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Pension Solution # 3

Liability Index Fund
(Beta Portfolio)

Index Funds are quite popular in America but Liability Index Funds are rare. An index fund by definition is supposed to duplicate the risk/reward of an index benchmark at low cost and low tracking error. Index funds became increasingly attractive due to several factors :

1. **Diversified portfolio** (index) purchased as one transaction
2. **Low to no tracking error** versus the target index.
3. **Lower cost** than most active management fees

Since it is hard to consistently outperform indexes (especially after fees) index funds became an increasingly larger or core investment for many institutional investors in the last two decades. The largest mutual funds tend to be index funds (Vanguard). And in the last five years, ETFs (exchange traded funds = index funds) have grown significantly mainly as a retail investment. Then we have the closet index funds that do not want the label of indexing (due to lower fees) but tend not to stray far away from the key characteristics and statistics comprising the index benchmark (i.e. sector stratification, duration, etc.). **Indeed, it is an Index Investment World !**

Risk Free Asset

I had the unique pleasure to brain storm with the Nobel Prize winner Bill Sharpe several years ago. He is certainly one of the outstanding intellects I have ever encountered. He was also a good listener. I explained to him how I thought that **the risk free asset was always the asset that matched the objective with certainty** rather than the Sharpe Ratio use of the lowest volatility asset (3-month T-Bill) as the risk free asset. I gave Professor Sharpe two examples to prove my point :

1. **Objective = S&P 500**
   The lowest risk asset here with this objective would be an S&P 500 index fund or ETF that matches the objective with certainty. The 3-month T-Bill would be very risky here as it could never match with any certainty the risk/reward behavior of the S&P 500. Professor Sharpe agreed.

2. **Objective = Liabilities**
   Liabilities tend to be monthly payments so I asked Bill what is the lowest risk asset I could buy to fund the 10-year liability. He said a 10-year Treasury zero-coupon bond. The 3-month T-Bill would again be very risky since it would have 39 reinvestment moments, 39 moments of uncertainty.

I concluded with the obvious fact that **the objective decides what the risk free asset is**. **You can not have a generic risk free asset that applies to all objectives**. **Risk is the uncertainty of not meeting the client objective. The greater the uncertainty … the greater the risk !** Accordingly, **if the objective is best measured as an index then an index fund is the risk free asset !** Bill Sharpe agreed and proceeded to create a new Sharpe Index that focuses on the objective and not the 3-month T-Bill. The industry uses this as the Information Ratio.

ALM (Asset / Liability Management)
Asset/Liability Management has had a rather strange evolution. In the beginning, **defeasance** was a common accounting term where if you matched your liabilities with certainty (thru Government zero-coupon bonds) you could write-off this liability. Prefundings with Government portfolios pledged or put in escrow were rather ordinary. This was a correct and low risk proper match of assets vs. liabilities.

Wall Street saw an opportunity to save costs by using corporate bonds or even mortgages. This gave birth to **Dedication** Models. At Ryan Financial Strategy Group (my first company) we hired the finest brains from I.P. Sharpe of Canada, who designed the early Dedication Models, to build the RFSG Dedication Model. Dedication was on the right track matching assets to liabilities in future value dollars. The problem was present value dollars. Since pensions, in particular, have annual valuation reports they compared assets vs. liabilities in present value dollars. Dedication Models may have reinvestment and credit risk plus interest rate risk if you do not wait till maturity … and pensions don't wait (accounting rules). Dedication models will not match liabilities in present value dollars when the yield curve changes its shape, credit spreads widen or reinvestment proceeds are invested at lower yields … but that was not their focus.

Immunization was then created as Wall Street's answer to matching assets vs. liabilities in present value dollars. The strategy here was to match the average duration of liabilities as the critical discipline. A stream of benefit payments out 30+ years might have a 12 year weighted average duration but you could not buy a bond portfolio with a 12-year average duration to immunize or match these liability payments. As soon as the yield curve changes it shapes you are no longer matched or immunized even if the weighted average duration has stayed constant. **Until you match each liability payment or the shape of liabilities (yield curve) you can not immunize interest rate risk**. This requires a daily system to calculate the term structure of liabilities (i.e. Custom Liability Index). Immunization did not work very well.

