Treasuries and Agencies are *stripped* and reported delinquent (Treasuries) or not at all (Agencies). This is why generic bond indexes leave the original issue amount on Government issues as the amount outstanding. Imagine a \$10 billion Treasury that is 40% stripped showing \$10 billion outstanding for its market weight calculation (40% weighting error). Corporate bonds are tendered, sunk and put which is usually only reported annually in the 10-k. Mortgage backed securities have monthly principal payments which are reported weeks delinquent. As a result, it is mission impossible for any generic bond index to know the accurate amount outstanding for most bonds at the end of the month for rebalancing and return calculation purposes. The obvious conclusion is that **market weighted bond indexes are skewed and faulty data.** The most appropriate weighting is based upon the clients' actuarial liability projections so an accurate duration, term structure and interest rate sensitivity can be calculated. Corporate bonds and mortgage-backed securities do not qualify as liability discount rates due to their lack of zero-coupons, uncertain cash flows, shorter durations and credit risk.

Average Duration vs. Term Structure

A common mistake is made by matching the average duration of liabilities instead of the term structure of liabilities. The projected liability payment schedule is a *yield curve* of cash flows. You must match *every* liability payment to be matched... not the average duration. This is the problem with Immunization strategies. When we compare the Ryan 15-year Treasury STRIPS index that matches the average duration of the Ryan Liability Benchmark (equal weighted composite yield curve of 30 constant duration STRIPS indexes) we find a significant **monthly tracking deviation of 62 bps. from 12/31/85 thru 06/30/10.** The classic example of this

matching confusion is the 30-year Treasury which is stripped and reconstituted on a regular if not daily basis. Although the pieces equal the whole in future value there is an arbitrage in present values where the pieces do not equal the whole. If a client had 30 years of semi-annual liability payments with an average duration equal to the 30-year Treasury coupon bonds, buying the 30-year Treasury could never match, fund or behave like this yield curve of liability payments (zero-coupon bonds). **In order to match liabilities, you have to match the entire term structure (all liability payments) not just the average duration.**

Interest Rate Risk Sensitivity

An eight year study by Notre Dame Professors Ph.D. Frank Reilly, Ph.D. David Wright and Ph.D. Wenchi Wong published in 1992¹ proved that **interest rate risk accounted for over 98% of the risk in bonds using all of the popular investment grade bond indexes** of that time. For such a critical cause of the risk/reward behavior in bonds you would think that bond indexes would provide interest rate sensitivity tests as part of their reporting process. Yet such reports are rare leaving it up to the investor to understand and test for such dominate systematic risk. Notably, Insurance companies are mandated by their rules to produce an annual test of their interest rate sensitivity on assets vs. liabilities to understand the solvency effect.

Funded Ratio

The true economic Funded Ratio should be the focus of Asset Allocation, Benefit and Contribution decisions. A large deficit should have a different asset allocation than a small deficit or surplus position. **It is critical that the liability index benchmark measure and price the liabilities of the pension plan not the bond market!** Just like snowflakes you will never find two liability schedules alike. This is a serious consideration when choosing a benchmark for liabilities and why only a Custom Liability Index fits. Given accurate and frequent liability valuation information, the pension plan trustees and consultant are now in a much more informed position to perform their duties. Generic bond indexes tell you nothing about the plan liabilities and could very well misinform and misdirect any asset, benefit or contribution decision. A liability driven objective needs a *liability index* not a bond index!

Solution ... Custom Liability Index (CLI)

Only a *Custom Liability Index* could ever price and match the unique cash flows of any pension or liability driven objective. It is critical that the CLI is installed as the proper benchmark for assets. Once in place the asset side can now function effectively on Asset Allocation, Asset Management and Performance Measurement in harmony with the true client objective. With a CLI the economic Funded Ratio (market value of assets/liabilities) can now be calculated accurately and frequently whereas traditionally it was reviewed only once a year months after the end of the fiscal year using accounting or actuarial valuations. **The Funded Ratio should be the focus of Asset Allocation** such that a large deficit position has a radically different allocation than a small deficit or surplus position. Asset management, especially bonds, can now manage in concert with the term structure and duration of liabilities. Performance measurement can now properly compare the risk/reward behavior of any assets vs. the liability benchmark. All asset functions are now in tune with the true client objective.

Features of the Ryan Custom Liability Index

1. **Daily Reports** including Structure, Performance, Interest Rate Sensitivity
2. Calculates the **present value** term structure with summary statistics
3. Prices each liability payment as a **risk-free** Treasury STRIPS
4. Calculates the economic **Funded Ratio** (liability side)
5. Private **internet delivery** password protected
6. Payable in soft dollars under SEC rule 28e

Given The Wrong Index ... you will get the Wrong Risk/Reward!

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Frank K. Reilly, David J. Wright, & G. Wenchi Kao, "Alternative Bond Market Indexes," Financial Analysts Journal Vol. 48 No. 3 (May-June 1992): pp. 44-58.