How to De-Risk a Pension

by

Ronald J. Ryan, CFA

CEO – Ryan ALM

Risk is best defined as the "uncertainty" of meeting the client objective. **The pension objective is to fund liabilities in a cost-effective manner such that contribution costs remain low and stable.** Pension plans also want to de-risk their plans over time. The lowest risk assets for a pension are those that match the liability benefit payment schedule with *certainty*. By definition, Treasury zero-coupon bonds (STRIPS) and annuities would be the lowest risk assets for pension since they have a known future value… but they tend to come at a high cost since they are low yielding (STRIPS) or have high fees (annuities). Given that the pension objective is to secure benefit payments in a cost-efficient manner, then solving for cost while matching and fully funding the liability payment schedule would be the ideal way to de-risk a pension.

A pension liability benefit payment schedule is a term structure or yield curve often referred to as the ***liability cash flow***. In order to match or de-risk each pension liability payment requires a matching cash flow from assets. Only bonds (and annuities) produce a certain cash flow. That is why bonds have been used for decades as the best way to defease, immunize, and de-risk a pension plan.

Problems with Hedges

Duration-matching strategies (Immunization), Interest Rate Swaps, futures, derivatives, risk overlays, etc. are all hedging tools to help assets match the liability growth rate. **They are NOT de-risking strategies since they do not match the liability cash flows.** Duration matching has several difficult, if not erroneous, data gathering choices it uses:

1. **Average duration of liabilities**

   Where do you get the average duration of liabilities? Most, if not all, actuarial reports do not provide this calculation. Moreover, they usually do not provide the projected liability benefit payment schedule which you would need to calculate duration. In addition, actuarial reports are, at a minimum, annual reports usually three to six months delinquent so there would be serious delayed information. The duration calculation is at a precise moment in time… like a balance sheet. As time and interest rates change… so will duration. Only A ***Custom Liability Index (CLI)*** based on each pension's unique liability benefit payment schedule could provide an accurate and monthly duration profile.

2. **Discount Rates**

   Since the duration of liabilities changes with interest rates (discount rates) this calculation needs to be refreshed and updated on a frequent and accurate basis. According to pension accounting rules (FAS 158, GASB 67) and federal funding standards (PPA – MAP 21 and spot rates) there is an assortment of discount rates required to price liabilities. Which one is best? The FASB accounting language says it best… you are use a discount rate that settles the liability payments. This means discount rates you can buy to **settle or defease** the liability payment schedule. ASC 715 comes the closest by using an AA corporate bond yield curve. Treasury STRIPS would be ideal, but no one seems to favor this approach since STRIPS are low yielding causing the present value of liabilities to be higher. The yield difference in these discount rates could be significant. Any difference in yield creates a difference in the calculation of duration and liability growth rates.

3. **Generic Bond Indexes**

   A common proxy for the average duration of liabilities is to use a generic bond market index… usually the Barclay's long corporate index. Such a proxy creates several erroneous data issues. This index has no bonds shorter than 10 years and no durations longer than 16 years. This certainly does not represent any pension liability schedule even if the average durations were similar. Accounting standards and actuarial practices price liabilities as a portfolio of zero-coupon bonds with a single average discount rate based on the present value of this zero-coupon liability portfolio. There are no generic bond indexes that use zero-coupon bonds as their portfolio. **There are no generic bond indexes that use pension discount rates in accordance with FASB, GASB and PPA guidelines.** Each pension plan's liabilities are different and unique to that plan due to a different labor force, salaries, mortality, and plan amendments. There is no way any generic bond market index could represent any pension plan liability term structure.

Only a **Custom Liability Index** could properly represent and measure any pension plan's liabilities providing all of the critical data calculations needed to de-risk the plan. In 1991, Ron Ryan designed the first Custom Liability Index (CLI). Based on each client's unique projected liability benefit payment schedule, Ryan ALM produces *monthly* CLI reports on:

Structure (Present Value, Average Duration, YTM, Price, etc.)
Growth Rate (Liability growth for month, year, and since inception)
Interest Rate Sensitivity (PV change in % and $ given rate changes)

4. **Interest Rate Sensitivity**

Every 1 year of duration difference between the liability proxy and the actual duration of each plan's benefit payment schedule would represent a 1% mismatch in liability growth for every 100 bps of discount rate change. In truth, the duration mismatch is more likely to be three to five years rather than one year. Given that pension cost for the actuary, administration, asset managers, and consultant are usually less than 50 bps a year; such a duration mismatch could be very costly representing years of pension cost.

5. **Funding Liabilities**

Imagine a 12-year average duration liability benefit payment schedule. It could have many different term structure shapes to come up with an average 12-year average duration. Imagine 100% of the assets in a 12-year duration bond portfolio. If interest rates rose 50 basis points in one-year, total assets and liabilities supposedly would both have a -6% price return (interest rate movement x duration (as a negative number). If they had the same income return = 5% they would match again. However, if the duration matching assets are used to ***fund*** liabilities as they come due then a -1% loss (-6% + 5% = -1%) on assets could be funding a short liability which will have a small positive growth rate. So, the assets could be taking a loss each year to fund the next liability payment if interest rates continue to rise. This could get to be a serious costly mismatch if interest rates continue their secular trend to higher rates for the next few years. But the point is……there is no cash flow match here, only a duration match so there is both a **funding and interest rate risk!**

6. Derivatives

Interest rate swaps and futures are contracts not assets. There is no cash flow or funds available to make the liability cash flow payments. They are certainly NOT de-risking strategies but hedges vs. the liability growth rate. In fact, these strategies introduce more risk: counter party risk, interest rate risk, non-matching risk of assets purchased (usually equities) vs. liabilities, and leverage. In addition, interest rate swaps and futures have all of the problems associated with a liability proxy data gathering… as listed with duration matching.