Custom Liability Index (CLI)
It became obvious that with pensions you needed to monitor the shape, size and growth rate of liabilities frequently if you had any hope of matching this volatile objective. That made it clear to me that **only a Liability Index customized to the unique benefit payment schedule of a**

plan sponsor could provide the data needed to provide a matching strategy and as the true benchmark objective for asset management. Just like snowflakes, no two pension plans are alike in their actuarial projected benefit schedule. Since each liability is weighted by its present value (market value) it is mathematical clear that a five year liability will behave much differently than a 20-year liability given the same interest rate change (@15% difference for every 100 basis point change in yields). Since interest rates change every day, a **daily Custom Liability Index** would be the most accurate monitor of liability size, shape and behavior (in present value dollars).

A review of the **Ryan Liability Benchmark** (go to our web site **www.ryanalm.com,** click on **Ryan Indexes**) proves how difficult liabilities are to hedge and match. The Ryan Liability Benchmark (generic version) is an equal weighted Treasury STRIP portfolio with an average duration of 13 years. The last five years show significant volatility in liability returns (growth rate) :

2000 = 25.96%	**2002 = 19.47%**	**2004 = 9.35%**
2001 = 3.08	**2003 = 1.97**	**2005 = 5.11 (thru October)**

We can not find a single asset class that behaves similar to this generic liability index much less a custom liability index (CLI). You have to create a **custom Liability Index Fund based on a CLI to create a Beta portfolio that matches the liability objective of pensions**.

Beta Portfolio

An index fund is the correct Beta portfolio that matches the index benchmark with such accuracy and tracking error that the Beta calculation and correlations are 1.00. With a liability driven objective, only a Liability Index Fund could qualify as the Beta or matching portfolio. Again, until you match each liability payment year (liability shape) you cannot hedge the interest rate risk that dominates the risk/reward behavior of liabilities. Only through the CLI could you get the present value calculations necessary to understand how to match the ever changing shape of liabilities. As I have preached so often : **given the wrong index … you will get the wrong risk/reward. There is no generic index that accurately represents any pension's liability behavior. Although the Ryan Liability Benchmark (generic index) would come the closest, a CLI is always the best representation of any pension's liability valuation and behavior.** The last 10 years data is quite revealing :

Generic Indexes vs. Ryan Liability Benchmark (6/30/95 – 6/30/05)

	Annual Return	STD	Tracking Error
Lehman Aggregate	**- 3.02**	**-7.94**	**193**
Lehman Long Government	**- 1.11**	**- 3.02**	**74**
S&P 500	**0.09**	**4.05**	**450**

The most popular generic indexes do not behave or correlate well to a liability index. The Lehman Aggregate lost by 3.02% annually with a huge tracking error of 193 bps monthly. The Lehman Long Government index, commonly used to match liabilities, still had a large tracking deviation of 74 bps and lost by 1.11% annually. The S&P 500 remarkablely matched the return

of our Ryan Liability Benchmark but with an incredible tracking error of 450 bps monthly (i.e. does not track liabilities). Naturally, all data here is time sensitive but every time horizon we calculate shows similar tracking dispersion. As a result, **no generic index should be used as a Beta portfolio for a liability driven objective.**

In Portable Alpha strategies, it is important that **Alpha is correctly measured as the excess return above liabilities.** Outperforming generic indexes is inappropriate performance measurement information vs. a liability objective. The ugly correction years for the stock market (2000 thru 2002) certainly highlight this Alpha clarification. As hard as it is to believe, the S&P 500 underperformed a 13-year average duration Treasury STRIP portfolio (Liability Benchmark) by **- 92.68%** over those three years :

	2000	**2001**	**2002**	**Cumulative**
S&P 500 Index	**- 9.09**	**11.86**	**- 22.08**	**- 37.56**
Ryan Liability Benchmark	**25.96**	**3.08**	**19.47**	**55.12**

				- 92.68

Many Portable Alpha strategies today not only measure Alpha vs. a generic index but use the generic index as their Beta portfolio (generic index fund). The pension fund could lose three ways here :

1. **Alpha portfolio loses to liabilities (CLI)**
2. **Beta portfolio loses to liabilities (does not match liabilities)**
3. **Performance fee paid on wrong Alpha measurement**

The asset side must be in sync with the liability objective if the asset side is to function properly. Without a CLI, how could Asset Allocation, Asset Management and Performance Measurement work properly? Their needs to be coordination and orchestration of all asset functions in harmony with **the true objective … funding liabilities at the lowest cost and risk to the plan sponsor**.

Given the wrong index … you will get the wrong risk/reward
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