Solution: Cash Flow Matching

As stated in the beginning, **matching the liability benefit payment schedule (liability cash flow) at the lowest cost is the ideal way to de-risk a pension plan.** Ryan ALM built a liability cash flow matching product, named the **Liability Beta Portfolio™ (LBP)**, as a cost optimization model that matches the liability benefit payment schedule at the lowest cost given the investment policy restrictions of our clients.

The **LBP provides about a 2% per year funding cost savings (1-15 years = 30%).** This is a serious cost reduction and should be a major consideration of any de-risking strategy. Yes, the LBP model has some credit risk but very small since we are using investment grade corporate bonds with a credit filter (no bonds on negative watch list) plus the cost savings provides a large value-added cushion.

The funded ratio should dictate the allocation to bonds. A surplus should have a high allocation to bonds matched to liabilities and vice versa for a deficit funded status. Unfortunately, asset allocation did not respond to the surplus status in the 1990s which led to the US pension crisis. With funded ratios at 120% and above then, why didn't pensions immunize and secure this victory? Amazingly, instead of increasing their bond allocation in response to a growing funded ratio they reduced it consistently because of low interest rates to the lowest bond allocations in modern history by 1999.

The allocation to bonds should determine how much of the liabilities we can cash flow match (i.e. a 25% bond allocation might fund the next seven years of gross liabilities). Ryan ALM recommends: ***funding the next 10 years of Retired Lives on a net liability basis*** (after contributions). Indeed, current assets fund the net liabilities not the gross liabilities. Our LBP model will calculate with precision the cost to fund liabilities (gross or net) in a cost-effective manner either as a % of total liabilities or liabilities ***chronologically***, as both methods will de-risk the plan gradually. There are advantages for each method.

Since liabilities are funded initially by contributions, using the LBP model to cash flow match net liabilities *chronologically* may be able to fund more liabilities than you think. Assume that a 20% bond allocation could match the next 10 years of net liability payments chronologically. Based on the Ryan ALM Liability Beta Portfolio™ (LBP) model we show a cost savings of about 20% on cash flow matching the first 10 years of liabilities, in this interest rate environment.

Matching liabilities chronologically should also buy time for the non-bond assets (Alpha assets) to perform and outgrow liabilities. Given time (7-10 years) most non-bond asset classes tend to outperform bonds. Since liabilities behave like bonds there is a high probability that non-bond asset classes could outperform vs. liability growth over an extended time horizon.

Since the pension objective is a cost focus, cash flow matching a % of total liabilities would produce the ***optimal*** cost savings since the longer the bond the less it costs given the same future value. Our LBP model is back tested since 2009. Every $1 billion in bonds used in our LBP model could save about $200 million in cost savings on a 1-10 year liability schedule and $400 million on a 1-20 year liability schedule.

Asset Allocation (AA)

Pension consultants and plan sponsors should consider installing an LBP as the ***core portfolio*** in asset allocation and as the ***liquidity assets*** to fund liability cash flows chronologically. The intrinsic value in bonds is the certainty of their cash flows. Bonds are usually not considered performance assets (Alpha assets) especially vs. pension liabilities which behave like bonds. Cash flow matching liabilities chronologically will buy time for the Alpha assets (non-bonds) to perform vs. liability growth, thereby enhancing the funded ratio. Such excess returns should be transferred over to the Liability Beta Portfolio™ (LBP) to de-risk more and more liabilities… **Portable Alpha**. Had this *portable Alpha* discipline been in place during the decade of the 1990s when funded ratios grew to their highest historical levels with true economic surpluses… **there would be no U.S. pension crisis today!**

Nota Bene **(Note Well)**

Please note that the definition of risk used in this article is in sharp contrast to the traditional approach produced by the Nobel Prize winner Ph.D. William F. Sharpe back in 1966. Professor Sharpe proposed that risk is the volatility of total returns and that the three-month T-Bill was the default risk-free rate. He developed the Sharpe Ratio as a means of calculating the risk-adjusted return by subtracting the return of the three-month T-Bill from the mean return of the asset(s) being analyzed and dividing the net return by the volatility of the return of the asset(s) in review. For many decades the Sharpe Ratio was the standard measurement of risk-adjusted returns. In 1994 Prof. Sharpe called me and invited me to Stanford to discuss our unique Custom Liability Index data and reports. I had the unique pleasure to meet and debate with one of the finest intellects I have ever met.

I proposed that risk is not a *generic* measurement but based on each client's objective. I referenced pensions where every client's liabilities are different (like snowflakes). As proof, I asked Professor Sharpe what is the risk-free asset for a 10-year liability payment? Professor Sharpe answered…
a 10-year Treasury zero-coupon bond. Prof. Sharpe identified that the three-month T-Bill would have 39 reinvestment moments of uncertainty, so there is no way the three-month T-Bill could match a 10-year liability future value with any certainty and would become a risky asset. Our discussion led to Prof. Sharpe re-inventing the Sharpe Ratio in 1994 to include the benchmark objective instead of the three-month T-Bill in the numerator and denominator such that the average return of the asset portfolio is reduced by the average return of the objective (numerator). This net average return is then divided by the standard deviation of the asset portfolio excess return vs. the objective return. This is commonly called today… the **Information Ratio**.

"Where is the knowledge we have lost in information"

T.S. Eliot